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Langley Research Center

Scientific and Technical Information Program Office

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Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

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Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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Subject Divisions

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I. Social and Information Sciences
J. Space Sciences
K. General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Subject Term Index
Personal Author Index

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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited.

01 Aeronautics (General) 1

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.

02 Aerodynamics 3

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03 Air Transportation and Safety 6

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.

04 Aircraft Communications and Navigation 12

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications; Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar.*

05 Aircraft Design, Testing and Performance 14

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.

06 Avionics and Aircraft Instrumentation 21

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For relatead information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 22

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 Aircraft Stability and Control 27

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 29

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety.* For astronautical facilities see *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited.

12 Astronautics (General) 29

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration, see *91 Lunar and Planetary Science and Exploration*.

13 Astrodynamics 31

Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 Ground Support Systems and Facilities (Space) 32

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

15 Launch Vehicles and Launch Operations 33

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.*

17 Space Communications, Spacecraft Communications, Command and Tracking 34

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 Spacecraft Design, Testing and Performance 34

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.*

19 Spacecraft Instrumentation and Astrionics 36

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also *06 Aircraft Instrumentation and Avionics;* For spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy, Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy.*

20 Spacecraft Propulsion and Power 37

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations;* and *44 Energy Production and Conversion*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited.

23 Chemistry and Materials (General) 41

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29*. For astrochemistry see category *90 Astrophysics*.

24 Composite Materials 50

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

25 Inorganic, Organic, and Physical Chemistry 58

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics*.

26 Metals and Metallic Materials 84

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

27 Nonmetallic Materials 99

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 Propellants and Fuels 118

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

29 Space Processing 147

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced–gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy.*

Subject Categories of the Division D. Engineering

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31 Engineering (General) 148

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

32 Communications and Radar 155

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation;* and *17 Space Communications, Spacecraft Communications, Command and Tracking;* for search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation and Safety.*

33 Electronics and Electrical Engineering 169

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware;* and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar.*

34 Fluid Mechanics and Thermodynamics 187

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics.*

35 Instrumentation and Photography 203

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation;* and *19 Spacecraft Instrumentation*.

36 Lasers and Masers 216

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 221

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

38 Quality Assurance and Reliability 227

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

39 Structural Mechanics 230

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited.

42 Geosciences (General) 238

Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

43 Earth Resources and Remote Sensing 247

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 254

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 Environment Pollution 274

Includes atmospheric, water, soil, noise, and thermal pollution.

46 Geophysics 302

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology;* and *93 Space Radiation*.

47 Meteorology and Climatology 310

Includes weather observation forecasting and modification.

48 Oceanography 325

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

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51 Life Sciences (General) 329

Includes general research topics related to plant and animal biology (non–human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

52 Aerospace Medicine 358

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

53 Behavioral Sciences 362

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 364

Includes human factors engineering; bionics, man–machine, life support, space suits and protective clothing. For related information see also *16 Space Transportation* and *52 Aerospace Medicine*.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited.

59 Mathematical and Computer Sciences (General) 369

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60 Computer Operations and Hardware 371

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61 Computer Programming and Software 373

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

62 Computer Systems 403

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

63 Cybernetics, Artificial Intelligence and Robotics 410

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

64 Numerical Analysis 416

Includes iteration, differential and difference equations, and numerical approximation.

65 Statistics and Probability 420

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

66 Systems Analysis and Operations Research 423

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

67 Theoretical Mathematics 424

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

Subject Categories of the Division H. Physics

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70 Physics (General) 427

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics*.

71 Acoustics 445

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.* For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion Propulsion and Power.*

72 Atomic and Molecular Physics 452

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

73 Nuclear Physics 470

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

74 Optics 494

Includes light phenomena and the theory of optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 508

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 522

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Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.*

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80 Social and Information Sciences (General) 553

Includes general research topics related to sociology; educational programs and curricula.

81 Administration and Management 554

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82 Documentation and Information Science 557

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

84 Law, Political Science and Space Policy 565

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

85 Technology Utilization and Surface Transportation 567

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion.* For specific technology transfer applications see also the category where the subject is treated.

Subject Categories of the Division J. Space Sciences

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88 Space Sciences (General) 568

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

89 Astronomy 568

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x–ray, ultraviolet, and infrared astronomy; and astrometry.

90 Astrophysics 577

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

91 Lunar and Planetary Science and Exploration 587

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 Solar Physics 590

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation.*

93 Space Radiation 593

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics.*

Subject Categories of the Division K. General

Select a category to view the collection of records cited.

99 General 594

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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VOLUME 40, JANUARY 25, 2002

01
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Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20020009087 NASA Glenn Research Center, Cleveland, OH USA

Gear Damage Detection Using Oil Debris Analysis

Dempsey, Paula J., NASA Glenn Research Center, USA; September 2001; 16p; In English; 14th; 14th International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management, 4-6 Sep. 2001, Manchester, UK; Sponsored by Manchester Univ., UK

Contract(s)/Grant(s): RTOP 712-30-13

Report No.(s): NASA/TM-2001-210936; E-12789; NAS 1.15:210936; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this paper was to verify, when using an oil debris sensor, that accumulated mass predicts gear pitting damage and to identify a method to set threshold limits for damaged gears. Oil debris data was collected from 8 experiments with no damage and 8 with pitting damage in the NASA Glenn Spur Gear Fatigue Rig. Oil debris feature analysis was performed on this data. Video images of damage progression were also collected from 6 of the experiments with pitting damage. During each test, data from an oil debris sensor was monitored and recorded for the occurrence of pitting damage. The data measured from the oil debris sensor during experiments with damage and with no damage was used to identify membership functions to build a simple fuzzy logic model. Using fuzzy logic techniques and the oil debris data, threshold limits were defined that discriminate between stages of pitting wear. Results indicate accumulated mass combined with fuzzy logic analysis techniques is a good predictor of pitting damage on spur gears.

Author

Gears; Pitting; Cumulative Damage; Damage Assessment

20020010244 Sterling Software, Inc., Moffett Field, CA USA

Tuning CAS Application using AIMS: An Automated Instrumentation and Monitoring System

Mehra, P., Sterling Software, Inc., USA; Sarukkai, S., Sterling Software, Inc., USA; Schmidt, M., Sterling Software, Inc., USA; Schulbach, C., Sterling Software, Inc., USA; VanVoorst, B., Sterling Software, Inc., USA; Yan, Jerry, Sterling Software, Inc., USA; [1994]; 1p; In English; NASA Computational Aerosciences Workshop, 7-9 Mar. 1995, Moffett Field, CA, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): NAS2-14088; RTOP 505-10-31; No Copyright; Avail: Issuing Activity; Abstract Only

To bring together NASA's scientists and engineers and their counterparts in industry, other government agencies, and academia working in the Computational AeroSciences (CAS) field. This workshop is part of the technology transfer plan of the High Performance Computing and Communications Program (HPCCP). Specific objectives of this Workshop are to: (1) communicate the goals and objectives of HPCCP in the area of CAS; (2) promote and disseminate CAS technology within the appropriate technical communities, including NASA, industry, academia, and other government labs; (3) help promote synergy among CAS scientists; and (4) permit feedback from peer researchers in issues pacing the CAS field in general and the HPCCP CAS program in particular.

Author

Aerospace Sciences; Technology Transfer; Computation

20020010245 NASA Ames Research Center, Moffett Field, CA USA

NASA Activities in Support of the ASTOVL/CTOL CALF Project

Wilson, Samuel B., III, NASA Ames Research Center, USA; [1994]; 1p; In English; SAE AEROTECH 1994, 3-6 Oct. 1994, Los Angeles, CA, USA

Contract(s)/Grant(s): RTOP 505-59-30; No Copyright; Avail: Issuing Activity; Abstract Only

A review of the NASA activities in support of the ARPA ASTOVL/CTOL CALF Project will be presented. These supporting activities include large-scale model tests on the Outdoor Aerodynamics Research Facility (OARF) and in the 40-ft by 80-ft wind tunnel at NASA Ames; manned simulations of the candidate concepts on the Ames Vertical Motion Simulator; scale model and component tests at NASA Langley Research Center; and propulsion component tests at NASA Lewis Research Center.
Author

ARPA Computer Network; V/STOL Aircraft; Aerodynamics

20020011156 Lawrence Livermore National Lab., Livermore, CA USA

March 1999 Working Group Meeting on Heavy Vehicle Aerodynamic Drag: Presentations and Summary of Comments and Conclusions

Brady, M.; Browand, F.; McCallen, R.; Ross, J.; Salari, K.; Mar. 01, 1999; 119p; In English, 11 Mar. 1999, Livermore, CA, USA

Report No.(s): DE2001-9877; UCRL-ID-133547; EE0301000; No Copyright; Avail: Department of Energy Information Bridge

A Working Group Meeting on Heavy Vehicle Aerodynamic Drag was held at Lawrence Livermore National Laboratory, Livermore, California on March 11, 1999. The purpose of the meeting was to present technical details on the experimental and computational plans and approaches and provide an update on progress in obtaining experimental results, model developments, and simulations. The focus of the meeting was a review of the experimental results for the integrated tractor-trailer benchmark geometry called the Sandia Model in the NASA Ames 7 ft x 10 ft wind tunnel. The present and projected budget and funding situation was also discussed. Presentations were given by representatives from the Department of Energy (DOE) Office of Transportation Technology Office of Heavy Vehicle Technology (OHVT), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), University of Southern California (USC), California Institute of Technology (Caltech), and NASA Ames Research Center.This report contains the technical presentations (viewgraphs) delivered at the Meeting, briefly summarizes the comments and conclusions, and outlines the future action items.
NTIS

Aerodynamic Drag; Conferences; Tractors; Trailers

20020012251 National Aerospace Lab., Amsterdam, Netherlands

Frangibility of Approach Lighting Structures at Airports

Wiggenraad, J. F. M.; Zimcik, D. G.; Feb. 13, 2001; 24p; In English; Original contains color illustrations

Report No.(s): PB2001-108835; NLR-TP-2001-064; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aircraft operations at airports require the presence of various types of equipment, such as approach lights, wind direction indicators, instrument landing systems (ILS), or microwave landing systems (MLS). Some of these installations must be positioned close to the runways. Furthermore, these installations quite often need to be pointed in a specific direction within very narrow tolerances, even during severe weather circumstances. Therefore, their construction and their support must be stiff. However, should aircraft stray into these installations during landing or take-off, these same installations become obstacles to flight safety. Since the resistance of these ”obstacles” may well determine the outcome of such a mishap, it must be minimal. In this respect, the damage which occurred in 1972, when a Boeing 747 made an incorrect take-off, and subsequently struck the approach lighting system is described. The aircraft lost two of its main landing gears, and parts of the approach light supporting structure had pierced the aircraft, endangering the flight safety considerably.
NTIS

Flight Operations; Runway Lights; Aircraft Accidents; Structural Stability

20020012261 Kumamoto Inst. of Tech., Japan

Numerical Results of Lifting Surface Theory Cat. 4 Benchmark Problem 3rd CAA Workshop *Final Report*

Namba, M.; Schulten, J. B. H. M.; Jan. 31, 2000; 38p; In English; Third Computational Aeroacoustics Workshop, 8-10 Nov. 1999, Cleveland, OH, USA

Report No.(s): PB2001-108691; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents two lifting surface solutions of the Category 4 benchmark problem of the Third Computational Aeroacoustics (CAA) Workshop, held at Cleveland, Ohio, USA, 8-10 November, 1999. The problem studied is rotor-stator interaction noise for a generic configuration, described in appendix C. Although the boundary value problem is the same for both

authors, there are quite some differences in their analytical modeling and subsequent numerical solution techniques. In general, the numerical results of both authors agree reasonably well. It appears that the agreement in vane pressure jump is very satisfactory. NTIS

Stators; Rotors; Boundary Value Problems; Lift Devices; Aeroacoustics; Numerical Analysis

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20020005971 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain

Low Reynolds Number Airfoils Analysis ***Analisis de Perfiles a Bajos Numeros de Reynolds***

Garcia, Sergio Alonso, Instituto Nacional de Tecnica Aeroespacial, Spain; September 2001; 278p; In Spanish

Report No.(s): INTA-AT/TNO/4410/015/INTA/01; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

In some applications (RPV's windturbines) is essential to know the aerodynamic characteristics of airfoil at low Reynolds numbers, where not much information is available. On the other hand, the computer tools are in general, not validated at those conditions. For that reason, a validation of the tools available at the Fluid Dynamics Dept, has been performed by using some the few experimental result found.

Author

Low Reynolds Number; Computational Fluid Dynamics; Airfoils

20020005977 Army Aviation Research and Development Command, Army Aeroflightdynamics Directorate, Moffett Field, CA USA

An Assessment of the Effect of Compressibility on Dynamic Stall

Carr, Lawrence W., Army Aviation Research and Development Command, USA; Chandrasekhara, M. S., Naval Postgraduate School, USA; [1994]; 1p; In English; 33rd AIAA Aerospace Sciences Meeting, 9-12 Jan. 1995, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

Compressibility plays a significant role in the development of separation on airfoils experiencing unsteady motion, even at moderately compressible free-stream flow velocities. This effect can result in completely changed stall characteristics compared to those observed at incompressible speed, and can dramatically affect techniques used to control separation. There has been a significant effort in recent years directed toward better understanding; of this process, and its impact on possible techniques for control of separation in this complex environment. A review of existing research in this area will be presented, with emphasis on the physical mechanisms that play such an important role in the development of separation on airfoils. The increasing impact of compressibility on the stall process will be discussed as a function of free-stream Mach number, and an analysis of the changing flow physics will be presented. Examples of the effect of compressibility on dynamic stall will be selected from both recent and historical efforts by members of the aerospace community, as well as from the ongoing research program of the present authors. This will include a presentation of a sample of high speed filming of compressible dynamic stall which has recently been created using real-time interferometry.

Author

Compressibility; Interferometry; Aerodynamic Stalling; Fluid Dynamics; Aeronautics

20020006197 General Electric Co., Cincinnati, OH USA

Summary of Drag Coefficients of Various Shaped Cylinders

Heddleson, C. F.; Brown, D. L.; Cliffe, R. T.; Apr. 1957; 51p; In English

Contract(s)/Grant(s): AF33(038)-21102

Report No.(s): AD-A395503; APEX-299; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Data are presented which can be used to predict the aerodynamic drag force caused by cylinders having different cross-sectional shapes. Drag characteristics of circular, square, rectangular, triangular, diamond, and elliptical cylinders, as well

as a large range of thickness-to-chord ratio symmetrical airfoil shapes, are presented as a function of Reynolds number. In addition, certain Mach number characteristics are discussed.
DTIC
Aerodynamic Drag; Symmetry; Cylindrical Bodies; Airfoils

20020006781 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Handbook of Supersonic Aerodynamics, Volume 3
Jun. 01, 1957; 100p; In English
Report No.(s): AD-A395554; NAVORD-1488-VOL-3; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
A preface to the entire Handbook of supersonic aerodynamics includes a brief history of the project. Handbook of the supersonic aerodynamics contains three closely relatedsections: two-dimensional airfoils, three-dimensional airfoils and bodies of revolution.
Derived from text
Bodies of Revolution; Three Dimensional Bodies; Supersonics; Aerodynamics; Supersonic Flow

20020009014 NASA Glenn Research Center, Cleveland, OH USA
Ten Years in the Making: AUSM-Family
Liou, Meng-Sing, NASA Glenn Research Center, USA; November 2001; 20p; In English; 15th; 15th Computational Fluid Dynamics Conference, 11-14 Jun. 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-28-13
Report No.(s): NASA/TM-2001-210977; E-12831; NAS 1.15:210977; AIAA Paper 2001-2521; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We begin by describing the motivations that gave birth to the original AUSM scheme and then focus on the ingredients that has spurred its growth and acceptance by the world of computational fluid dynamics. As it has played out more in the field, weaknesses have also surfaced. Hence, nutrients and supplements are prescribed to help it grow and stay strong and robust. In this paper, we will describe the saga of efforts owing to researchers who have contributed to building up the AUSM-family for the CFD community. It is hoped that a healthy scheme will contribute to the accurate and robust solution of problems encountered in a wide range of disciplines. We analyze numerical mass fluxes with an emphasis on their capability for accurately capturing shock and contact discontinuities. We will present a new scheme for the pressure flux, along with results for a host of test problems.
Author
Computational Fluid Dynamics; Upwind Schemes (Mathematics); Flux Difference Splitting; Flux Vector Splitting

20020009516 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Handbook of Supersonic Aerodynamics, Volume 4
Jan. 01, 1952; 124p; In English
Report No.(s): AD-A395922; NAVORD-R-1488-Vol-4; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This document presents the section of the Handbook of Supersonic Aerodynamics which pertains to aeroelastic phenomena. Tables and graphs are presented that may be used, on the basis of flutter considerations, in the design of guided missiles. In addition there is included here a brief treatment of certain theoretical aspects of flutter in the supersonic regime. This treatment includes a derivation of one of the equations for flutter of airfoils in supersonic flow, namely that for torsional flutter of a two-dimensional (infinite) wing.
Derived from text
Supersonic Flight; Aeroelasticity; Flutter; Graphs (Charts); Missiles; Tables (Data); Wings

20020010909 NASA Ames Research Center, Moffett Field, CA USA
Unsteady Aerodynamic Behavior Measured in Hovering Flight
Bousman, William G., NASA Ames Research Center, USA; Kufeld, Robert M., NASA Ames Research Center, USA; [1994]; 1p; In English; AHS 51st Annual Forum and Technology Display, 9-11 May 1995, Fort Worth, TX, USA; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only
A highly-instrumented UH-60A aircraft was tested at NASA-Ames Research Center from August 1993 to February 1994 obtaining an extensive data base for level flight, maneuvers, acoustics (both with respect to ground microphone arrays and inflight microphones), and flight dynamics. A majority of the data obtained are now in an electronic data base, however, only a small

fraction of the data have been examined. The proposed paper will examine the issue of hovering steadiness in more detail. In particular, a single set of data obtained during ground acoustic testing may provide considerable insight as the wind speeds were measured at a hover height of 250 feet and the aircraft was positioned in 15 deg. steps in heading from 0 to 180 deg. Also, hover housekeeping data were obtained for many of the 31 flights and these will also allow a characterization of the unsteadiness. The variation in section lift will be examined in terms of the induced flow angle variation and this will be related to possible physical explanations.
Author
Unsteady Aerodynamics; Aerodynamic Characteristics; Hovering

20020011954 Research Inst. of National Defence, Weapons and Protection Div., Tumba, Sweden
Computational Study of Subsonic Flow Past a NACA0012 Airfoil
Alin, N.; Fureby, C.; August 2000; 20p; In English
Report No.(s): PB2002-100455; FOA-R-00-01562-865-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The problem of rapidly detecting biological and chemical agents under active-service conditions is of obvious importance and complexity. A promising technique has previously been developed that involves a collection system, an enrichment system, and a detection module. The detection module and the enrichment system are in operating condition, but an optimal design of the collection system remains. A possible design consists of a rotor with a number of short wing sections at a small angle of attack. Each wing section has a slit at the leading edge where air passes through to the enrichment system, where particles or chemical agents are trapped, and passed on to the detection module. The present study is concerned with positioning of the slit in relation to the angle of attack and the thickness of the wing section. to this end the authors apply Large eddy Simulation (LES) to investigate subsonic flow around a fixed NACA 0012 wing section at different angles of attack in a constant air-stream. The flow is examined using advanced visualization techniques, and based on this, a position of the slit is determined together with an approximate width of the slit in order to collect a given volume of air.
NTIS
Air Flow; Airfoils; Detection; Subsonic Flow; Computational Fluid Dynamics; Aircraft Configurations

20020012216 NASA Ames Research Center, Moffett Field, CA USA
Navier-Stokes Aerodynamic Simulation of the V-22 Osprey on the Intel Paragon MPP
Vadyak, Joseph, NASA Ames Research Center, USA; Shrewsbury, George E., NASA Ames Research Center, USA; Narramore, Jim C., NASA Ames Research Center, USA; Montry, Gary, NASA Ames Research Center, USA; Holst, Terry, NASA Ames Research Center, USA; [1995]; 3p; In English; Computational Aeroscience Workshop, 7-9 Mar. 1995, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 505-99-10; No Copyright; Avail: Issuing Activity

The paper will describe the Development of a general three-dimensional multiple grid zone Navier-Stokes flowfield simulation program (ENS3D-MPP) designed for efficient execution on the Intel Paragon Massively Parallel Processor (MPP) supercomputer, and the subsequent application of this method to the prediction of the viscous flowfield about the V-22 Osprey tiltrotor vehicle. The flowfield simulation code solves the thin Layer or full Navier-Stoke's equation - for viscous flow modeling, or the Euler equations for inviscid flow modeling on a structured multi-zone mesh. In the present paper only viscous simulations will be shown. The governing difference equations are solved using a time marching implicit approximate factorization method with either TVD upwind or central differencing used for the convective terms and central differencing used for the viscous diffusion terms. Steady state or Lime accurate solutions can be calculated. The present paper will focus on steady state applications, although time accurate solution analysis is the ultimate goal of this effort. Laminar viscosity is calculated using Sutherland's law and the Baldwin-Lomax two layer algebraic turbulence model is used to compute the eddy viscosity. The Simulation method uses an arbitrary block, curvilinear grid topology. An automatic grid adaption scheme is incorporated which concentrates grid points in high density gradient regions. A variety of user-specified boundary conditions are available. This paper will present the application of the scalable and superscalable versions to the steady state viscous flow analysis of the V-22 Osprey using a multiple zone global mesh. The mesh consists of a series of sheared cartesian grid blocks with polar grids embedded within to better simulate the wing tip mounted nacelle. MPP solutions will be shown in comparison to equivalent Cray C-90 results and also in comparison to experimental data. Discussions on meshing considerations, wall clock execution time, load balancing, and scalability will be provided.
Author
V-22 Aircraft; Computerized Simulation; Massively Parallel Processors; Computational Fluid Dynamics; Navier-Stokes Equation; Flow Distribution; Viscous Flow; Computational Grids

20020012248 National Aerospace Lab., Amsterdam, Netherlands

Assessment of Wake Vortex Safety to Evaluate Separation Distances

Speijker, L. J. P.; Blom, H. A. P.; Kos, J.; Nov. 1999; 16p; In English

Report No.(s): PB2001-108840; NLR-TP-99454; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The steady increase in air traffic imposes a need for enhanced airport capacity, and the desire to safely reduce existing separation standards. An important limiting factor in establishing required separation standards is the risk imposed by wake vortices. A probabilistic model is developed for the determination of wake vortex induced accident risk. The modeling approach is integrated within a stochastic framework. Four probabilistic sub models are being used: Wake vortex evolution model; Wake vortex interaction model; Aircraft control capability model; Flight path evolution model. This probabilistic model can be used for an assessment of wake vortex safety related to different ATM concepts or procedures. It provides a tool to evaluate the separation standards for the current practice, and for promising new concepts which may enable a safe reduction of the current separation standards. Numerical evaluation results can be fed back to ATM designers, who can use these results to redesign or improve their proposed ATM concept.

NTIS

Air Traffic Control; Aircraft Accidents; Aircraft Control

20020012432 George Washington Univ., School of Engineering and Applied Sciences, Hampton, VA USA

Joint Institute for Advancement of Flight Sciences *Annual Report, 1 Dec. 2000 - 30 Nov. 2001*

Klein, Vladislav, George Washington Univ., USA; [2001]; 16p; In English

Contract(s)/Grant(s): NCC1-326; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The program in its present form includes three major topics: (1) the improvement of existing methods and development of new methods for wind tunnel and flight test data analysis; (2) the application of these methods to wind tunnel and flight test data obtained from advanced airplanes; and (3) the correlation of flight results with wind tunnel measurements and theoretical predictions.

Author

Flight Mechanics; Wind Tunnel Tests; Flight Tests; Aerodynamic Characteristics

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20020006492 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Can the Air Combat Element of the Marine Air Ground Task Force Successfully Conduct Operational Maneuver from the Sea in the 21st Century?

Becker, Kenneth R.; Jan. 2001; 101p; In English; Original contains color images

Report No.(s): AD-A395651; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Operational Maneuver from the Sea (OMFTS) is a capstone concept that has the flexibility and diversity to meet all operational concepts in Joint Vision 2020. Under the OMFTS concept, a Naval Expeditionary Force can rapidly react to a crisis from a virtually undetectable position over the horizon, establish maritime superiority, conduct precision engagement with focused logistics and, due to the maneuverability of the naval forces, enhance its full dimensional protection. The Air Combat Element (ACE) will play a vital role in the accomplishment of the OMFTS concept. However, with the rapid rate of technological advances and the current and proposed Naval and Marine Corps aviation platforms designed to meet the OMFTS concept, is aviation able to become the integral maneuver element to successfully accomplish the four operational concepts that are embedded in Joint Vision 2020 and OMFTS? Is there a shortfall between the current and projected employment of aviation assets and the swift accomplishment of OMFTS objectives? If the MV-22 and JSF are integrated into the ACE, it is a fact that the MAGTF will be able to successfully conduct OMFTS. However, if these platforms are cancelled, the implementation of the OMFTS concept risks becoming fiction.

DTIC

Combat; Maneuverability; Military Aviation; Seas; Marine Technology

20020006760 Air Force Materiel Command, Wright-Patterson AFB, OH USA

Opportunities and Perils in the Command of Space

Alford, Lionel D., Jr; Mar. 26, 2001; 26p; In English; Sponsored by NDIA. Contains viewgraphs only

Report No.(s): AD-A394796; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation of viewgraphs concerns space systems and historical, strategic and technological parallels of aircraft, warfare and military operations in the past.

DTIC

Aerospace Systems; Warfare

20020006887 Air Command and Staff Coll., Maxwell AFB, AL USA

Establishing a Commercial Reserve Imagery Fleet Obtaining Surge Imagery Capacity from Commercial Remote Sensing Satellite Systems During Crisis

Rider, Douglas B.; Apr. 2000; 63p; In English; Original contains color images

Report No.(s): AD-A394938; AU/ACSC/152/2000-04; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Precision-guided weapons employment during and since the Gulf War highlights the critical role space assets, particularly reconnaissance systems, play in modern military operations. This, along with other developments, has led to a proliferation of commercial satellite remote sensing systems. Congress directed the National Reconnaissance Office and National Imagery and Mapping Agency to investigate commercial satellite imaging systems as a supplement to national reconnaissance systems. This paper investigates one of the recommendations in the response to Congress: the development of a Commercial Reserve Imagery Fleet (CRIF) to augment national imagery systems during crises. The CRIF concept is explored in detail using the successful Civil Reserve Air Fleet (CRAF) model that supplies surge airlift capacity for comparison. The first question that must be answered is why establish a CRIF? There are at least three reasons, the principal being money. In the current budgetary and strategic environment, Congress will not continue to fund the development of national imagery systems to meet ever-expanding requirements, particularly surge requirements expected during crises. Congress desires to leverage the investment being made in the commercial remote sensing market to reduce the burden on the taxpayer. Second, the path is historically proven. The development of aviation technology followed a similar course when the CRAF was instituted to reduce government costs while meeting surge airlift requirements. Third, valid requirements for surge imagery capacity exist that can be fulfilled by current commercial imagery systems. The necessary conditions for establishing a CRIF are then examined. The development of the early US aviation industry is reviewed to identify the conditions that led to the formation of the CRAF. This history is compared to currently identify. Finally,and logistical issues that existed during CRAF development. The CRIF concept is the

DTIC

Commercial Aircraft; Aeronautics; Aerospace Systems; Remote Sensing; Civil Aviation

20020008234 Analytic Sciences Corp., Fairborn, OH USA

Technology for Maintenance Procedure Validation ***Interim Report, Jan. 2000-Jan 2001***

Badler, Norman; Erignac, Charles; Bindiganavale, Rama; Vincent, Patrick J.; Sanchez, Edgar; Abshire, Kevin; Wampler, Jeffrey L.; Boyle, Edward S.; Ianni, John D.; May 2001; 42p; In English; Prepared in cooperation with the University of Pennsylvania, Center for Human M&S, Philadelphia, PA

Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710

Report No.(s): AD-A395888; AFRL-HE-WP-TR-2001-0117; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This task was performed under delivery order #8 of the Technology for Readiness and Sustainment (TRS) contract period of research from January 2000 through January 2001. The primary objective of this research was to explore the feasibility of validating aircraft maintenance procedures using human models. The candidate aircraft maintenance procedures are decomposed from their written form into implied actions to obtain accurate simulation of the procedures. By comparing the procedure language with its corresponding actions, we can easily judge whether procedures as written are safe, logically ordered, and complete. In addition, this task also produced a core set of critical research and development tasks considered essential to overcoming important barriers to the development of an automated Technical Order (TO) validation and verification system or application.

DTIC

Aircraft Maintenance; Program Verification (Computers); Computerized Simulation; Automation

20020008241 Georgia Tech Research Inst., Electronics and Computer Systems Lab., Atlanta, GA USA

Integrated Technical Information for the Air Logistics Center: Enhancing Maintenance Technician Task Performance ***Final Report***

Mitta, Deborah A.; Quill, Laurie L.; Masquelier, Barbara L.; Jan. 1998; 90p; In English; Prepared in cooperation with University of Dayton Research Institute, Dayton, OH

Contract(s)/Grant(s): SPO900-94-D-0001; Proj-1710

Report No.(s): AD-A395750; AFRL-HE-WP-TR-2001-0038; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This technical paper documents the final results of an analysis of the task environment under which depot maintenance technicians perform their jobs, specifically, programmed depot maintenance (PDM) for F-15 aircraft. This effort has resulted in a detailed system-level analysis of PDM activities in which an understanding of the PDM process, specific major jobs with the process, and the types of support necessary for successful job completion have been identified. The motivation for this research was to identify activities in the process that would most benefit from technologies expected from the Integrated Technical Information for the Air Logistics Center (ITI-ALC) Program.

DTIC

Aircraft Maintenance; Human Performance; Personnel; Logistics

20020008615 Systems Research Labs., Inc., Dayton, OH USA

Development and Testing of a New Reefing System to Reduce Parachute Opening Shock Characteristics During Seat Ejection ***Final Report, Nov. 1990-Nov 1992***

Brinkman, John C.; Nov. 1992; 7p; In English

Contract(s)/Grant(s): F33615-89-C-0574; AF Proj. 2830

Report No.(s): AD-A395743; AFRL-HE-WP-TR-2001-0045; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report summarizes the initial testing of a new parachute slider reefing system to control the opening dynamics of the military C-9 parachute. It has been theorized that if one could control the opening of the parachute canopy used during emergency ejections, the parachute opening forces on the crewmember could he significantly reduced. The report addressed the reefing system modification and summarizes the initial testing results of the new slider reefing system to control the parachute opening dynamics.

DTIC

Ejection Seats; Parachutes; Shock (Physiology); Crews

20020008650 Minnesota Univ., Dept. of Landscape Architecture, Minneapolis, MN USA

Groundside Effects of Air Transportation ***Topical Report***

Cidell, J. L.; Adams, J. S.; August 2001; 110p; In English

Report No.(s): PB2001-108573; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report systematically examines land uses around airports across the country, as well as the consequences for a metropolitan region of expanding versus moving an airport. A combination of methodologies is found to be the best approach. The airports in Minneapolis-St. Paul and Denver are further examined as case studies for the question of expansion versus new construction. Conclusions include: the larger the city, the more specialized the airport land uses, and regional economic needs and wants override local economic, social, and environmental needs and wants. Future study should take a more historical approach and more carefully define the region influenced by an airport.

NTIS

Airports; Land Use

20020008662 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Safety Recommendations Adopted During the Month of December 2000

Dec. 2000; 60p; In English

Report No.(s): PB2000-916612; NTSB/REC-00/12; No Copyright; Avail: National Technical Information Service (NTIS)

The report contains the National Transportation Safety Board's safety recommendations sent to various affected agencies regarding four separate accidents.

NTIS

Air Transportation; Accident Investigation

20020009003 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Assessment of Crew Workload for the RAH-66 Comanche Force Development Experiment 1 ***Final Report***
Durbin, David B.; Oct. 2001; 63p; In English; Original contains color images
Contract(s)/Grant(s): Proj-AH70
Report No.(s): AD-A395936; ARL-TN-183; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Crew workload was assessed during the RAH-66 Comanche Force Development Experiment (FDE) 1. The purpose was to determine if: (a) the pilots experienced tolerable and comparable workload levels when flying the aircraft versus operating the mission equipment package (MEP), and (b) workload levels contribute to a need to 'battle roster' Comanche pilots. Workload data were collected via the Bedford Workload Rating Scale and a cockpit controls and displays usability questionnaire. Results of the assessment indicate that: (a) workload was tolerable for the pilots, (b) workload was moderately higher for the pilots when they operated the MEP, and (c) there is no compelling need to prescribe battle rostering because pilots experienced only moderate differences in workload when they flew the aircraft versus when they operated the MEP.
DTIC
Workloads (Psychophysiology); Flight Crews; Pilots (Personnel); Pilot Performance; Military Helicopters

20020009052 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA
Aviation Accidents and Incidents Associated With the Use of Ophthalmic Devices by Civilian Pilots ***Final Report***
Nakagawara, Van B.; Montgomery, Ron W.; Wood, Kathryn J.; Jul. 2001; 13p; In English
Report No.(s): AD-A396122; DOT/FAA/AM-01/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Approximately 54% of civilian pilots rely on ophthalmic lenses to correct defective vision and maintain a valid airman medical certificate. The use of these devices can potentially create operational problems in an aviation environment. This report reviews aviation accidents and incidents in which ophthalmic lenses used by civilian pilots were contributing factors in the mishaps between 1 January 1980 and 31 December 1998. Methods. The National Transportation Safety Board's (NTSB's) Aviation Accident/Incident Database and the Federal Aviation Administration's (FAA's) Incident Data System were queried for terms related to ophthalmic lenses for the period 1980-98. All reports annotated with ophthalmic terms were reviewed and stratified based on the type of ophthalmic correction used and if the device was determined to be a factor in the mishap. Additionally, the Aviation Safety Reporting System (ASRS), which allows aviation personnel to report actual or potential discrepancies and deficiencies involving the safety of aviation operations, was similarly queried and reviewed for the period 1988-98. Results. The NTSB and FAA databases included 16 mishaps in which factors, such as lost/broken eyeglasses, problems with sunglasses, incompatibility with personal protective breathing equipment, adaptation difficulties, inappropriate ophthalmic prescriptions and contact lenses, were found to be contributing factors in aviation accidents or incidents. Aviation personnel voluntarily submitted 26 ASRS reports describing operational problems involving traditional ophthalmic devices that adversely affected aviation safety. Conclusions. Ophthalmic devices used by pilots have contributed to aviation accidents and incidents.
DTIC
Vision; Contact Lenses; Aircraft Accidents; Data Systems

20020009148 NCI Information Systems, Inc., Fairborn, OH USA
Passive Aircraft Status System (PASS) ***Final Report, Aug. 1999-Aug 2001***
January 2001; 38p; In English
Contract(s)/Grant(s): F41624-99-F-0007; AF Proj. 2745
Report No.(s): AD-A395699; AFRL-HE-WP-TR-2001-0114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Passive Aircraft Status System (PASS) concept addresses the timing and accuracy of aircraft information (system failures, consumables, aircraft status, etc.) available to maintenance personnel and to alleviate maintenance issues by providing accurate and detailed information to the maintenance environment before the aircraft landing. The maintenance community uses this information to plan and schedule the aircraft's next activity (fly or fix). The effort occurred in three phases: (1) Technology Review and Data Collection: to investigate and review the communications, information displays, and state-of-the-art technologies currently available for possible use in a PASS, (2) Design and Analysis: to define the functions required to fulfill the concept, identify potential different approaches for a PASS implementation, and prioritize the recommended approaches to develop the concept for a field demonstration, (3) Preliminary Plan for Technology Development: to encapsulate and demonstrate the benefits of PASS in current and future maintenance process.
DTIC
Information Systems; Aircraft Maintenance; Systems Engineering; Design Analysis

20020009149 NCI Information Systems, Inc., Fairborn, OH USA

Passive Aircraft Status System (PASS): Design and Analysis ***Interim Report, Aug. 1999-Aug 2001***

January 2001; 24p; In English

Contract(s)/Grant(s): F41624-99-F-0007; AF Proj. 2745

Report No.(s): AD-A395698; AFRL-HE-WP-TR-2001-0126; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Passive Aircraft Status System (PASS) concept addresses the timing and accuracy of aircraft information (system failures, consumables, status, etc.) available to maintenance personnel and to alleviate maintenance issues by providing accurate and detailed information to maintenance environment before the aircraft landing. This is the second phase of a three phase effort. The design and analysis study consisted of collecting relevant data at operational bases, analyzing the data results, developing and prioritizing the approaches, and recommending concepts for the laboratory demonstration.

DTIC

Information Systems; Aircraft Maintenance; Systems Engineering; Design Analysis; Aircraft Instruments

20020009661 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

Multimodal Displays for Target Localization in a Flight Test ***Interim Report, 1 Oct. 1997-30 Sep. 1999***

Tannen, Robert S.; Jan. 2001; 63p; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A396169; AFRL-HE-WP-TR-2001-0102; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study evaluated the role of adaptive cueing interfaces as a means of integrating visual and auditory displays for target designation and was conducted at the Air Force Research Laboratory's Synthesized Immersion Research Environment (SIRE) facility. Twelve pilots with a mean of 2652 flight hours performed a simulated flight task in which they were instructed to maintain a prescribed flight path, air speed, and altitude. Pilots visually searched out-the-window for ground and air targets. Seven target-location cueing conditions were employed which featured spatialized auditory, visual, non-adaptive multimodal, and adaptive multimodal display configurations. Designation accuracy was poorest in the non-cueing and spatialized auditory display conditions in comparison to the other display configurations. The addition of spatialized sound to visual cueing reduced target designation time in comparison to the visual cue alone in some conditions, and the time advantage form multimodal cueing was approximately 825 msec. Multimodal cueing also reduced head motion and lowered pilots' workload by approximately 30%. This study suggests that multimodal cueing may effectively aid target localization in tactical aviation and revealed no advantage or disadvantage for presenting multimodal information adaptively over presenting it in a fixed format; the benefits associated with multimodal information were identical in both fixed and adaptive formats.

DTIC

Flight Simulation; Flight Tests; Target Recognition; Display Devices; Visual Stimuli

20020009665 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Delicate Balance: Protecting the Environment and Strengthening Trade Through Controlling Aircraft Noise and Emissions

Richardson, Linda L.; Aug. 31, 2001; 97p; In English

Report No.(s): AD-A396160; AFIT-CI01-292; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

International trade and environmental law present a difficult and delicate balance for the commercial airline industry. The weight of real-world trade and environmental issues constantly shift the balance in opposing regulatory and normative directions. For instance, the environmental realities of running an airport, ranging from noise control and air emissions to less publicized issues of chemical runoff and waste disposal, foment anti-airport sentiment in the public and impose significant fiscal burdens on the airport itself. Despite that, the speed and convenience of air travel and the cheaper ticket prices brought by deregulation has the same public clamoring for more flights to more places at more times of the day and night.

DTIC

Emission; Aircraft Noise; Environment Protection; Waste Disposal; Acoustic Emission

20020010135 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Safety Recommendations Adopted during the Month of April 2001
Apr. 2001; 30p; In English
Report No.(s): PB2001-916604; NTSB/REC-01/04; No Copyright; Avail: National Technical Information Service (NTIS)
The publication contains safety recommendations in air mode of transportation adopted by the Transportation Safety Board during the month of April, 2001.
NTIS
Safety Management; Transportation; Recommendations

20020010136 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Safety Recommendations Adopted during the Month of February 2001
Feb. 2001; 8p; In English
Report No.(s): PB2001-916602; NTSB/REC-01/02; No Copyright; Avail: National Technical Information Service (NTIS)
The report contains the National Transportation Safety Board's safety recommendations sent to various affected agencies.
NTIS
Air Transportation; Safety Management; Accident Investigation; Aircraft Safety

20020010256 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Surveillance Performance Requirements for Runway Incursion Prevention Systems
Thompson, S. D.; Eggert, J. R.; Sep. 26, 2001; 136p; In English
Report No.(s): PB2002-100420; ATC-301; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
In response to concerns over the number of runway incursions and runway conflicts at U.S. airports, the Federal Aviation Administration is sponsoring research and development of safety systems for the airport surface. Two types of safety systems are being actively pursued, a tower cab alerting system and a runway status light system. The tower cab alerting system, called the Airport Movement Area Safety System (AMASS) is currently undergoing initial operational evaluation at several major airports. It provides rural and visual alerts to the tower cab to warn the controllers of potential traffic conflicts. The runway status light system is currently in the development phase, with initial operational suitability demonstrations planned at Dallas/Fort Worth International Airport during FY2003. Both systems operate automatically, requiring no controller inputs. Activation commands for alerts and lights are generated by the systems' safety logic, which in turn receives airport traffic inputs from a surface surveillance and target tracking system. Accurate traffic representation is essential to meet system requirements, which include high conflict detection rate, prompt and accurate and light activation, low nuisance and false alarm rate, and negligible interference with normal operations. This report analyzes the effect of the two fundamental surveillance performance parameters - position accuracy and surveillance update rate - on the performance of three different surface safety systems.
NTIS
Runways; Surveillance; Airports; Air Traffic Control; Accident Prevention

20020010915 NASA Ames Research Center, Moffett Field, CA USA
Information for Lateral Aircraft Spacing Enabling Closely-Spaced Runway Operations During Instrument-Weather Conditions
Thrush, Trent, NASA Ames Research Center, USA; Pritchett, Amy, Massachusetts Inst. of Tech., USA; Johnson, Eric, Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1994]; 1p; In English; Eighth International Symposium on Aviation Psychology, 23-27 Apr. 1994, Unknown
Contract(s)/Grant(s): RTOP 538-04-11; No Copyright; Avail: Issuing Activity; Abstract Only
In an effort to increase airport capacity, the U.S. plans on investing nearly $6 billion a year to properly maintain and improve the nation's major airports. Current FAA standards however, require a reduction in terminal operations during instrument-weather conditions at many airports, causing delays and reducing airport capacity. NASA, in cooperation with the FAA, has developed the Terminal Area Productivity Program to achieve clear-weather capacity in instrument- weather conditions for all phases of flight. This paper describes a series of experiments planned to investigate the conceptual design of different systems that provide information to flight crews regarding nearby traffic during the approach phase of flight. The purpose of this investigation is to identify and evaluate different display and auditory interfaces to the crew for use in closely-spaced parallel runway operations. Three separate experiments are planned for the investigation. The first two experiments will be conducted using part-task flight simulators located at the MIT Aeronautical Systems Laboratory and at NASA Ames. The third experiment will be conducted in the Advanced Concepts Flight Simulator, a generic "glass-cockpit" simulator at NASA Ames. Subjects for each experiment will be current glass-cockpit pilots from major U.S. air carriers. Subject crews will fly several experimental scenarios in which

pseudo-aircraft are ”blundered” into the subject aircraft simulation. Runway spacing, longitudinal aircraft separation, aircraft performance and traffic information will be varied. Analyses of the subject reaction times in evading the blundering aircraft and the resulting closest points of approach will be conducted. This paper presents a preliminary examination of the data recorded during the part-task experiments. The impact of traffic information on closely-spaced parallel runway operations is discussed, cockpit displays to aid these operations are examined, and topics for future research are suggested.
Author
Aircraft Approach Spacing; Runways; Weather; Aircraft Performance

20020012283 National Aerospace Lab., Informatics Div., Amsterdam Netherlands
Data System in Flight and Emission Modelling
de Witte, T. D.; Oct. 27, 1998; 16p
Report No.(s): PB2002-100801; NLR-TP-98480; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Flight and emission modeling is applied in operational applications and in engineering to quantify aircraft emissions by aviation activities. A data system, called the flight and emission model, is designed to comply with both types of usage. Main features of this data system are described. Traffic processing as special feature is highlighted, especially related to large volume data processing on multiple platforms. Methods have been applied to improve the computational performance by creating a flight sequence that minimizes the number of calculation steps. Results show that model performance can be increased by such methods, in addition to the definite gain from the increasing power of computer platforms. The data system provides the framework for integrating flight and emission model components. The resulting flight and emission model has proven to be successful in studies performed at NLR and has been embedded in a policy analysis instrument for the national government.
NTIS
Data Processing; Data Systems; Mathematical Models; Exhaust Emission; Civil Aviation

20020012544 National Aerospace Lab., Amsterdam, Netherlands
Operational Safety Implications of GPS-based Non-Precision Approach Operations ***Final Report***
Vermeij, J. H.; Karwal, A. K.; Speijker, L. J. P.; Dieroff, M.; Jan. 2001; 20p; In English
Report No.(s): PB2001-108702; NLR-TP-2000-152; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The qualitative assessment of the relative safety of (Global Positioning System) GPS-based NPAs (Non-Precision Approach) is performed by comparing the differences of the GPS-based NPA with the NPA based on conventional radio navigation aids. For that purpose, first a clear description of the conventional NPAs is compiled, then a list of hazards consisting of differences between GPS and conventional NPAs is compiled. This list of differences is used for the actual relative safety criticality analysis.
NTIS
Global Positioning System; Approach; Navigation Aids; Safety

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20020006061 NASA Ames Research Center, Moffett Field, CA USA
Models of Human Information Requirements: ”When Reasonable Aiding Systems Disagree”
Corker, Kevin, NASA Ames Research Center, USA; Pisanich, Gregory, Sterling Software, Inc., USA; [1994]; 1p; In English; Computer-Based Human Support Systems: Technology, Methods and Future, 25-29 Jun. 1995, Philadelphia, PA, USA; Sponsored by American Nuclear Society, USA
Contract(s)/Grant(s): RTOP 538-04-11; No Copyright; Avail: Issuing Activity; Abstract Only
Aircraft flight management and Air Traffic Control (ATC) automation are under development to maximize the economy of flight and to increase the capacity of the terminal area airspace while maintaining levels of flight safety equal to or better than current system performance. These goals are being realized by the introduction of flight management automation aiding and operations support systems on the flight deck and by new developments of ATC aiding systems that seek to optimize scheduling of aircraft while potentially reducing required separation and accounting for weather and wake vortex turbulence. Aiding systems on both the flight deck and the ground operate through algorithmic functions on models of the aircraft and of the airspace. These models may differ from each other as a result of variations in their models of the immediate environment. The resultant flight

operations or ATC commands may differ in their response requirements (e.g. different preferred descent speeds or descent initiation points). The human operators in the system must then interact with the automation to reconcile differences and resolve conflicts. We have developed a model of human performance including cognitive functions (decision-making, rule-based reasoning, procedural interruption recovery and forgetting) that supports analysis of the information requirements for resolution of flight aiding and ATC conflicts. The model represents multiple individuals in the flight crew and in ATC. The model is supported in simulation on a Silicon Graphics' workstation using Allegro Lisp. Design guidelines for aviation automation aiding systems have been developed using the model's specification of information and team procedural requirements. Empirical data on flight deck operations from full-mission flight simulation are provided to support the model's predictions. The paper describes the model, its development and implementation, the simulation test of the model predictions, and the empirical validation process. The model and its supporting data provide a generalizable tool that is being expanded to include air/ground compatibility and ATC crew interactions in air traffic management.
Author
Air Traffic Control; Automatic Control; Flight Management Systems; Flight Simulation; Performance Prediction

20020008226 NASA Dryden Flight Research Center, Edwards, CA USA
Data Synchronization Discrepancies in a Formation Flight Control System
Ryan, Jack, NASA Dryden Flight Research Center, USA; Hanson, Curtis E., NASA Dryden Flight Research Center, USA; Norlin, Ken A., NASA Dryden Flight Research Center, USA; Allen, Michael J., NASA Dryden Flight Research Center, USA; November 2001; 18p; In English; 32nd Annual Society of Flight Test Engineers Symposium, 10-14 Sep. 2001, Seattle, WA, USA; Sponsored by Society of Flight Test Engineers, USA
Contract(s)/Grant(s): RTOP 710-70-14-E8-28
Report No.(s): NASA/TM-2001-210720; H-2470; NAS 1.15:210720; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aircraft hardware-in-the-loop simulation is an invaluable tool to flight test engineers; it reveals design and implementation flaws while operating in a controlled environment. Engineers, however, must always be skeptical of the results and analyze them within their proper context. Engineers must carefully ascertain whether an anomaly that occurs in the simulation will also occur in flight. This report presents a chronology illustrating how misleading simulation timing problems led to the implementation of an overly complex position data synchronization guidance algorithm in place of a simpler one. The report illustrates problems caused by the complex algorithm and how the simpler algorithm was chosen in the end. Brief descriptions of the project objectives, approach, and simulation are presented. The misleading simulation results and the conclusions then drawn are presented. The complex and simple guidance algorithms are presented with flight data illustrating their relative success.
Author
Hardware-In-The-Loop Simulation; Flight Tests; Anomalies; Global Positioning System

20020009557 NASA Ames Research Center, Moffett Field, CA USA
Initial Field Evaluation of Pilot Procedures for Flying CTAS Descent Clearances
Palmer, Everett; Goka, Tsuyoshi; Cashion, Patricia; Feary, Michael; Graham, Holly; Smith, Nancy; [1994]; 1p; In English; Eigth International Symposium on Aviation Psychology, 23-27 Apr. 1995, Columbus, OH, USA
Contract(s)/Grant(s): RTOP 505-64-13; No Copyright; Avail: Issuing Activity; Abstract Only

The Center TRACON Automation System (CTAS) is a new support system that is designed to assist air traffic controllers in the management of arrival traffic. CTAS will provide controllers with more information about current air traffic, enabling them to provide clearances for efficient, conflict-free descents that help achieve an orderly stream of aircraft at the final approach fix. CTAS is a computer-based system that functions as a "ground-based FMS" that can predict flight trajectories and arrival times for all incoming aircraft. CTAS uses an aircraft's cruise airspeed; current air traffic, winds and temperature; performance characteristics of the aircraft type; and individual airline preferences to create a flight profile from cruise altitude to the final approach fix. Controllers can use this flight profile to provide a descent clearance that will allow an aircraft to fly an efficient descent and merge more smoothly with other arriving aircraft. A field test of the CTAS Descent Advisor software was conducted at the Denver Center for aircraft arriving at the Stapleton International Airport from September 12-29. CTAS Descent clearances were given to a NASA flight test aircraft and to 77 airline flights that arrived during low traffic periods. For the airline portion of the field test, cockpit procedures and pilot briefing packages for both FMS equipped and unequipped aircraft were developed in cooperation with an airline. The procedures developed for the FMS equipped aircraft were to fly a VNAV descent at a controller specified speed to cross a metering fix at a specified altitude and speed. For nonFMS aircraft, the clearance also specified a CTAS calculated top-of-descent point. Some CTAS related flight deck issues included how much time was available to the pilots' for compliance, the amount of information that needed to be interpreted in the clearance and possible repercussions of

misunderstandings. Data collected during the study ranged from subjective data (including the airline pilots' opinions and comments about the new descent clearances and procedures) to objective data (including observations of aircraft performance from the flight deck). This paper will present data and the resulting changes in the design of the procedures and clearance phraseology.
Author
Air Traffic; Air Traffic Controllers (Personnel); Computer Techniques; Automatic Control; Support Systems; Field Tests

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020006046 General Dynamics Armament Systems, Inc., Burlington, VT USA
Advanced Turreted Gun Systems for All-Composite Aircraft. RAH-66 and MV-22
DePasqual, Ed; Apr. 09, 2001; 19p; In English; Proceedings from the 36th Annual Gun & Ammunition Symposium & Exhibition 9-12 April 2001 Sponsored by NDIA. Contains viewgraphs only
Report No.(s): AD-A394812; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The viewgraphs for the advanced Turreted Gun Systems for all-composite aircraft, RAH-66 and MV-22, are presented.
DTIC
Helicopters; Vertical Takeoff Aircraft; Gun Turrets; Tilt Rotor Aircraft

20020006050 Simulation Strategies, Inc., Alexandria, VA USA
Building a Distributed Product Description for the Joint Strike Fighter
Hollenbach, Jim; May 15, 2001; 24p; In English; 3rd Simulation Based Acquisition Conference, 15-17 May 2001, USA; Sponsored by National Defense Industrial Association, USA; Original contains color images
Report No.(s): AD-A394745; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This document includes the proceedings from the 3rd Simulation Based Acquisition conference, 15-17 May 2001, sponsored by NDIA.
Author
Conferences; Data Bases; Fighter Aircraft; Digital Simulation; Computer Programs

20020006173 NASA Ames Research Center, Moffett Field, CA USA
Evaluation of Standard Gear Metrics in Helicopter Flight Operation
Mosher, Marianne, NASA Ames Research Center, USA; Pryor, Anna, NASA Ames Research Center, USA; Huff, Edward M., NASA Ames Research Center, USA; [2001]; 1p; In English; 56th Meeting of the Society for Machinery Failure Prevention Technology, 15-19 Apr. 2002, Virginia Beach, VA, USA; Sponsored by Society for Machinery Failure Prevention Technology, USA
Contract(s)/Grant(s): RTOP 704-31-12; No Copyright; Avail: Issuing Activity; Abstract Only
Each false alarm made by a machine monitoring system carries a high price tag. The machine must be taken out of service, thoroughly inspected with possible disassembly, and then made ready for service. Loss of use of the machine and the efforts to inspect it are costly. In addition, if a monitoring system is prone to false alarms, the system will soon be turned off or ignored. For aircraft applications, one growing concern is that the dynamic flight environment differs from the laboratory environment where fault detection methods are developed and tested. Vibration measurements made in flight are less stationary than those made in a laboratory, or test facility, and thus a given fault detection method may produce more false alarms in flight than might be anticipated. In 1977. Stewart introduced several metrics, including FM0 and FM4, for evaluating the health of a gear. These metrics are single valued functions of the vibration signal that indicate if the signal deviates from an ideal model of the signal. FM0 is a measure of the ratio of the peak-to-peak level to the harmonic energy in the signal. FM4 is the kurtosis of the signal with the gear mesh harmonics and first order side bands removed. The underlying theory is that a vibration signal from a gear in good condition is expected to be dominated by a periodic signal at the gear mesh frequency. If one or a small number of gear teeth contain damage or faults, the signal will change, possibly showing increased amplitude, local phase changes or both near the damaged region of the gear. FM0 increases if a signal contains a local increase in amplitude. FM4 increases if a signal contains a local

increase in amplitude or local phase change in a periodic signal. Over the years, other single value metrics were also introduced to detect the onset and growth of damage in gears. These various metrics have detected faults in several gear tests in experimental test rigs. Conditions in these tests have been steady state in the sense that the rpm, torque and forces on the gear have been held steady. For gears used in a dynamic environment such as that occurring in aircraft, the rpm, torque and forces on the gear are constantly changing. The authors have measured significant variation in rpm and torque in the transmissions of helicopters in controlled steady flight conditions flown by highly proficient test pilots. Statistical analyses of the data taken in flight show significant nonstationarity in the vibration measurements. These deviations from stationarity may increase false alarms in gear monitoring during aircraft flight. In the proposed paper, the authors will study vibration measurements made in flight on an AH-1 Cobra and an OH-58C Kiowa helicopters. The primary focus will be the development of a methodology to assess the impact of nonstationarity on false alarms. Issues to be addressed include how time synchronous averages are constructed from raw data as well as how lack of stationarity effects the behavior of single value metrics. Emphasis will be placed on the occurrence of false alarms with the use of standard metrics. In order to maintain an acceptable level of false alarms in the flight environment, this study will also address the determination of appropriate threshold levels, which may need to be higher than for test rigs.
Author
Gears; Helicopters; Flight Operations; Warning Systems; False Alarms; Vibration

20020006196 General Accounting Office, Washington, DC USA
Report to the Chairman, Subcommittee on National Security, Veterans Affairs and International Relations, Committee on Government Reform, House of Representatives. Joint Strike Fighter Acquisition: Mature Critical Technologies Needed to Reduce Risks
Oct. 2001; 23p; In English; Report to the Chairman, Subcommittee on National Security, Veterans' Affairs, and International Relations, Committee on Government Reform, House of Representatives
Report No.(s): AD-A395506; GAO-02-39; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Joint Strike Fighter Program is the most expensive aircraft program in the Department of Defense (DOD). It is intended to produce affordable, next-generation aircraft to replace aging aircraft in the military services' inventories. As currently planned, the program will cost about $200 billion to develop and procure about 3,000 aircraft and related support equipment. Two contractor teams, led by the Boeing Company and by the Lockheed Martin Aeronautics Company, are competing for the engineering and manufacturing development phase. This phase of the program is projected to last about 8 years and cost about $20 billion and typically involves large, fixed investments in human capital, facilities, and materials.
DTIC
Defense Program; Risk; Fighter Aircraft; Reports; Technology Assessment; International Relations

20020006218 General Accounting Office, Washington, DC USA
Report to the Chairman, Subcommitte on National Security, Veterans' Affairs, and International Relations, Committee on Government Reform, House of Representatives. Joint Strike Fighter Acquisition: Mature Critical Technologies Needed to Reduce Risks
Oct. 2001; 23p; In English; Report to the Chairman, Subcommittee on National Security, Veterans' Affairs, and International Relations, Committee on Government Reform, House of Representatives
Report No.(s): AD-A395413; GAO-02-39; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Joint Strike Fighter Program is the most expensive aircraft program in the Department of Defense (DOD). It is intended to produce affordable, next-generation aircraft to replace aging aircraft in the military services inventories. As currently planned, the program will cost about $200 billion to develop and procure about 3,000 aircraft and related support equipment. Two contractor teams, led by the Boeing Company and by the Lockheed Martin Aeronautics Company, are competing for the engineering and manufacturing development phase. This phase of the program is projected to last about 8 years and cost about $20 billion and typically involves large, fixed investments in human capital, facilities, and materials.
DTIC
Fighter Aircraft; Defense Program; Military Operations

20020006225 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia

Improvement of Fast Binary Pressure-Sensitive Paint Technology for Helicopter Rotor Blade Investigations ***Final Report, 1 May 1999 - 31 Oct. 2000***

Koulesh, V. P.; Mosharov, V. E.; Radchenko, V. N.; Tarasov, N. N.; Bosnyakov, S. M.; Oct. 31, 2000; 25p; In English; Original contains color images

Contract(s)/Grant(s): DAAD19-99-1-0176

Report No.(s): AD-A395378; ARO-39806.1-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The laboratory investigations of the characteristics of fast pressure sensitive paint (PSP) are continued. In the first stage it was already investigated the spectra of emission and excitation, the calibration characteristics and the time response. In addition the spatial homogeneity of the covering is investigated. The scheme of experiment in T-105 wind tunnel using the helicopter devices MVP-5 and MVP-8 is developed and the supporting optical system is designed. The developed units and blocks to optical system are manufactured. The algorithms and programs of processing of the PSP images was enhanced to binary-type images. An units and techniques have been tested in TsAGI's T-125 wind tunnel at investigations of airfoil model with chord 100 mm, approximately equal to chord of model of the helicopter blade model under test.

DTIC

Pressure Sensitive Paints; Characterization; Wind Tunnel Tests

20020006759 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Multi-Role Aviation Weapon System (MRAWS) Background & Advanced 30mm Combat Round

Zandberg, Henry; Hirlinger, John; Apr. 11, 2001; 27p; In English; Proceedings from the 36th Annual Gun & Ammunition Symposium & Exhibition 9-12 April 2001 Sponsored by NDIA. Contains viewgraphs only

Report No.(s): AD-A394816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The viewgraphs for the multi-role aviation weapon system (MRAWS) background and advanced 30mm combat round are presented.

DTIC

Helicopters; Weapon Systems

20020006801 Air Force Materials Lab., Wright-Patterson AFB, OH USA

Conference on Transparent Aircraft Enclosures

Wittman, Robert E.; Jun. 1973; 857p; In English; Presented at Conference on Transparent Aircraft Enclosures held in Las Vegas, NV on 5-8 Feb. 1973

Report No.(s): AD-A395461; AFML-TR-73-126; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The purpose of this report is to make available the technical papers presented at the recent Tenth Conference on 'Transparent Aircraft Enclosures'. This Conference was held for the exchange of knowledge on new developments and design concepts concerned with vision areas of crew enclosures. Also to make known the state-of-the-art with respect to transparent plastics, interlayer materials, and glass, of the type suitable for these applications. The papers contained herein have been reproduced directly from the original manuscripts.

DTIC

Conferences; Service Life; Coatings; Transparence; Enclosures; Glass

20020006822 Sandia National Labs., Albuquerque, NM USA

TeleKnoSys Interactive Tool for a God's Eye View of Flight Test Experiments

Ashcraft, G. W.; Giron, J. W.; Platzbecker, M. R.; Ryerson, D. E.; Sandison, D. R.; Jun. 14, 1999; 11p; In English

Report No.(s): DE2001-7875; SAND99-0271C; No Copyright; Avail: Department of Energy Information Bridge

Flight test vehicle telemetry can be visualized in the field using existing dual-processor desktop computing technology. Our results show that processor speed allows more robust sensor analysis techniques, like Kalman filtering. In this case we used only 15% of the analysis time available within each major frame. The 10-15 Hz visualization rates that are possible with scenes that contain tens of thousands of polygons are too slow for state-of-the-art flight simulators, but provide a wealth of information from real-time flight vehicles. A newer version of the APL decommutation system can time-tag minor frames, which minimizes data loss. Specifically, we can use all of the minor frames in the first major frame collected after a dropout. Sending sporadic minor frames as they are collected may help fill the data gap associated with large dropouts, but an unbuffered data collection scheme reduces the time slice available for data analysis. to avoid a scaled earth model and single precision vehicle position image jitter, we are implementing Vega's Large Area Database Manager (LADBM), which provides double precision position calculations and can dynamically shift the database origin to a local area-of-interest. As computers and graphics accelerators continue to

increase in speed and power, and Telemetry System development gets increasingly more complex acquiring tremendous amounts of data, interactive 3D visualization tools will become essential in the understanding of these data sets.
NTIS
Flight Tests; Data Acquisition; Flight Simulators; Telemetry; Real Time Operation; Scientific Visualization; Systems Engineering; Computers

20020006931 NASA Ames Research Center, Moffett Field, CA USA
Optimization of Wing-Body Configurations by the Euler Equations
Chang, I.-Chung, NASA Ames Research Center, USA; Torres, Francisco J., NASA Ames Research Center, USA; Driscoll, F. P., California Univ., USA; vanDam, C. P., California Univ., USA; [1994]; 1p; In English
Contract(s)/Grant(s): RTOP 505-59-00; No Copyright; Avail: Issuing Activity; Abstract Only
This paper describes a new wing-body design procedure which is based on the Euler equations and a constrained numerical optimization technique. The geometry modification is based on a set of fundamental modes defined on the unit interval. A design example involving a generic wing-body model is presented to demonstrate the usefulness of the design program. It is shown that the use of an Euler solver coupled with a direct numerical optimization procedure is affordable on the current generation of supercomputers.
Author
Body-Wing Configurations; Optimization; Euler Equations of Motion

20020008163 Naval Aerospace Medical Research Lab., New Orleans, LA USA
Non-Fatal Ejection Vertebral Fracture and its Prevention
Ewing, Channing L.; Jan. 1972; 8p; In English
Report No.(s): AD-A395716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Non-fatal ejection vertebral fracture has been a common injury in aviators since ejection seats came into use. (1) The injury is defined as any fracture of a vertebra due to the force of ejection itself, in an individual who survives the ejection and all subsequent hazards of this emergency escape. While many individuals who were killed, drowned or died during ejection and its sequelae may have suffered vertebral fracture, it is improbable that many of them died as a result of the vertebral fracture alone.
DTIC
Ejection Seats; Vertebrae; Back Injuries; Ejection Injuries

20020009067 Essex Corp., Fort Hood, TX USA
Manprint Findings from the OT II Test of the Remotely Piloted Vehicle System (Aquila)
Krohn, Greg; February 1988; 318p; In English
Contract(s)/Grant(s): MDA903-83-C-0033
Report No.(s): AD-A396088; WP-FH-88-05; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
The test design plan emphasized the three MANPRINT (manpower and personnel integration) areas of human factors engineering, safety, and health hazards as part of issue 4. Other MANPRINT areas were assessed as part of a thorough investigation and included training, manpower, and organizational structure. The purpose of the assessment was to investigate the MANPRINT areas in order to identify MANPRINT findings leading to system refinements. The assessment was conducted in support of USAOTEA by the US Army Research Institute (ARI) for the Behavioral and Social Sciences Fort Hood Field Unit. Several types of data collection techniques were used in order to gather MANPRINT data. Data collection techniques included critical task crew performance measures, critical task assessment interviews, on-site observation, structured interviews covering test data requirements, and comment and opinion data from test participants. The use of multiple data collection techniques provided the avenues of investigation into the broad MANPRINT areas to ensure a full analysis.
DTIC
Data Acquisition; Manpower; Personnel; Procedures; Remotely Piloted Vehicles

20020009163 North Carolina Agricultural and Technical State Univ., NASA Center for Aerospace Research, Greensboro, NC USA
Active Wave Propagation and Sensing in Plates
Ghoshal, Anindya; Martin, William N.; Sundaresan, Mannur J.; Schulz, Mark J.; Ferguson, Frederick; Sep. 14, 2001; 11p; In English; Third Workshop on Structural Health Monitoring, 12-14 Sep. 2001, Stanford, CA, USA; Original contains color images
Contract(s)/Grant(s): F49620-00-1-0232; DAAD19-00-1-0536; NAG8-1646
Report No.(s): AD-A395622; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Health monitoring of aerospace structures can be done using an active interrogation approach with diagnostic Lamb waves. Piezoelectric patches are often used to generate the waves, and it is helpful to understand how these waves propagate through a structure. to give a basic understanding of the actual physical process of wave propagation, a model is developed to simulate asymmetric wave propagation in a panel and to produce a movie of the wave motion. The waves can be generated using piezoceramic patches of any size or shape. The propagation, reflection, and interference of the waves are represented in the model. Measuring the wave propagation is the second important aspect of damage detection. Continuous sensors are useful for measuring waves because of the distributed nature of the sensor and the wave. Two sensor designs are modeled, and their effectiveness in measuring acoustic waves is studied. The simulation model developed is useful to understand wave propagation and to optimize the type of sensors that might be used for health monitoring of plate-like structures.
DTIC
Aircraft Structures; Wave Propagation; Plates (Structural Members); Computerized Simulation; Lamb Waves; Sound Waves; Systems Health Monitoring

20020009167 Holman (John F.) and Co., Inc., Washington, DC USA
Streamlines in a Steady Flow ***Lignes de Courant d'un Ecoulement Continu***
Legendre, Robert; La Recherche Aerospatiale; Jul. 1966, No. 105, pp. 3-9; In English
Report No.(s): AD-A395523; NASA-TT-F-405-Rev; NAS 1.77:405-Rev; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The author states some tentative principles in the absence of an existence theorem of sufficiently general solutions of viscous fluid equations which could be applied by engineers. These principles are used for the characterization of the singular points of flow, which can be determined and identified by experimental engineers to solve a problem of fluid mechanics by a model.
DTIC
Steady Flow; Viscous Fluids; Fluid Mechanics; Streamlining

20020009201 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Engine Debris Fuselage Penetration Testing, Phase 1 ***Final Report***
Lundin, Steven J.; Aug. 2001; 31p; In English; Original contains color images
Report No.(s): AD-A396153; DOT/FAA/AR-01/27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During February 1999, the Naval Air Warfare Center Weapons Division (NAWCWD), China Lake, conducted a series of simulated uncontained engine failure structural impact tests. A large gas gun was used to launch turbine engine fan blade segments into an aircraft fuselage The impacts were documented and analyzed with high-speed photography. Impact velocities, presented areas, and residual velocities were calculated. The data were then compared to analytic results predicted by the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) penetration equations. These equations were originally develop to predict the penetration and residual velocity of ballistic weapon projectiles upon impact with various vehicles. The ballistic prediction equations developed for warhead fragments are the closest in geometric shape to turbine engine blade fragments. The data comparison shows good agreement for the predicted and experimental residual velocities.
DTIC
Fuselages; Debris; Engine Failure; Impact Tests; Penetration

20020009681 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Remotely Piloted Vehicle (Aquila) Force Development Test and Experimentation. (FDTE): Army Research Institute Fort Hood Field Unit Evaluation (1987)
Nicholson, Nigel R.; Deignan, Gerard N.; Smootz, Edwin R.; Feb. 01, 1988; 39p; In English
Report No.(s): AD-A395997; ARI-FH-8804; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This Working Paper represents the Fort Hood Army Research Institute (ARI) Field Unit contribution to the TRADOC Test and Experimentation Command (TEXCON) (Provisional) report of the 1987 Remotely Piloted Vehicle (RPV) (Aquila) Force Development Test and Experimentation (FDTE). This report was submitted to TEXCOM on 12 January 1988. The report is presented in four sections. Section 1 presents a summary of conflict resolution information gathered from an analysis of video tapes. These analyses are in response to Evaluation Plan Criteria 2.2.1.2.2 ('The GCS crew must identify incomplete mission order request forms and high risk or nonexecutable missions, and resolve conflicts.'). Section 2 presents the results of questionnaires administered after each RPV flight to assess the impact of a fourth crewmember of OCS operations. Section 3 also addresses the impact of a fourth crewmember on GCS operations but presents data from questionnaires administered at the end of the test.

Section 4 is a narrative summary of the results. The purpose of this report was to provide TEXCOM with data that could be integrated with data from other sources in producing a final report. The organization and format of this report reflect that purpose.
DTIC
Remotely Piloted Vehicles; Flight Tests; Flight Crews

20020010266 Federal Aviation Administration, Fire Safety Section, Atlantic City, NJ USA
Inerting of a Vented Aircraft Fuel Tank Test Article with Nitrogen-Enriched Air ***Final Report***
Burns, Michael; Cavage, William M.; Apr. 2001; 29p; In English
Report No.(s): AD-A396168; DOT/FAA/AR-01/6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents a series of experiments designed to determine the quantity and purity of nitrogen-enriched air (NEA) required to inert a vented aircraft fuel tank. NEA, generated by a hollow fiber membrane gas separation system, was used to inert a laboratory fuel tank with a single vent on top designed to simulate a transport category airplane fuel tank. The tank ullage space could be heated as well as cooled and fuel could be heated in the bottom of the fuel tank to provide varying hydrocarbon concentrations within the ullage space. Several inerting runs were performed with varying NEA gas purities and flow rates. The data was nondimensionalized in terms of NEA purity, volume flow rate, and fuel tank size to provide one universal inerting curve. Changing temperatures and hydrocarbon concentrations appear to have little effect on the amount and purity of NEA needed to inert the test specimen. A model of ullage washing developed by the Federal Aviation Administration Chief Scientific and Technical Advisor for fuel systems design, based on the volume exchange of gases of different concentrations, was compared with data obtained from the test article. Also, an exact solution based on uniform and instantaneous mixing was derived and compared with the test data. Both the model and exact solution showed good agreement in both trend and magnitude with the data obtained during the testing.
DTIC
Aircraft Fuels; Fuel Tanks; Nitrogen; Purity; Ullage

20020010897 Indiana Univ., Computer Science Dept., Bloomington, IN USA
Case-Based Capture and Reuse of Aerospace Design Rationale, ***1 May 1998 - 31 Jul. 2001***
Leake, David B., Indiana Univ., USA; [2001]; 15p; In English
Contract(s)/Grant(s): NCC2-1035; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project was to apply artificial intelligence techniques to facilitate capture and reuse of aerospace design rationale. The project combined case-based reasoning (CBR) and concept maps (CMaps) to develop methods for capturing, organizing, and interactively accessing records of experiences encapsulating the methods and rationale underlying expert aerospace design, in order to bring the captured knowledge to bear to support future reasoning. The project's results contribute both principles and methods for effective design-aiding systems that aid capture and access of useful design knowledge. The project has been guided by the tenets that design-aiding systems must: (1) Leverage a designer's knowledge, rather than attempting to replace it; (2) Be able to reflect different designers' differing conceptualizations of the design task, and to clarify those conceptualizations to others; (3) Include capabilities to capture information both by interactive knowledge modeling and during normal use; and (4) Integrate into normal designer tasks as naturally and unobtrusive as possible.
Derived from text
Artificial Intelligence; Aerospace Engineering; Design Analysis

20020011014 Thermoscience Inst., Moffett Field, CA USA
Sonic and Supersonic Jet Plumes
Venkatapathy, E., Thermoscience Inst., USA; Naughton, J. W., Thermoscience Inst., USA; Flethcher, D. G., Thermoscience Inst., USA; [1994]; 1p; In English; 29th AIAA Thermophysics Conference, 19-22 Jun. 1995, San Diego, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 527-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Study of sonic and supersonic jet plumes are relevant to understanding such phenomenon as jet-noise, plume signatures, and rocket base-heating and radiation. Jet plumes are simple to simulate and yet, have complex flow structures such as Mach disks, triple points, shear-layers, barrel shocks, shock- shear- layer interaction, etc. Experimental and computational simulation of sonic and supersonic jet plumes have been performed for under- and over-expanded, axisymmetric plume conditions. The computational simulation compare very well with the experimental observations of schlieren pictures. Experimental data such as temperature measurements with hot-wire probes are yet to be measured and will be compared with computed values. Extensive analysis of the computational simulations presents a clear picture of how the complex flow structure develops and the conditions under which self-similar flow structures evolve. From the computations, the plume structure can be further classified into many

sub-groups. In the proposed paper, detail results from the experimental and computational simulations for single, axisymmetric, under- and over-expanded, sonic and supersonic plumes will be compared and the fluid dynamic aspects of flow structures will be discussed.
Author
Plumes; Temperature Measurement; Supersonic Jet Flow; Shock Layers; Shear Layers

20020011642 NASA Ames Research Center, Moffett Field, CA USA
Optimal Category-A Helicopter Flight Trajectories for Operation From a Clear Heliport
Sharma, Vivek, Minnesota Univ., USA; Zhao, Yiyuan, Minnesota Univ., USA; Chen, Robert T. N., NASA Ames Research Center, USA; Hindson, William S., NASA Ames Research Center, USA; [1995]; 5p; In English; AHS 51st Forum and Technology Display, 9-11 May 1995, Fort Worth, TX, USA; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only

Engine failure represents a major safety hazard to helicopter operation. As a result, FA certifies helicopters according to their abilities to survive engine failures. Federal Aviation Regulation Part 29 specifies that transport helicopters must be certified as either category A or B. Category-B certification applies to either single or multi-engine helicopters with gross weight less than 20,000 lbs. A Category-B helicopter must be able to land safely in the case of one or all engine failures. There is no requirement for continued flight capability. In contrast, Category-A certification applies to multi-engine helicopters with independent engine systems. It requires that helicopter can continue flight with one engine inoperative (OEI). Therefore, Category-A helicopters are capable of operating from rooftops and oil rigs and flying to areas where no emergency landing sites are available. While there is no maximum weight limit, a Category-A helicopter must be able to satisfy OEI operation requirements within the available runway field. Additional information is contained in the original extended abstract.
Author
Certification; Helicopters; Aircraft Safety; Engine Failure; Trajectories

20020011708 Swedish Defence Research Establishment, Sensor Technology, Linkoeping, Sweden
Radar Absorption by Plasma ***Topical Report Plasma som Radarabsorbent***
Bondeson, A.; January 2001; 26p; In Swedish
Report No.(s): PB2001-108437; FOI-R-0027-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The possibility of reducing the radar cross section of aircraft by means of collisional plasmas is discussed. Electromagnetic theory shows that this is feasible, provided the plasma layer is sufficiently thick and has sufficient electron and neutral gas densities. For instance, a 2 cm thick plasma layer with electron density 10 sup 18 m-cum in a background of inert gas at atmospheric pressure gives at least about 10 dB reduction for frequencies from 4 to 15 GHz. Possible ways to generate such plasmas with moderate power consumption are discussed and references to experimental results published in the literature are given. Plasmas similar to those required for RCS reduction can be generated in inert gases using kV voltages at kHz frequencies across electrodes, at least on of which is covered by a dielectric. The published experimental results demonstrate all the required parameters, with the exception of layer thickness.
NTIS
Collisional Plasmas; Plasma Layers; Radar Cross Sections

20020012260 National Aerospace Lab., Structures and Materials Div., Amsterdam, Netherlands
Design Optimization of Stiffened Composite Panels for Damage Resistance ***Final Report***
Wiggenraad, J. F. M.; Vercammen, R. W. A.; Arendsen, P.; Ubels, L. C.; Jan. 20, 2000; 18p; In English
Report No.(s): PB2001-108692; NLR-TP-2000-023; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Although aircraft structures made of composite materials may have superior properties, compared to metal structures, when considering structural weight, corrosion resistance and fatigue behavior, they are more vulnerable to defects incurred during production or damage induced during service. This is due to the inability of the material to redistribute peak stresses by plastic deformation, the weak out-of-plane properties associated with its layered architecture, and the heterogeneous nature of the material, consisting of stiff fibers contained in a soft matrix. Impact damage or defects, when present in composite structures, are known to reduce the strength considerably, in particular the compression strength, because the highly loaded fibers are no longer adequately supported by the matrix. Moreover, the presence of defects or the extent of impact damage are difficult to detect, and the residual strength of the flawed or damaged structure is difficult to predict. As structures with 'barely visible impact damage

must still be able to carry the ultimate design load, these technological problems, which still have not been fully resolved, have led to conservative designs, time consuming inspection procedures and expensive repair techniques.
NTIS
Panels; Composite Structures; Aircraft Structures; Design Optimization; Structural Analysis

20020012281 National Aerospace Lab., Flight Div., Amsterdam, Netherlands
Cockpit Systems Requirements in a Future ATM Environment
de Muynck, R. J.; Hoekstra, J. M.; Ruigrok, R. C. J.; vanGimst, R. F. W. F.; December 1998; 24p; In English; Original contains color illustrations
Report No.(s): PB2002-100803; NLR-TP-98519; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes an evaluation study on a number of cockpit concepts, performed at the NLR. The study was aimed at finding minimum cockpit systems requirements necessary to operate a regional aircraft efficiently and safely in a future ATM environment. Initially, a pilot experiment was performed to evaluate a number of proposed flight control and display concepts with respect to workload and situational awareness, compared to current implementations. Since future aircraft will have to operate in a busy environment with tight navigation and time constraints, this may require an improved cockpit design to compensate for the additional pilot workload. Based on the experience gained from the pilot experiment, a combined ATC-aircraft simulation evaluation was conducted utilizing NLR's moving base Research Flight Simulator and ATC Research Simulator. Apart from an evaluation of the most promising cockpit concepts in a realistic environment, the study also addressed the application of two proposed 4D Air Traffic Management concepts.
NTIS
Cockpits; Air Navigation; Air Traffic Control; Flight Simulators; Systems Engineering

20020012285 National Aerospace Lab., Structures and Materials Div., Amsterdam, Netherlands
Design, Test and Analysis of Tensor Skin Panels for Improved Crashworthiness in Case of Water Impact ***Final Report***
Michielsen, A. L. P. J.; Wiggenraad, J. F. M.; Ubels, L. C.; Frijns, R. H. W. M.; Kohlgrueber, D.; August 1998; 16p; In English
Report No.(s): PB2002-100794; NLR-TP-98356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Within the framework of a European BRITE EURAM project, several partners work together to evaluate and analyze 'tensor skin' panels. Tensor skin panels are designed to improve the crashworthiness of composite helicopters in case of impact on water, by providing a quasi-plastic deformation behavior. Tensor skin panels were designed, fabricated and tested as well as several equivalent conventional honeycomb core sandwich panels with identical face sheets. The panels were tested in static transverse load, static in-plane shear and at dynamic transverse impact. This paper presents the panel configurations, the test conditions and the test results as well as the numerical simulation of these tests.
NTIS
Crashworthiness; Tensors; Computerized Simulation; Panels; Water; Honeycomb Structures; Impact Tests; Fabrication

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020008655 National Defence Research Establishment, Div. of Command and Control Warfare, Linkoeping, Sweden
Experimental Evaluation of a Temporal Display ***Utvaedering av en Temporal Hotindikator***
Linde, L.; Stroemberg, D.; Andersson, R.; Alfredson, J.; December 2000; 44p; In Swedish
Report No.(s): PB2001-108420; FOA-R-00-01781-706-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the present experiment was to evaluate the feasibility of a so called temporal display, presenting time intervals for weapon emission or evasive action. A BVR air combat was simulated. Two professional fighter pilots were used as subjects. Two conditions for presentation of tactical information were compared. In one of them a conventional TSD and a multisensor display were used. In a second condition the above mentioned temporal display was presented in addition to the other two. Objective performance (no. of weapon emissions, no. of hits) was recorded. The subjects also made subjective ratings of e.g. workload (WL) and situation awareness (SA). They answered queries in written and oral form. Precision (i.e. no. of hits/no. of

emissions) was found to be significantly higher when the temporal display was available. However, the subjective ratings of WL and SA were not affected by the presentation of the temporal display. The subjects raised objections to the color coding, size of symbols, and size of display area. The displays have only been tested in generic cockpit environments. Performance figures in the simulation can not be compared to performance figures of any specific aircraft.
NTIS
Display Devices; Fighter Aircraft; Feasibility Analysis

20020012276 Swedish Defence Research Establishment, Sensor Technology, Linkoeping, Sweden
Prestudy and Suggestion of a Demonstrator of an Optical Air Data System (VILA-Project) ***Foestudie och Demonstratorfoerslag ave ett Optiskt Luftdatasystem (Vila-Projektet)***
Karlsson, C.; Arntzen, P. O.; Hansson, G.; Zyra, S.; Haegaerd, A.; November 1999; 144p; In Swedish
Report No.(s): PB2001-108088; FOA-R-99-01276-408-SE; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Requirements for an air data system for future aircraft has been specified. The requirements includes advanced maneuvering of the aircraft at up to a height of 20 km. Different potentially useful laser based measurement methods are discussed. Based on the requirements, the characteristics of the different methods and their technical maturity, the conclusion is that a pulsed coherent laser radar system (pulsed CLR-system) should be best suited for the function as an optical air data system (OADS). The signal to noise ratio (SNR) has been calculated for a realistic OAD-system. SNR is an important system parameter which affects both the accuracy and the update rate of the measurements. The expected measurement uncertainty for the radial velocity is also discussed.
NTIS
Air Data Systems; Coherent Radar; Pulsed Lasers; Signal to Noise Ratios

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

20020006252 Federal Energy Technology Center, Morgantown, WV USA
Advanced Gas Turbine Systems Research ***Quarterly Report, 1 Oct. - 31 Dec. 1998***
Jan. 19, 1999; 14p; In English
Report No.(s): DE2001-772497; DE-FC21-92MC29061-15; No Copyright; Avail: Department of Energy Information Bridge
Major accomplishments during this reporting period by the Advanced Gas Turbine Systems Research (AGTSR) are: AGTSR submitted FY99 program continuation request to DOE-FETC for $4M; AGTSR submitted program and workshop Formation to the Collaborative Advanced Gas Turbine (CAGT) initiative; AGTSR distributed research accomplishment summaries to DOE-FETC in the areas of combustion, aero-heat transfer, and materials; AGTSR reviewed and cleared research papers with the IRB from Arizona State, Cornell, Wisconsin, Minnesota, Pittsburgh, Clemson, Texas and Georgia Tech; AGTSR prepared background material for DOE-FETC on three technology workshops for distribution at the DOE-ATS conference in Washington, DC; AGTSR coordinated two recommendations for reputable firms to conduct an economic impact analysis in support of new DOE gas turbine initiatives; AGTSR released letters announcing the short-list winners/non-winners from the 98RFP solicitation AGTSR updated fact sheet for 1999 and announced four upcoming workshops via the SCIES web page AGTSR distributed formation to EPRI on research successes, active university projects, and workshop offerings in 1999 AGTSR continued to conduct telephone debriefings to non-winning PIs born the 98RFP solicitation AGTSR distributed completed quarterly progress report assessments to the IRB experts in the various technology areas AGTSR provided Formation to GE-Evandale on the active combustion control research at Georgia Tech AGTSR provided information to AlliedSignal and Wright-Pat Air Force Base on Connecticuts latest short-listed proposal pertaining to NDE of thermal barrier coatings AGTSR submitted final technical reports from Georgia Tech - one on coatings and the other on active combustion control - to the HU3 for review and evaluation AGTSR coordinated the format, presentation and review of 28 university research posters for the ATS Annual Review Meeting in November, 1998 AGTSR published a research summary paper at the ATS Annual Review pertaining to the university consortiums activities AGTSR published and presented a paper on the status of ATS catalytic combustion R&D at the RTA/NATO Gas Turbine Combustion Symposium, October 12-16,1998 in Lisbon, Portugal IRE approved a 12-month add-on request from Penn State University to conduct an added research task in their multistage unsteady aerodynamics project AGTSR reviewed a research extension white paper from Clemson University with the IRB to conduct an added task pertaining to their mist/steam cooling

research project AGTSR coordinated new research topics with the IR.Band select universities to facilitate R&D roadmapping needs at the Aero-Heat Transfer III workshop in Austin, TX AGTSR distributed FY97 research progress reports to DOE and the XRB; and AGTSR solicited new R&D topics from the IRB experts for the 1999 RFP.
NTIS
Gas Turbines; Gas Turbine Engines

20020006900 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Fishermans Bend, Australia
Measurement of the Natural Bending Modes of Rotors in the TF30 Engine
Shilo, Mark; Becker, Andrew; Sep. 2001; 21p; In English
Report No.(s): AD-A395587; DSTO-TN-0393; DSTO/AMRL-AR-012-009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The natural bending modes of the high and low speed shafts from the TF (turbofan)-30 engine were measured in order to provide an unequivocal reference for validation of 3D (three dimensional) Finite Element models of the shafts. The shafts were assembled separately, and without blades or any engine casing structure.
DTIC
Turbine Blades; Tf-30 Engine; Bending; Three Dimensional Models; Finite Element Method

20020006948 Modern Technologies Corp., Propulsion Systems Group, Middleburg Heights, OH USA
Exoskeletal Engine Concept: Feasibility Studies for Medium and Small Thrust Engines
Halliwell, Ian, Modern Technologies Corp., USA; November 2001; 131p; In English
Contract(s)/Grant(s): NAS3-27326; RTOP 714-01-10
Report No.(s): NASA/CR-2001-211322; E-13132; NAS 1.26:211322; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The exoskeletal engine concept is one in which the shafts and disks are eliminated and are replaced by rotating casings that support the blades in spanwise compression. Omission of the shafts and disks leads to an open channel at the engine centerline. This has immense potential for reduced jet noise and for the accommodation of an alternative form of thruster for use in a combined cycle. The use of ceramic composite materials has the potential for significantly reduced weight as well as higher working temperatures without cooling air. The exoskeletal configuration is also a natural stepping-stone to complete counter-rotating turbomachinery. Ultimately this will lead to reductions in weight, length, parts count and improved efficiency. The feasibility studies are in three parts. Part 1: Systems and Component Requirements addressed the mechanical aspects of components from a functionality perspective. This effort laid the groundwork for preliminary design studies. Although important, it is not felt to be particularly original, and has therefore not been included in the current overview. Part 2: Preliminary Design Studies turned to some of the cycle and performance issues inherent in an exoskeletal configuration and some initial attempts at preliminary design of turbomachinery were described. Twin-spoon and single-spool 25,800-lbf-thrust turbofans were used as reference vehicles in a mid-size commercial subsonic category in addition to a single-spool 5,000-lbf-thrust turbofan that represented a general aviation application. The exoskeletal engine, with its open centerline, has tremendous potential for noise suppression and some preliminary analysis was done which began to quantify the benefits. Part 3: Additional Preliminary Design Studies revisited the design of single-spool 25,800-lbf-thrust turbofan configurations, but in addition to the original FPR = 1.6 and BPR = 5.1 reference engine. two additional configurations used FPR = 2.4 and BPR = 3.0 and FPR = 3.2 and BPR = 2.0 were investigated. The single-spool 5.000-lbf-thrust turbofan was refined and the small engine study was extended to include a 2,000-lbf-thrust turbojet. More attention was paid to optimizing the turbomachinery. Turbine cooling flows were eliminated, in keeping with the use of uncooled CMC materials in exoskeletal engines. The turbine performance parameters moved much closer to the nominal target values, demonstrating the great benefits to the cycle of uncooled turbines.
Author
Feasibility Analysis; Turbomachinery; Turbofans; Engine Design; Equipment Specifications

20020008015 NASA Glenn Research Center, Cleveland, OH USA
Simulation of Aircraft Engine Blade-Out Structural Dynamics
Lawrence, Charles, NASA Glenn Research Center, USA; Carney, Kelly, NASA Glenn Research Center, USA; Gallardo, Vicente, Ohio Aerospace Inst., USA; September 2001; 26p; In English; Worldwide Aerospace Conference and Technology Showcase, 24-26 Sep. 2001, Toulouse, France; Sponsored by MSC Software, France
Contract(s)/Grant(s): RTOP 708-24-13
Report No.(s): NASA/TM-2001-210957/REV1; NAS 1.15:210957/REV1; E-12812-1/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A primary concern of aircraft structure designers is the accurate simulation of the blade-out event and the subsequent windmilling of the engine. Reliable simulations of the blade-out event are required to insure structural integrity during flight as well as to guarantee successful blade-out certification testing. The system simulation includes the lost blade loadings and the interactions between the rotating turbomachinery and the remaining aircraft structural components. General-purpose finite element structural analysis codes such as MSC NASTRAN are typically used and special provisions are made to include transient effects from the blade loss and rotational effects resulting from the engine's turbomachinery. The present study provides the equations of motion for rotordynamic response including the effect of spooldown speed and rotor unbalance and examines the effects of these terms on a cantilevered rotor. The effect of spooldown speed is found to be greater with increasing spooldown rate. The parametric term resulting from the mass unbalance has a more significant effect on the rotordynamic response than does the spooldown term. The parametric term affects both the peak amplitudes as well as the resonant frequencies of the rotor.
Author
Turbomachinery; Dynamic Structural Analysis; Computerized Simulation; Structural Failure; Rotor Dynamics; Aircraft Engines

20020009025 NASA Glenn Research Center, Cleveland, OH USA
Role of Air-Breathing Pulse Detonation Engines in High Speed Propulsion
Povinelli, Louis A., NASA Glenn Research Center, USA; Lee, Jin-Ho, NASA Glenn Research Center, USA; Anderberg, Michael O., Massachusetts Inst. of Tech., USA; September 2001; 18p; In English; 52nd; 52nd International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; Sponsored by International Astronautical Federation, Unknown
Contract(s)/Grant(s): RTOP 706-31-23
Report No.(s): NASA/TM-2001-211163; E-13021; NAS 1.15:211163; IAF-01-S.5.01; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, the effect of flight Mach number on the relative performance of pulse detonation engines and gas turbine engines is investigated. The effect of ram and mechanical compression on combustion inlet temperature and the subsequent sensible heat release is determined. Comparison of specific thrust, fuel consumption and impulse for the two engines show the relative benefits over the Mach number range.
Author
Gas Turbine Engines; Pulse Detonation Engines

20020009088 NASA Glenn Research Center, Cleveland, OH USA
Experimental Results of Schlicher's Thrusting Antenna
Fralick, Gustave C., NASA Glenn Research Center, USA; Niedra, Janis M., QSS Group, Inc., USA; November 2001; 12p; In English; 37th Joint Propulsion Conference and Exhibit, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 713-74-70
Report No.(s): NASA/TM-2001-211207; E-13058; NAS 1.15:211207; AIAA Paper 2001-3657; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experiments were conducted to test the claims by Rex L. Schlicher, et al., (Patent 5,142,86 1) that a certain antenna geometry produces thrust greatly exceeding radiation reaction, when driven by repetitive, fast rise, and relatively slower decay current pulses. In order to test this hypothesis, the antenna was suspended by strings as a 3 in pendulum. Current pulses were fed to the antenna along the suspension path by a very flexible coaxial line constructed from loudspeaker cable and copper braid sheath. When driving the antenna via this cabling, our pulser was capable of sustaining 1200 A pulses at a rate of 30 per second up to a minute. In this way, bursts of pulses could be delivered in synch with the pendulum period in order to build up any motion. However, when using a laser beam passing through a lens attached to the antenna to amplify linear displacement by a factor of at least 25, no correlated motion of the beam spot could be detected on a distant wall. We conclude, in agreement with the momentum theorem of classical electromagnetic theory, that any thrust produced is far below practically useful levels. Hence, within classical electrodynamics, there is little hope of detecting any low level motion that cannot be explained by interactions with surrounding structural steel and the Earth's magnetic field.
Author
Radiation Effects; Antennas; Hypotheses; Propulsion System Performance

20020010249 Thermoscience Inst., Moffett Field, CA USA

Analytical Studies of Prompt NO(x) Emissions from Aircraft Gas Turbine Combustors

Adelman, Henry G., Thermoscience Inst., USA; Menees, Gene P., NASA Ames Research Center, USA; [1994]; 2p; In English; 31st AIAA/SAE/ASME/ASEE Joint Propulsion Conference, 10-12 Jul. 1995, San Diego, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The reduction of oxides of nitrogen (NO(x)) emissions from aircraft gas turbines is a vital part of the NASA High Speed Research Program (HSRP). Emissions reduction studies are critical to the feasibility of future civil aircraft operating at supersonic speeds in the stratosphere. It is believed that large fleets of supersonic aircraft using conventional gas turbine engines would emit levels of NO(x) that are harmful to the stratospheric ozone layer.

Author

Nitrogen Oxides; Exhaust Emission; Gas Turbine Engines; Aircraft Engines; Supersonic Aircraft

20020010587 Computer Sciences Corp., Moffett Field, CA USA

Simulation of Unsteady Combustion in a Ramjet Engine Using a Highly Parallel Computer

Menon, Suresh, Georgia Inst. of Tech., USA; Weeratunga, Sisira, Computer Sciences Corp., USA; [1994]; 1p; In English; 1994 Simulation Multi Conference, 10-15 Apr. 1994, San Diego, CA, USA

Contract(s)/Grant(s): RTOP 536-01-11; No Copyright; Avail: Issuing Activity; Abstract Only

Combustion instability in ramjets is a complex phenomenon that involve nonlinear interaction between acoustic waves, vortex motion and unsteady heat release in the combustor. to numerically simulate this 3-D, transient phenomenon, enormous computer resources (time, memory and disk storage) are required. Although current generation vector supercomputers are capable of providing adequate resources for simulations of this nature, their high cost and limited availability, makes such machines less than satisfactory for routine use. The primary focus of this study is to assess the feasibility of using highly parallel computer systems as a cost-effective alternative for conducting such unsteady flow simulations. Towards this end, a large-eddy simulation model for combustion instability was implemented on the Intel iPSC/860 and a careful study was conducted to determine the benefits and the problems associated with the use of such machines for transient simulations. Details of this study along with the results obtained from the unsteady combustion simulations carried out on the iPSC/860 are discussed in this paper.

Author

Unsteady Flow; Ramjet Engines; Parallel Computers; Computerized Simulation; Large Eddy Simulation; Combustion Stability

20020010588 NASA Ames Research Center, Moffett Field, CA USA

Flight Testing of Hypersonic Airbreathing Propulsion for Developing Computational Design Technology

Mehta, Unmeel B., NASA Ames Research Center, USA; [1994]; 1p; In English; Second European Symposium on Aerothermodynamics for Space Vehicles, 22-25 Nov. 1994, Noordwijk, Noordwijk, Netherlands, Netherlands; Sponsored by European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands

Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

The objective of this paper is to present and discuss a scenario and the requirements for flight testing of hypersonic airbreathing propulsion leading to the development of computational design technology. Flight Testing for this development is a significant part of a triad/synergistic, design approach which integrates computations, flight testing, and ground testing. These three complementary, design developmental tools have various capabilities and limitations. An incremental approach is necessary to use and to develop these tools effectively and efficiently. This computational technology must be developed keeping in focus the aerospace plane that is to be developed. The criteria for selecting the right plane are presented and consequently, the appropriate flight tests are identified. Two conceptual, flight-test systems are suggested considering the following: (1) the relevant, lessons learned from previous and current USA hypersonic programs, from the Apollo program, from the Space Shuttle program, and from the space station program; (2) the current need for a low risk, affordable access to space; and (3) the design challenge for hypersonic airbreathing propulsion testing. How these systems may be used for developing the computational design technology is described. The requirements for conducting propulsion- design computations, sources of uncertainties in these computations, and a guide for establishing the credibility of these computations are also presented.

Author

Air Breathing Engines; Propulsion; Hypersonic Flight; Flight Tests; Computer Systems Design; Computer Systems Simulation

20020011010 NASA Langley Research Center, Hampton, VA USA

Research in Hypersonic Airbreathing Propulsion at the NASA Langley Research Center

Kumar, Ajay, NASA Langley Research Center, USA; Drummond, J. Philip, NASA Langley Research Center, USA; McClinton, Charles R., NASA Langley Research Center, USA; Hunt, James L., NASA Langley Research Center, USA; [2001]; 17p; In

English; Fifteenth International Symposium on Airbreathing Engines, 2-7 Sep. 2001, Bangalore, India; Original contains color illustrations
Report No.(s): ISABE-2001-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA Langley Research Center has been conducting research for over four decades to develop technology for an airbreathing-propelled vehicle. Several other organizations within the USA have also been involved in this endeavor. Even though significant progress has been made over this period, a hypersonic airbreathing vehicle has not yet been realized due to low technology maturity. One of the major reasons for the slow progress in technology development has been the low level and cyclic nature of funding. The paper provides a brief historical overview of research in hypersonic airbreathing technology and then discusses current efforts at NASA Langley to develop various analytical, computational, and experimental design tools and their application in the development of future hypersonic airbreathing vehicles. The main focus of this paper is on the hypersonic airbreathing propulsion technology.
Author
Air Breathing Engines; Hypersonic Vehicles; Technology Assessment; Systems Analysis; Computational Fluid Dynamics

20020011685 NASA Glenn Research Center, Cleveland, OH USA
Use of Pressure Sensitive Paint for Diagnostics in Turbomachinery Flows With Shocks
Lepicovsky, Jan, QSS Group, Inc., USA; Bencic, Timothy J., NASA Glenn Research Center, USA; November 2001; 14p; In English; 15th International Symposium on Airbreathing Engines, 2-7 Sep. 2001, Bangalore, India; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-28-13
Report No.(s): NASA/TM-2001-211111; NAS 1.15:211111; E-12958; ISABE-2001-1142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The technology of pressure sensitive paint (PSP) is well established in external aerodynamics. In internal flows in narrow channels and in turbomachinery cascades, however, there are still unresolved problems. In particular, the internal flows with complex shock structures inside highly curved channels present a challenge. It is not always easy and straightforward to distinguish between true signals and ”ghost” images due to multiple internal reflections in narrow channels. to address some of the problems, investigations were first carried out in a narrow supersonic channel of Mach number 2.5. A single wedge or a combination of two wedges were used to generate a complex shock wave structure in the flow. The experience gained in a small supersonic channel was used for surface pressure measurements on the stator vane of a supersonic throughflow fan. The experimental results for several fan operating conditions are shown in a concise form, including performance map points, midspan static tap pressure distributions, and vane suction side pressure fields. Finally, the PSP technique was used in the NASA transonic flutter cascade to compliment flow visualization data and to acquire backwall pressure fields to assess the cascade flow periodicity. A summary of shortcomings of the pressure sensitive paint technology for internal flow application and lessons learned are presented in the conclusion of the paper.
Author
Pressure Sensitive Paints; Turbomachinery; Internal Flow; Shock Waves

20020012247 National Aerospace Lab., Amsterdam, Netherlands
Significance of Dwell Cracking for IN718 Turbine Discs
Wanhill, R. J. H.; Sep. 1999; 34p; In English
Report No.(s): PB2001-108843; NLR-TP-99392; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High temperature dwell cracking of the nickel-base superalloy IN718 was investigated as part of a European project on military aircraft turbine discs. Dwell and fatigue crack growths tests under simple loading conditions indicated that dwell cracking would be unlikely to occur under actual flight loadings and that standard fracture mechanics specimens may be inappropriate for predicting crack growth in discs. Flight-by-flight loading tests showed that dwell cracking was either absent or limited.
NTIS
Dwell; Crack Propagation; Gas Turbine Engines; Heat Resistant Alloys; Nickel Alloys

20020012280 National Aerospace Lab., Flight Div., Amsterdam, Netherlands
Modelling the Effects of Operating Conditions and Alternative Fuels on Gas Turbine Performance and Emissions
Visser, W. P. J.; Kluiters, S. C. A.; December 1998; 38p; In English
Report No.(s): PB2002-100805; NLR-TP-98629; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the increasing attention to gas turbine exhaust gas pollution, a need has emerged to assess effects of a variety of operational variables on the emission levels. An effective approach to address this need is to integrate combustor emission models

in gas turbine performance models. NLR's generic gas turbine performance simulation environment (GSP) has therefore been extended with a major exhaust gas emissions NOx, CO, UHC and Smoke. First, GSP's gas model has been extended to include a detailed description of gas composition including the particular emission species. Second, a new generic multi-reactor combustor model has been developed for detailed modeling of the processes in a combustor. The combustor model is set up by defining a number of reactors modeling combustion.
NTIS
Exhaust Emission; Exhaust Gases; Mathematical Models; Gas Turbine Engines; Performance Prediction; Aircraft Fuels

20020012423 NASA Glenn Research Center, Cleveland, OH USA
Recent Developments in U.S. Engine Noise Reduction Research
Bridges, James, NASA Glenn Research Center, USA; Envia, Edmane, NASA Glenn Research Center, USA; Huff, Dennis, NASA Glenn Research Center, USA; September 2001; 14p; In English; Fifteenth International Symposium on Airbreathing Engines, 2-7 Sep. 2001, Bangalore, India; Sponsored by International Society for airbreathing Engines, Unknown; Original contains color illustrations
Contract(s)/Grant(s): RTOP 781-30-15
Report No.(s): NASA/TM-2001-211083; NAS 1.15:211083; ISABE-2001-1017; E-12927; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Aircraft engine noise research in the USA has made considerable progress over the past 10 years for both subsonic and supersonic flight applications. The Advanced Subsonic Technology (AST) Noise Reduction Program started in 1994 and will be completed in 2001 without major changes to program plans and funding levels. As a result, significant progress has been made toward the goal of reducing engine source noise by 6 EPNdB (Effective Perceived Noise level in decibels). This paper will summarize some of the significant accomplishments from the subsonic engine noise research performed over the past 10 years. The review is by no means comprehensive and only represents a sample of major accomplishments.
Author
Jet Aircraft Noise; Engine Noise; Noise Reduction; Research

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20020006865 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Guidance of Collaborating Missiles. Status Report ***Styrning av Samverkande Robotar Laegesrapport 2000-09-30***
Alvae, P.; Fokas, A.; October 2000; 46p; In Swedish
Report No.(s): PB2001-108412; FOA-R-00-01624-314-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This is status report for the project 'Guidance of Collaborating Missiles,' focusing on Studies of collaborating missiles systems. Control law for near optimal target search and development of a simulation model for collaborating missiles. Results from previous research and ideas of future work are also given.
NTIS
Missile Systems; Missile Control

20020006871 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Optimization of Missile Performance, Activity Report ***Optimering av Robotprestanda, Verksametsrapport***
Hamberg, J.; December 2000; 22p; In Swedish
Report No.(s): PB2001-108211; FOA-R-00-01801-314-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent technological, political, and economic developments have led to major revisions of military philosophy, internationally as well as nationally, leading to a general 'upgrading of theory.' Careful mathematical modeling and analysis is done in areas where it has heretofore been considered unfeasible or otherwise not worthwhile. Autonomous systems play an increasingly important role, as does precision engagement under extreme conditions. The systems have to satisfy new demands on economical, environmental, and humanitarian concerns. This process calls for a total revision of the established ways of modeling, designing, guiding, and controlling systems, in particular moving systems. Future missile research will have to make use of a larger part of nonlinear systems theory and the correct description and modeling of the underlying physics. Likewise, more systematic and high-level methods of modeling and simulation will be necessary. One of the main objectives of the project is a

general competence generation in order to meet the future need of modeling, simulation, and assessment. This activity is mainly theoretical and mathematical by nature.
NTIS
Evaluation; Nonlinear Systems; Missiles

20020010579 Defence Science and Technology Organisation, Airframes and Engines Div., Fishermans Bend, Australia
Prediction of Buffet Loads Using Artificial Neural Networks
Levinski, Oleg, Defence Science and Technology Organisation, Australia; September 2001; 46p; In English
Report No.(s): DSTO-RR-0218; DODA-AR-012-019; Copyright; Avail: Issuing Activity

The use of artificial neural networks (ANN) for predicting the empennage buffet pressures as a function of aircraft state has been investigated. The buffet loads prediction method which is developed depends on experimental data to train the ANN algorithm and is able to expand its knowledge base with additional data. The study confirmed that neural networks have a great potential as a method for modelling buffet data. The ability of neural networks to accurately predict magnitude and spectral content of unsteady buffet pressures was demonstrated. Based on the ANN methodology investigated, a buffet prediction system can be developed to characterize the F/A-18 vertical tail buffet environment at different flight conditions. It will allow better understanding and more efficient alleviation of the empennage buffeting problem.
Author
Algorithms; Buffeting; Neural Nets

20020011020 NASA Ames Research Center, Moffett Field, CA USA
Visual-Motion Cueing in Altitude and Yaw Control
Johnson, Walter W., NASA Ames Research Center, USA; Schroeder, Jeffery, NASA Ames Research Center, USA; [1994]; 1p; In English; 38th Annual Human Factors and Ergonomics Society Meeting, 24-28 Oct. 1994, Nashville, TN, USA
Contract(s)/Grant(s): RTOP 505-64-36; No Copyright; Avail: Issuing Activity; Abstract Only

Research conducted using the Vertical Motion Simulator at the NASA Ames Research Center examined the contributions of platform motion and visual level-of-detail (LOD) cueing to tasks that required altitude and/or yaw control in a simulated AH-64 Apache helicopter. Within the altitude control tasks the LOD manipulation caused optical density to change across altitudes by a small, moderate, or large amount; while platform motion was either present or absent. The results from these tasks showed that both constant optical density and platform motion improved altitude awareness in an altitude repositioning task, while the presence of platform motion also led to improved performance in a vertical rate control task. The yaw control tasks had pilots'sit 4.5 ft in front of the center of rotation, thus subjecting them to both rotational and lateral motions during a yaw. The pilots were required to regulate their yaw, while the platform motion was manipulated in order to present all combinations of the resulting rotational and lateral motion components. Ratings of simulation fidelity and sensed platform motion showed that the pilots were relatively insensitive to the rotational component, but highly aware of the lateral component. Together these findings show that: 1) platform motion cues are important when speed regulation is required during altitude change; 2) platform motion contributes to the perception of movement amplitude; 3) lateral, but not rotational, motion cues are essential to the perception of vehicle yaw; and 4) LOD management yielding constant optical density across altitudes improves altitude awareness.
Author
Motion Perception; Altitude Control; Yaw; Vertical Motion Simulators; Cues

20020011703 Research Inst. of National Defence, Stockholm, Sweden
LFT-Modeling of a Rolling Missile. Scientific Report
Henriksson, K. H., Research Inst. of National Defence, Sweden; June 1999; 90p; In English
Report No.(s): PB2001-108145; FOA-R-01189-314-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In this report we treat the problem of modeling and simulation of a rolling missile. to be able to deal with the nonlinearities and the time dependency associated with the dynamics of the missile, a Linear Fractional Transformation-model of the missile is derived. This report begins with a survey of how quaternions can be used for coordinate transformations. The quaternions are defined and the algebra associated to the quaternions is listed. Comparisons between the quaternions and the Euler angles are also made.
NTIS
Nonlinear Systems; Missile Control; Computerized Simulation; Quaternions; Rotating Bodies

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20020011241 Lawrence Livermore National Lab., Livermore, CA USA
Large volume 2000 MPA air source for the radiatively driven hypersonic wind tunnel
Constantino, M.; Jul. 14, 1999; 6p; In English
Report No.(s): DE2001-9846; UCRL-JC-133809; No Copyright; Avail: Department of Energy Information Bridge

An ultra-high pressure air source for a hypersonic wind tunnel for fluid dynamics and combustion physics and chemistry research and development must provide a 10 kg/s pure air flow for more than 1 s at a specific enthalpy of more than 3000 kJ/kg. The nominal operating pressure and temperature condition for the air source is 2000 MPa and 900 K. A radial array of variable radial support intensifiers connected to an axial manifold provides an arbitrarily large total high pressure volume. This configuration also provides solutions to cross bore stress concentrations and the decrease in material strength with temperature.
NTIS
Hypersonic Wind Tunnels; Air Flow; Enthalpy

20020012286 National Aerospace Lab., Flight Div., Amsterdam, Netherlands
AIRSIM: A Desktop Research Flight Simulator *Final Report*
Groeneweg, J.; October 1998; 22p; In English; Original contains color illustrations
Report No.(s): PB2002-100793; NLR-TP-98338; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

About seven years ago it was possible to buy a voluminous graphics workstation that costs about $100,000. Nowadays it is possible to buy graphics workstations for about 10 percent of that amount with the same computing power and small enough to fit somewhere on your desktop. This development has made it possible that people can buy low-cost graphics workstations and yet run high graphical demanding applications while sitting behind their desk. One of these applications is AIRSIM. AIRSIM is a flight simulator such as the PC-based Microsoft Flight Simulator ’98 (FS ’98) or Aerowinx Precision Simulator 1 (PS1). Although build for different purposes these flight simulators have one commonality. They all depend heavily on the graphical performance of the computer. This paper gives an overview of why NLR has developed AIRSIM, what this flight simulator is, how it works, what its characteristics and advantages are and how it can be used.
NTIS
Flight Simulators; Computer Graphics; Avionics; Computer Programs

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20020006889 Air Command and Staff Coll., Maxwell AFB, AL USA
Space Operations in the Joint Warfighting Arena: The Viability of a Joint Force Space Component Commander
Price, Larry G.; Apr. 2000; 18p; In English; Original contains color images
Report No.(s): AD-A394925; AU/ACSC/144/2000-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper is written for the non-space-minded person who is willing to hear ideas of how to integrate space power throughout the U.S. military’s joint warfighting ways. The U.S. military is becoming increasingly more dependent upon space assets to help win wars. In fact, some have said, Operation DESERT STORM was the first space war. As the world’s dependence on space assets grows, so grows the costs of building space assets and launching them into orbit. As such, the business of building and launching space assets fits the classic low supply/ high demand relationship. But as the costs to gain space power increases, the U. S. Department of Defense s budget continues to decrease. Therefore, the U.S. military must rely on commercial and civil--as well as its own--space assets, to maximize the effects space power brings to the theater Commander in Chief. Additionally, it s not difficult to imagine that the U.S. military may also rely on the space assets of allied countries in future coalition wars. So, given the U.S. military’s limited budget, coupled with its increasing reliance on space assets, it is imperative to maximize all available

space power in future wars. It follows, then, to question whether the U.S. military currently integrates space into the joint warfighting arena as effectively and efficiently as possible. Today, the U.S. military relies on the air component, within the joint warfighting structure, to work space issues for the Joint Force Commander (JFC). However, information distilled from USA Space Command's estimate of world space assets reveals that the U.S. military owns or controls less than 1/ 5th (with the U.S. Air Force owning the majority of those) of the space assets potentially available for U.S. military use in the next war. One might wonder how the other 4/5ths are integrated into the fight?
DTIC
Space Missions; Commerce

20020008239 Air Command and Staff Coll., Maxwell AFB, AL USA
Force Protection for the 21st Century Expeditionary Aerospace Forces: Security Forces Need for Organic Ground Intelligence
Chambers, James J., Jr; Apr. 1999; 62p; In English
Report No.(s): AD-A395785; AU/ACSC/026/1999-04; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The USA military, force on force, is unmatched by any other country in the world. Our dominance encourages adversaries to seek asymmetric means to thwart our abilities to carry out our global leadership policies. To make an impact through the media and with the will of the American people, attacks on U.S. Forces will be highly visible and very deadly. It is predicted that over the next 15 years, terrorists will become even more sophisticated in their targeting, propaganda, and political action operations. Nation-states and/or non-governmental organizations that choose to wage war on the United States must rely on unconventional methods to attack our centers of gravity. The evolution of the Expeditionary Aerospace Force (EAF), placing highly lethal strike packages on targets with the lowest possible logistics footprint creates new challenges for operational and security forces commanders. Are the security forces optimally organized to counter future threats, symmetrical and asymmetrical, to the EAF to make it a viable military instrument of power? This is the question this project will try to answer. to begin answering this question, a historical study was accomplished to determine how and why air base defense doctrine was created. It will show how today's force protection concepts were developed based on experiences and mindset of the past. Once the historical foundation of how the Air Force addresses air base defense is poured, this project will examine two recent force protection failures, their causes as seen by independent commissions, and how the failure affected the national security strategy. This project will look at the predicted strategic environment in the next century and the threats that accompany that environment, and compare those threats to the current Department of Defense and the Air Force countermeasures.
DTIC
Air Defense; Armed Forces (USA); Aerospace Systems; Protection; Warfare; Terrorism

20020008240 Air Command and Staff Coll., Maxwell AFB, AL USA
Space and Air Force: Rhetoric or Reality
Cashin, James P.; Spencer, Jeffrey D.; Apr. 1999; 71p; In English; Original contains color images
Report No.(s): AD-A395770; AU/ACSC/023/1999-04; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The Air Force, as part of its vision for the 21st century, claims to be an Air and Space Force transitioning to a Space and Air Force. In order to reach the goal of becoming a Space and Air Force, or using more recent terminology an Aerospace Force, the Air Force must first understand the need for space and how space can be applied to meet requirements set forth in the National Security Strategy (NSS). Joint Vision 2010, the Air Force's Global Engagement, and several long range plans all establish requirements that can only be fulfilled through the application of spacepower. to capitalize on the full potential of space, the Air and Space Force must cultivate a complete understanding of the medium (space-mindedness), modify the current National Space Policy and international agreement obligations, develop new space doctrine, and fund and acquire new space systems. A complete understanding of the space medium or space-mindedness can be achieved by educating the American public, the national and military leadership, and the space leadership in particular. Current national space policy must be changed to allow the Department of Defense to defend both national and commercial space assets and ensure the space assets supporting worldwide military operations are protected. Since most of the treaties require a five-year withdrawal period, the U.S. should not wait until a national crisis or space attack occurs to start deploying a national space defense. Nor should it ignore how a force of omnipresent, unmanned, pre-deployed systems would enhance the Aerospace Expeditionary Force concept with the capability to deliver combat power anywhere in the world within minutes. New space capabilities will not be cheap or simple. The U.S. must maintain its lead in space by major funding and technology development in space.
DTIC
Military Operations; Aerospace Systems; Space Flight; Space Weapons; Armed Forces (USA)

20020010248 NASA Ames Research Center, Moffett Field, CA USA

Mars Aerocapture Analysis For MESUR/Mars-Pathfinder Aeroshells Using Un-modulated Control in Low L/D Configurations

Wercinski, Paul F., NASA Ames Research Center, USA; [1994]; 1p; In English; AIAA Atmosphere Flight Mechanics Conference, 7-10 Aug. 1995, Baltimore, MD, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 213-20-01; No Copyright; Avail: Issuing Activity; Abstract Only

Aerocapture scenarios are examined to determine the feasibility of using MESUR/Mars Pathfinder aeroshell designs to capture spacecraft aerodynamically into Mars orbit. Using lift over drag (L/D) ratios up to 0.3, entry trajectories were simulated over a range of entry vehicle masses and entry velocities. Entry corridor widths were calculated for undershoot and overshoot trajectories yielding Mars parking orbits having periods from 2 to 20 hours. For entries with L/D = 0.3, entry corridor widths of about 1.2 degrees are possible over entry velocities from 5.5 to 9.0 km/sec. The design constraints for an aeroshell used for orbital aerocapture are less severe than a ballistic entry for a surface lander mission such as Mars Pathfinder, because the aerothermodynamic heating and deceleration loads are smaller. The mass savings from aerocapture orbit insertion versus propulsive insertion into Mars orbit could result in significantly reducing program costs and increasing mission capabilities. Author

Aerocapture; Aeroshells; Orbit Insertion; Mars Atmosphere

13
ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

20020009211 Sandia Corp., Livermore, CA USA

Feasibility Study on Small Particle Ablation Using a Free-Flight Range

Collins, Daniel J.; Sangster, David K.; Rogers, Walter K.; Nov. 1966; 66p; In English

Contract(s)/Grant(s): 48-4587

Report No.(s): AD-A396138; SC-CR-66-2128; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The feasibility of using a free-flight range to investigate the re-entry behavior of small spherical particles (400 to 700 microns diameter) was experimentally investigated. Using laser photography, information was obtained of shape changes of particles in flight. Under the conditions of the experiments, it is concluded that Al2O3 spheres fragment as a result of thermal stresses. DTIC

Ablation; Free Flight; Feasibility; Fragments

20020009547 NASA Ames Research Center, Moffett Field, CA USA

The Impact Hazard

Morrison, David, NASA Ames Research Center, USA; [1994]; 1p; In English; Fifth Annual AAS/AIAA Space Flight Mechanics Conference, 12-15 Feb. 1995, Albuquerque, NM, USA; Sponsored by American Astronautical Society, USA

Contract(s)/Grant(s): RTOP 196-41-67-06; No Copyright; Avail: Issuing Activity; Abstract Only

The Earth has been subject to hypervelocity impacts from comets and asteroids since its formation, and such impacts have played an important role in the evolution of life on our planet. We now recognize not only the historical role of impacts, but the contemporary hazard posed by such events. In the absence of a complete census of potentially threatening Earth-crossing asteroids or comets (called collectively Near Earth Objects, or NEOs), or even of a comprehensive cur-rent search program to identify NEOs, we can consider the hazard only from a probabilistic perspective. We know the steep power-law relationship between NEO numbers and size, with many more small bodies than large ones. We also know that few objects less than about 50 m in diameter (with kinetic energy near 10 megatons) penetrate the atmosphere and are capable of doing surface damage. But there is a spectrum of possible impact hazards associated with objects from this 10-megaton threshold all the way up to NEOs 5 km or larger in diameter, which are capable of inflicting severe damage on the environment, leading to mass extinction's of species. Detailed analysis has shown that, in general, the larger the object the greater the hazard, even when allowance is made for the infrequency of large impacts. Most of the danger to human life is associated with impacts by objects roughly 2 km or larger (energy greater than 1 million megatons), which can inject sufficient submicrometer dust into the atmosphere to produce a severe short-term global cooling with subsequent loss of crops, leading to starvation. Hazard estimates suggest that the chance of such an event occurring during a human lifetime is about 1:5000, and the global probability of death from such impacts is of the order of 1:20000, values that can be compared with risks associated with other natural hazards such as earthquakes, volcanic eruptions, and severe storms. However, the impact hazard differs from the others in that it can be largely prevented by a comprehensive survey for

threatening objects and the application of technological solutions to deflect or destroy objects that are found to have orbits that will lead to collision with the Earth.
Author
Biological Evolution; Asteroids; Collisions; Comets; Earthquakes; Kinetic Energy; Hazards; Farm Crops

20020009554 NASA Ames Research Center, Moffett Field, CA USA
The Rings Node for the Planetary Data System
Showalter, Mark R., NASA Ames Research Center, USA; Bollinger, Kenneth J., NASA Ames Research Center, USA; Cuzzi, Jeffrey N., NASA Ames Research Center, USA; Nicholson, Philip D., NASA Ames Research Center, USA; [1994]; 1p; In English
Contract(s)/Grant(s): RTOP 489-10-04-01; No Copyright; Avail: Issuing Activity; Abstract Only

The Planetary Data System's Rings Node is devoted to the archiving and distributing of scientific data sets relevant to planetary ring systems. The two major classes of ring data are images and occultation profiles, although a variety of additional data types (e.g. spectra, particle absorption signatures, etc.) are also of interest. A large fraction of our data sets are from the Voyager missions to the outer planets, but Earth-based and Hubble Space Telescope data sets are also represented. Archiving work often includes re-formatting the data into standardized formats and reconstructing some of the data processing steps. The Rings Node also performs a variety of services to support research into these data sets. These services include developing on-line catalogs and information systems, filling orders for data, developing software tools, and coordinating special observing campaigns.
Author
Planetary Systems; Standardization; Data Systems; Data Processing; Planetary Rings

20020012351 Center for Mathematics and Computer Science, Amsterdam Netherlands
Parallel Stoermer-Cowell Methods for High-Precision Orbit Computations. Modelling, Analysis and Simulation
van der Houwen, P. J.; Mesina, E.; de Swart, J. J. B.; July 1998; 30p; In English
Report No.(s): PB2001-108498; MAS-R9812; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Many orbit problems in celestial mechanics are described by (nonstiff) initial-value problems (IVPs) for second-order ordinary differential equations of the form y=f(y). The most successful integration methods are based on high-order Runge-Kutta-Nystrom formulas. However, these methods were designed for sequential computer systems. In this paper, we consider high-order parallel methods that are not based on Runge-Kutta-Nystrom formulas, but which fit into the class of general linear methods. In each step, these methods compute blocks of k approximate solution values (or stage values) at k different points using the whole previous block of solution values. The k stage values can be computed in parallel, so that on a k-processor computer system such methods effectively perform as a one-value method.
NTIS
Differential Equations; Numerical Integration; Orbit Calculation; Parallel Processing (Computers)

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also 09 Research and Support Facilities (Air).

20020008614 AMPTEk, Inc., Bedford, MA USA
Compact Environmental Anomaly Sensor (CEASE) Flight Integration Support Contract
Oberhardt, Marilyn R.; Redus, Robert H.; McGarity, John O.; Sperry, David J.; Moran, Scott J.; Jul. 29, 1999; 17p; In English
Contract(s)/Grant(s): F19628-96-C-0063; AF Proj. 2823
Report No.(s): AD-A395758; AFRL-VS-TR-2000-1512; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The outer space environment experienced by modern, electronically sophisticated spacecraft can be very hostile due to interactions between complex, sensitive electronics systems and the naturally occurring energetic particle population indiginous to the solar system. The Compact Environmental Anomaly System (CEASE) has been developed as a small, low-power device to monitor space "weather" and to provide autonomous warnings of conditions that may cause operational anomalies in the host spacecraft. CEASE uses a two-element, solid-state telescope and two radiation dosimeters to sample critical energetic particle fluxes and uses a sophisiticated real-time processing program that can forecast hazardous conditions before they affect the

spacecraft. The spacecraft, in turn, can re-prioritize its operations, inhibit any anomaly sensitive operations such as attitude adjustments, or initiate other prudent actions as indicated by the CEASE warning flags.
DTIC
Warning Systems; Magnetic Anomalies; Radiation Dosage; Charging; Radiation Effects

20020010254 National Defence Research Establishment, Div. of Command and Control Warfare, Linkoeping, Sweden
Detection and Target Tracking in the Infrared Wavelength Region
Andersson, U.; Tonnvik, A.; September 2000; 110p; In English
Report No.(s): PB2002-100401; FOA-R-00-01639-616-SE; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Within FOA (The Defense Research Establishment in Sweden) research upon countermeasures for tanks is in progress. This report describes a model, which simulates a terminally guided projectile, in order to be used in the development and evaluation of countermeasures for tanks and other armoured vehicles. The model consists of three parts preprocessing, target selection and target tracking. The model works both for sequences recorded within a single wavelength band and for sequences recorded within dual wavelength bands. The image sequences used in this work were recorded from a helicopter with a thermal camera. They are preprocessed to imitate the effects of a projectile's sensors. These preprocessed sequences are used in the segmentation, the classification and in the tracking. The segmentation produces a set of target candidates. From this set relevant features are extracted. by comparing these features with 'normal values' for a tank, the objects are classified. When the classifier has chosen a target the tracker starts and tracks the target towards the ground.
NTIS
Infrared Spectra; Tracking (Position); Detection; Mathematical Models; Target Recognition

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20020006240 Los Alamos National Lab., NM USA
Alexis: The 6 year telescope flight experience
Roussel-Dupre, D.; Bloch, J.; Jul. 01, 1999; 18p; In English
Report No.(s): DE2001-772940; LA-UR-99-3410; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Array of Low Energy X-ray Imaging Sensors (ALEXIS) satellite was launched from the 4th flight of the Pegasus booster on 25 April, 1993 into an 800 km, 70 degree inclination orbit. After an initial launch difficulty, the satellite was successfully recovered and is still producing 100 MB of mission data per day. ALEXIS, still going strong in its sixth year, was originally designed to be a high risk, single string, Smaller-Faster-Cheaper satellite, with a 1-year nominal and a 3-year design limit. This paper will discuss the on-orbit detector performance including microchannel plate operation, pre- and post-flight calibration efforts, observed backgrounds and impacts of flying in a high radiation environment.
NTIS
X Ray Imagery; Satellite Instruments

20020009668 Sandia Labs., Albuquerque, NM USA
Rover Postoperational Destruct Instrumentation Development
Berry, R. E.; Martin, J. P.; Dec. 1965; 125p; In English
Report No.(s): AD-A396091; SC-RR-65-551; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
In partial fulfillment of its responsibility to the AEC for the safety analyses of nuclear power supplies to be used in space, Sandia Corporation performed a series of development tests in preparation for a full-scale destruct test of the ROVER/NERVA space propulsion engine. The data from the full-scale test are necessary before the safety analysis of the nuclear space engine can be completed.
DTIC
Full Scale Tests; Nuclear Engine For Rocket Vehicles; Nuclear Propulsion

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

20020011684 NASA Glenn Research Center, Cleveland, OH USA

Satellite Communications for Aeronautical Applications: Recent research and Development Results

Kerczewski, Robert J., NASA Glenn Research Center, USA; September 2001; 15p; In English; Seventh Ka-Band Utilization Conference, 26-28 September 2001, Genoa, Italy; Sponsored by Istituto Internazionale delle Comunicazioni, Italy

Contract(s)/Grant(s): RTOP 727-01-00

Report No.(s): NASA/TM-2001-211150; E-13003; NAS 1.15:211150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Communications systems have always been a critical element in aviation. Until recently, nearly all communications between the ground and aircraft have been based on analog voice technology. But the future of global aviation requires a more sophisticated ”information infrastructure” which not only provides more and better communications, but integrates the key information functions (communications, navigation, and surveillance) into a modern, network-based infrastructure. Satellite communications will play an increasing role in providing information infrastructure solutions for aviation. Developing and adapting satellite communications technologies for aviation use is now receiving increased attention as the urgency to develop information infrastructure solutions grows. The NASA Glenn Research Center is actively involved in research and development activities for aeronautical satellite communications, with a key emphasis on air traffic management communications needs. This paper describes the recent results and status of NASA Glenn’s research program.

Author

Satellite Communication; Telecommunication; Radio Communication; Aircraft Communication

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SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20020006508 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

Military Voice Services over Wireless ATM Networks: Performance Analysis of FEC Schemes at ATM Transport Over Wireless Links

Tsakiridou, Sophia; Mar. 2001; 103p; In English; Original contains color images

Report No.(s): AD-A395812; DREO-TR-2001-058; CRC-2001-003; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Wireless ATM was designed to extend the support of broadband, multimedia services provided in fixed ATM networks to the wireless/mobile environment in a seamless and efficient manner. It is a candidate wireless networking technology for future tactical military networks which have adopted ATM in the core network. The bandwidth-limited, error-prone nature of wireless links poses significant challenges in the design of wireless ATM. This report is part of a study on the feasibility of military voice services over wireless ATM networks and is concerned with the impact of wireless link errors on the performance of ATM. The work presents a review of various error control schemes proposed for the efficient transport of ATM over point-to-point wireless links. Due to the strict latency requirements of voice applications, only error control schemes based on Forward Error Correction are considered. The performance of these schemes is analyzed for the random-error channel and for the Gilbert-Elliott burst-error channel.

DTIC

Asynchronous Transfer Mode; Communication Networks; Reliability Analysis

20020008687 NASA, Washington, DC USA

Report by the International Space Station (ISS) Management and Cost Evaluation (IMCE) Task Force

Young, A. Thomas, NASA, USA; Nov. 01, 2001; 90p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The International Space Station (ISS) Management and Cost Evaluation Task Force (IMCE) was chartered to conduct an independent external review and assessment of the ISS cost, budget, and management. In addition, the Task Force was asked to provide recommendations that could provide maximum benefit to the U.S. taxpayers and the International Partners within the President's budget request. The Task Force has made the following principal findings: (1) The ISS Program's technical achievements to date, as represented by on-orbit capability, are extraordinary; (2) The Existing ISS Program Plan for executing the FY 02-06 budget is not credible; (3) The existing deficiencies in management structure, institutional culture, cost estimating, and program control must be acknowledged and corrected for the Program to move forward in a credible fashion; (4) Additional budget flexibility, from within the Office of Space Flight (OSF) must be provided for a credible core complete program; (5) The research support program is proceeding assuming the budget that was in place before the FY02 budget runout reduction of $1B; (6) There are opportunities to maximize research on the core station program with modest cost impact; (7) The U.S. Core Complete configuration (three person crew) as an end-state will not achieve the unique research potential of the ISS; (8) The cost estimates for the U.S.-funded enhancement options (e.g., permanent seven person crew) are not sufficiently developed to assess credibility. After these findings, the Task Force has formulated several primary recommendations which are published here and include: (1) Major changes must be made in how the ISS program is managed; (2) Additional cost reductions are required within the baseline program; (3) Additional funds must be identified and applied from the Human Space Flight budget; (4) A clearly defined program with a credible end-state, agreed to by all stakeholders, must be developed and implemented.
Derived from text
International Space Station; Evaluation; Cost Analysis; Project Management; Budgeting; NASA Programs

20020009658 Air Force Research Lab., Munitions Directorate, Eglin AFB, FL USA
Experimental and Computational Results of a Maneuverable Power-Law Elliptic Cross-Section Projectile at Supersonic Speeds ***Final Report, Jan. 1998-Aug. 2001***
Bertin, John J.; Forsythe, James R.; Schuricht, Paul H.; Oct. 2001; 77p; In English; Original contains color images; Original contains color plates: All DTIC reproductions will be in black and white. Prepared in cooperation with USA Air Force Academy, USAFA, CO
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A396176; AFRL-MN-EG-TR-2001-7104; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report documents the results of an experimental and computational investigation of a power-law elliptic cross-section projectile for increased maneuverability. Surface-pressure measurements and force-and-moment measurements have been conducted in the Tri-Sonic Wind-Tunnel (TWT) at the Aerodynamic Research Center (ARC) at the U.S. Air Force Academy. Flow visualization data were also obtained in the form of Schlieren photographs and surface oil-flow patterns during these test programs. Data were obtained at a Mach number of 4.2 over a range of Reynolds numbers (based on the free-stream conditions and the model length) of 12.47 million to 19.96 million over an angle-of-attack range from -11 to +11 degrees. The data from these wind-tunnel tests were compared with computations generated using the Cobalt code, which was run on the Beowulf cluster at the High-Performance Computing Facility (HPCF) at the ARC. It should be noted that the experimental and the computational parts of this investigation were conducted concurrently in a double-blind fashion. That is, the results from the experimental effort were not used to influence the way in which the results from the CFD effort were produced and vice versa. Free flight investigations were carried out at the U.S. Air Force Research Laboratory Munitions Directorate Aeroballistic Research Facility and were conducted at Mach numbers ranging from 3.0 to 5.0. The free flight experimental data consisted of nine free-flight projectiles launched within an instrumented facility. Additional computational work was again carried out via the Cobalt code at the flight conditions of the experimental facility. The results indicate good agreement between the experimental and computational data determined in this effort, as well as, with engineering level predictions. The free-flight data was limited to small angles of attack therefore high fidelity determination of the aerodynamic stability coefficients and derivatives was not possible.
DTIC
Missiles; Ellipticity; Supersonic Speed; Wind Tunnel Tests

20020010895 NASA Marshall Space Flight Center, Huntsville, AL USA
Synchronized Docking System
Howard, Richard T., Inventor, NASA Marshall Space Flight Center, USA; Book, Michael L., Inventor, NASA Marshall Space Flight Center, USA; Bryan, Thomas C., Inventor, NASA Marshall Space Flight Center, USA; Jul. 03, 2001; 4p; In English
Patent Info.: Filed 10 Dec. 1998; NASA-Case-MFS-31278-1; US-Patent-6,254,035; US-Patent-Appl-SN-228071; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A synchronized target subsystem for use in an automated docking system for docking a chase vehicle with a target vehicle wherein the chase vehicle is provided with a video camera for feeding digitized frames to an image processing unit which feeds

signals to a control circuit. The control circuit turns on the video camera to digitize a background frame which will include the target vehicle. After the camera grabs the background frame the control circuit turns on a light, which is carried by carried on the chase vehicle and aimed at the target vehicle, and signals the video camera to digitize a foreground frame. A light sensing circuit on the target vehicle receives the light from the chase vehicle and connects a power supply to lights on the target vehicle such that when the foreground frame is digitized the Lights on the target vehicle will show in the foreground frame. Die image processing unit subtracts the background frame from the foreground frame and provides a docking signal.
Official Gazette of the U.S. Patent and Trademark Office
Image Processing; Spacecraft Docking; Detection

20020010903 NASA Marshall Space Flight Center, Huntsville, AL USA
Synchronized Autonomous Docking System
Howard, Richard T., Inventor, NASA Marshall Space Flight Center, USA; Book, Michael L., Inventor, NASA Marshall Space Flight Center, USA; Bryan, Thomas C., Inventor, NASA Marshall Space Flight Center, USA; May 08, 2001; 4p; In English
Patent Info.: Filed 10 Dec. 1998; NASA-Case-MFS-31279-1; US-Patent-6,227,495; US-Patent-Appl-SN-228033; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A synchronized target subsystem for use in an automated docking system for docking a chase vehicle with a target vehicle wherein the chase vehicle is provided with a video camera for feeding digitized frames to an image processing unit which controls a timing circuit. 'Me timing circuit turns on the video camera to digitize a foreground frame and at the same time turns on a transmitter on the chase vehicle. A power generating antenna on the target vehicle receives the transmitted signal from the transmitter and actuates lights on the chase vehicle so that these lights appear in the foreground frame. After the foreground frame has been grabbed, the timing circuit turns the transmitter off and signals the video camera to digitize a background frame. The image processing unit subtracts the background frame from the foreground frame and provides a docking signal.
Official Gazette of the U.S. Patent and Trademark Office
Autonomy; Image Processing; Spacecraft Docking; Cameras

20020012437 NASA Ames Research Center, Moffett Field, CA USA
The Evolution of Flexible Insulation as Thermal Protection Systems for Reusable Launch Vehicles: AFRSI (Advanced Flexible Reusable Surface Insulation) to CRI (Conformal Reusable Insulation)
Rezin, Marc, NASA Ames Research Center, USA; Oka, Kris, Boeing Co., USA; [2001]; 16p; In English; National Space and Missile Materials Symposium, 25 Jun. 2001, Unknown; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation gives an overview of the evolution of flexible insulation as a thermal protection system for reusable launch vehicles, Advanced Flexible Reusable Surface Insulation (AFRSI) to Conformal Reusable Insulation (CRI). Details are given on the approved use of AFRIS on the Shuttle Orbiter in June 1980, the first flight of AFRIS on STS-6, windward blanket development, composite flexible blanket insulation, and flight demonstrations.
CASI
Thermal Insulation; Space Shuttle Orbiters

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also 06 Aircraft Instrumentation and Avionics; For spaceborne instruments not integral to the vehicle itself see 35 Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy, Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy.

20020012004 Analex Corp., Brook Park, OH USA
The Electromagnetic Compatibility (EMC) Design Challenge for Scientific Spacecraft Powered by a Stirling Power Converter
Sargent, Noel B., Analex Corp., USA; November 2001; 11p; In English; 36th Intersociety Energy Conversion Engineering Conference, 29 July - 2 August, 2001, Savannah, GA, USA; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): NAS3-00145; RTOP 896-30-00
Report No.(s): NASA/CR-2001-210945; E-12799; IECEC2001-CT-37; NAS 1.26:210945; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 55 We free-piston Stirling Technology Demonstration Convertor (TDC) has been tested as part of an evaluation to determine its feasibility as a means for significantly reducing the amount of radioactive material required compared to Radioisotope Thermoelectric Generators (RTGs) to support long-term space science missions. Measurements were made to quantify the low frequency magnetic and electric fields radiated from the Stirling's 80 Hertz (Hz) linear alternator and control electronics in order to determine the magnitude of reduction that will be required to protect sensitive field sensors aboard some science missions. One identified "Solar Probe" mission requires a 100 dB reduction in the low frequency magnetic field over typical military standard design limits, to protect its plasma wave sensor. This paper discusses the electromagnetic interference (EMI) control options relative to the physical design impacts for this power system, composed of 3 basic electrical elements. They are (1) the Stirling Power Convertor with its linear alternator, (2) the power switching and control electronics to convert the 90 V, 80 Hz alternator output to DC for the use of the spacecraft, and (3) the interconnecting wiring including any instrumentation to monitor and control items 1 and 2.
Author
Electromagnetic Compatibility; Electromagnetic Interference; Linear Alternators; Power Converters; Stirling Engines; Nuclear Electric Power Generation; Stirling Cycle

20020012255 National Aerospace Lab., Space Div., Amsterdam, Netherlands
Modelling of the Transient Environmental Heat Load on the ALADIN Instrument in an Arbitrary ISS-Related Orbit *Final Report*
vanEs, J.; Knobbout, H. A.; Veldman, S. M.; May 16, 2000; 14p; In English
Report No.(s): PB2001-108708; NLR-TP-2000-264; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The described thermal model is part of the Lidar Performance Analysis Simulator (LIPAS), a simulator of the Atmospheric Laser Doppler Instrument ALADIN. The developed model calculates the transient environmental heat load on ALADIN and gives an overall instrument temperature prediction. The heat load model accounts for the fact that the ISS (International Space Station) orbit is a non-fixed one, and is therefore essentially based on the actual position of the spacecraft, rather than on orbit parameters. In order to verify the validity of the model developed, results are compared with results from other heat load programs.
NTIS
Temperature Measurement; Computerized Simulation; Thermal Simulation; Simulators; Optical Radar; Atmospheric Lasers; Temperature Effects

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20020006335 NASA Glenn Research Center, Cleveland, OH USA
High Voltage TAL Performance
Jacobson, David T., NASA Glenn Research Center, USA; Jankovsky, Robert S., NASA Glenn Research Center, USA; Rawlin, Vincent K., NASA Glenn Research Center, USA; Manzella, David H., Toledo Univ., USA; November 2001; 20p; In English; 37th Joint Propulsion Conference and Exhibit, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 755-B4-05
Report No.(s): NASA/TM-2001-211147; E-12999; NAS 1.15:211147; AIAA Paper 2001-3777; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The performance of a two-stage, anode layer Hall thruster was evaluated. Experiments were conducted in single and two-stage configurations. In single-stage configuration, the thruster was operated with discharge voltages ranging from 300 to 1700 V. Discharge specific impulses ranged from 1630 to 4140 sec. Thruster investigations were conducted with input power ranging from 1 to 8.7 kW, corresponding to power throttling of nearly 9: 1. An extensive two-stage performance map was generated. Data taken with total voltage (sum of discharge and accelerating voltage) constant revealed a decrease in thruster efficiency as the discharge voltage was increased. Anode specific impulse values were comparable in the single and two-stage configurations showing no strong advantage for two-stage operation.
Author
Throttling; Hall Thrusters; Performance Tests; Anodes; Evaluation

20020006950 NASA Glenn Research Center, Cleveland, OH USA

Innovative Airbreathing Propulsion Concepts for Access to Space

Whitlow, Jr., Woodrow, NASA Glenn Research Center, USA; Blech, Richard A., NASA Glenn Research Center, USA; Blankson, Isaiah M., NASA Glenn Research Center, USA; November 2001; 20p; In English; Novel Aero Propulsion Systems International Symposium, 3-4 Sept. 2000, London, UK; Sponsored by Institution of Mechanical Engineers, UK

Contract(s)/Grant(s): RTOP 910-30-11

Report No.(s): NASA/TM-2001-210564; E-12529; NAS 1.15:210564; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper will present technologies and concepts for novel aeropropulsion systems. These technologies will enhance the safety of operations, reduce life cycle costs, and contribute to reduced costs of air travel and access to space. One of the goals of the NASA program is to reduce the carbon-dioxide emissions of aircraft engines. Engine concepts that use highly efficient fuel cell/electric drive technologies in hydrogen-fueled engines will be presented in the proposed paper. Carbon-dioxide emissions will be eliminated by replacing hydrocarbon fuel with hydrogen, and reduce NOx emissions through better combustion process control. A revolutionary exoskeletal engine concept, in which the engine drum is rotated, will be shown. This concept has the potential to allow a propulsion system that can be used for subsonic through hypersonic flight. Dual fan concepts that have ultra-high bypass ratios, low noise, and low drag will be presented. Flow-controlled turbofans and control-configured turbofans also will be discussed. to increase efficiency, a system of microengines distributed along lifting surfaces and on the fuselage is being investigated. This concept will be presented in the paper. Small propulsion systems for affordable, safe personal transportation vehicles will be discussed. These low-oil/oilless systems use technologies that enable significant cost and weight reductions. Pulse detonation engine-based hybrid-cycle and combined-cycle propulsion systems for aviation and space access will be presented.

Author

Air Breathing Engines; Engine Design; Propulsion System Configurations; Pulse Detonation Engines; Hydrogen Engines; Combined Cycle Power Generation

20020009015 NASA Glenn Research Center, Cleveland, OH USA

Performance Evaluation of Titanium Ion Optics for the NASA 30 cm Ion Thruster

Soulas, George C., NASA Glenn Research Center, USA; December 2001; 20p; In English; 27th; 27th International Electric Propulsion Conference, 14-19 Oct. 2001, Pasadena, CA, USA; Sponsored by Air Force Research Lab., USA

Contract(s)/Grant(s): RTOP 755-B4-04

Report No.(s): NASA/TM-2001-211220; E-13073; NAS 1.15:211220; IEPC-01-092; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of performance tests with titanium ion optics were presented and compared to those of molybdenum ion optics. Both titanium and molybdenum ion optics were initially operated until ion optics performance parameters achieved steady state values. Afterwards, performance characterizations were conducted. This permitted proper performance comparisons of titanium and molybdenum ion optics. Ion optics' performance A,as characterized over a broad thruster input power range of 0.5 to 3.0 kW. All performance parameters for titanium ion optics of achieved steady state values after processing 1200 gm of propellant. Molybdenum ion optics exhibited no burn-in. Impingement-limited total voltages for titanium ion optics where up to 55 V greater than those for molybdenum ion optics. Comparisons of electron backstreaming limits as a function of peak beam current density for molybdenum and titanium ion optics demonstrated that titanium ion optics operated with a higher electron backstreaming limit than molybdenum ion optics for a given peak beam current density. Screen grid ion transparencies for titanium ion optics were as much as 3.8 percent lower than those for molybdenum ion optics. Beam divergence half-angles that enclosed 95 percent of the total beam current for titanium ion optics were within 1 to 3 deg. of those for molybdenum ion optics. All beam divergence thrust correction factors for titanium ion optics were within 1 percent of those with molybdenum ion optics.

Author

Ion Engines; Ion Optics; Performance Tests; Titanium

20020009165 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA

Solid Propellant Test Motor Scaling

Fry, Ronald S.; September 2001; 104p; In English

Contract(s)/Grant(s): SP0700-97-D-4004

Report No.(s): AD-A395610; CPIA-CPTR-73; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Current burning rate measurement test techniques and subscale test hardware used within the NATO (North Atlantic Treaty Organization) community are reviewed and recommendations are made to support improved scaling and prediction of internal

ballistics of a full-scale solid propellant motor. The NATO Research and Technology Organization (RTO), Advanced Vehicle Technology (AVT), Working Group (WG) 016 (formerly AGARD/PEP working Group #27) undertook an evaluation of methods used within the NATO propulsion community to measure burning rate in solid propellant rocket systems. The purpose was to identify similarities and differences among the member nations. The WG 016 sought to contribute to improvements in the burning rate tools by addressing issues that have remained unresolved in the solid propulsion industry for over 40 years: (1) Better understanding of burning rate, r(sub b)(p,To), data from various facilities to ease the comparison of propellants from various manufacturers and to improve international exchanges and cooperation. (2) Improved measurement accuracy and reliability to allow a decrease in the number of tests (and associated time and cost) and improved control of manufacturing and quality assurance and the assessment of aging. AVT WG 016 activities have identified that manufacturer burning rate data may not easily be compared without accounting for industry-wide differences in subscale devices, test methods and scaling analysis methods. The WG recommends the NATO propulsion community review these findings as a means of advancing their own burning rate measurement and analysis methods.
DTIC
Burning Rate; Solid Propellant Rocket Engines; Solid Rocket Propellants; North Atlantic Treaty Organization (NATO); Propellant Tests

20020010171 NASA Glenn Research Center, Cleveland, OH USA
A Review of Testing of Hollow Cathodes for the International Space Station Plasma Contactor
Kovaleski, S. D., QSS Group, Inc., USA; Patterson, M. J., NASA Glenn Research Center, USA; Soulas, G. C., NASA Glenn Research Center, USA; Sarver-Verhey, T. R., NASA Glenn Research Center, USA; December 2001; 20p; In English; 27th International Electric Propulsion Conference, 14-19 Oct. 2001, Pasadena, CA, USA; Sponsored by Air Force Research Lab., USA
Contract(s)/Grant(s): RTOP 478-88-10
Report No.(s): NASA/TM-2001-211291; E-13096; NAS 1.15:211291; IEPC-01-271; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since October 2000, two plasma contactors have been providing charge control on the International Space Station (ISS). At the heart of each of the two plasma contactors is a hollow cathode assembly (HCA) that produces the contacting xenon plasma. The HCA is the result of 9 years of design and testing at the NASA Glenn Research Center. This paper summarizes HCA testing that has been performed to date. As of this time, one cathode has demonstrated approximately 28,000 hr of lifetime during constant, high current use. Another cathode, HCA.014. has demonstrated 42,000 ignitions before cathode heater failure. In addition to these cathodes, four cathodes. HCA.006, HCA.003, HCA.010, and HCA.013 have undergone cyclic testing to simulate the variable current demand expected on the ISS. HCA.006 accumulated 8,000 hr of life test operation prior to being voluntarily stopped for analysis before the flight units were fabricated. HCA.010 has accumulated 15,876 hr of life testing, and 4,424 ignitions during ignition testing. HCA.003 and HCA.0 13 have accumulated 12,415 and 18,823 hr of life testing respectively.
Author
Hollow Cathodes; International Space Station; Accelerated Life Tests; Contactors

20020011037 NASA Glenn Research Center, Cleveland, OH USA
International Space Station Nickel-Hydrogen Battery Start-Up and Initial Performance
Cohen, Fred, Boeing Co., USA; Dalton, Penni J., NASA Glenn Research Center, USA; July 2001; 12p; In English; 36th Intersociety Energy Conversion Engineering Conference, 29 Jul. - 2 Aug. 2001, Savannah, GA, USA; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 478-29-10
Report No.(s): NASA/TM-2001-210983; E-12837; NAS 1.15:210983; IECEC2001-AT-52; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

International Space Station (ISS) Electric Power System (EPS) utilizes Nickel-Hydrogen (Ni-H2) batteries as part of its power system to store electrical energy. The batteries are charged during insolation and discharged during eclipse. The batteries are designed to operate at a 35% depth of discharge (DOD) maximum during normal operation. Thirty eight individual pressure vessel (IPV) Ni-H2 battery cells are series-connected and packaged in an Orbital Replacement Unit (ORU). Two ORUs are series-connected utilizing a total of 76 cells, to form one battery. The ISS is the first application for low earth orbit (LEO) cycling of this quantity of series-connected cells. The P6 Integrated Equipment Assembly (IEA) containing the initial ISS high-power components was successfully launched on November 30, 2000. The IEA contains 12 Battery Subassembly ORUs (6 batteries)

that provide station power during eclipse periods. This paper will describe the battery hardware configuration, operation, and role in providing power to the main power system of the ISS. We will also discuss initial battery start-up and performance data.
Author
International Space Station; Space Station Power Supplies; Nickel Hydrogen Batteries

20020012005 NASA Glenn Research Center, Cleveland, OH USA
Improving the Total Impulse Capability of the NSTAR Ion Thruster With Thick-Accelerator-Grid Ion Optics
Soulas, George C., NASA Glenn Research Center, USA; December 2001; 22p; In English; 27th International Electric Propulsion Conference, 14-19 Oct. 2001, Pasadena, CA, USA; Sponsored by Air Force Research Lab., Bolling Air Force Base, USA
Contract(s)/Grant(s): RTOP 755-B4-04
Report No.(s): NASA/TM-2001-211276; NAS 1.15:211276; E-13075; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The results of performance tests with thick-accelerator-grid (TAG) ion optics are presented. TAG ion optics utilize a 50 percent thicker accelerator grid to double ion optics' service life. NSTAR ion optics were also tested to provide a baseline performance for comparison. Impingement-limited total voltages for the TAG ion optics were only 0 to 15 V higher than those of the NSTAR ion optics. Electron backstreaming limits for the TAG ion optics were 3 to 9 V higher than those for the NSTAR optics due to the increased accelerator grid thickness for the TAG ion optics. Screen grid ion transparencies for the TAG ion optics were only about 2 percent lower than those for the NSTAR optics, reflecting the lower physical screen grid open area fraction of the TAG ion optics. Accelerator currents for the TAG ion optics were 19 to 43 percent greater than those for the NSTAR ion optics due, in part, to a sudden increase in accelerator current during TAG ion optics' performance tests for unknown reasons and to the lower-than-nominal accelerator aperture diameters. Beam divergence half-angles that enclosed 95 percent of the total beam current and beam divergence thrust correction factors for the TAG ion optics were within 2 degrees and 1 percent, respectively, of those for the NSTAR ion optics.
Author
Ion Optics; Performance Tests; Ion Engines; Ion Propulsion; Total Impulse

20020012436 NASA Glenn Research Center, Cleveland, OH USA
Aerospace Flywheel Technology Development for IPACS Applications
McLallin, Kerry L., NASA Glenn Research Center, USA; Jansen, Ralph H., Ohio Aerospace Inst., USA; Fausz, Jerry, Air Force Research Lab., USA; Bauer, Robert D., Lockheed Martin Missiles and Space, USA; October 2001; 12p; In English; 36th Intersociety Energy Conversion Engineering Conference, 29 Jul. - 2 Aug. 2001, Savannah, GA, USA; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 755-1A-09
Report No.(s): NASA/TM-2001-211093; NAS 1.15:211093; E-12936; IECEC2001-AT-82; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The National Aeronautics and Space Administration (NASA) and the Air Force Research Laboratory (AFRL) are cooperating under a space act agreement to sponsor the research and development of aerospace flywheel technologies to address mutual future mission needs. Flywheel technology offers significantly enhanced capability or is an enabling technology. Generally these missions are for energy storage and/or integrated power and attitude control systems (IPACS) for mid-to-large satellites in low earth orbit. These missions require significant energy storage as well as a CMG or reaction wheel function for attitude control. A summary description of the NASA and AFRL flywheel technology development programs is provided, followed by specific descriptions of the development plans for integrated flywheel system tests for IPACS applications utilizing both fixed and actuated flywheel units. These flywheel system development tests will be conducted at facilities at AFRL and NASA Glenn Research Center and include participation by industry participants Honeywell and Lockheed Martin.
Author
Flywheels; Energy Storage; Attitude Control; Research and Development

20020012540 NASA Glenn Research Center, Cleveland, OH USA
High Voltage SPT Performance
Manzella, David, Toledo Univ., USA; Jacobson, David, NASA Glenn Research Center, USA; Jankovsky, Robert, NASA Glenn Research Center, USA; November 2001; 16p; In English; 37th Joint Propulsion Conference and Exhibit, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-B4-05
Report No.(s): NASA/TM-2001-211135; NAS 1.15:211135; E-12983; AIAA Paper 2001-3774; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 2.3 kW stationary plasma thruster designed to operate at high voltage was tested at discharge voltages between 300 and 1250 V. Discharge specific impulses between 1600 and 3700 sec were demonstrated with thrust between 40 and 145 mN. Test data indicated that discharge voltage can be optimized for maximum discharge efficiency. The optimum discharge voltage was between 500 and 700 V for the various anode mass flow rates considered. The effect of operating voltage on optimal magnet field strength was investigated. The effect of cathode flow rate on thruster efficiency was considered for an 800 V discharge.
Author
High Voltages; Field Strength; Mass Flow Rate; Plasma Propulsion; Optimization

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20020006155 Federal Energy Technology Center, Morgantown, WV USA
Coal/Polymer Coprocessing with Efficient Use of Hydrogen
Broadbelt, L. J.; DeWitt, M. J.; Mar. 20, 1998; 24p; In English
Report No.(s): DE2001-7728; DE-FG22-96PC96204-03; No Copyright; Avail: Department of Energy Information Bridge

Inadequacies of current recovery and disposal methods for mixed plastic wastes drive the exploration of viable strategies for plastics resource recovery. The combination of diminishing landfill space and increasing usage of plastic products poses a significant dilemma, since current recovery methods are costly and ill-suited to handle contaminants. Coprocessing of polymeric waste with other materials may provide potential solutions to the deficiencies of current resource recovery methods, including unfavorable process economics. By incorporating plastic waste as a minor feed into an existing process, variations in supply and composition could be mediated, permitting continuous operation. One attractive option is the coprocessing of polymeric waste with coal under direct liquefaction conditions, allowing for simultaneous conversion of both feedstocks into high-valued products. Catalyst-directed coliquefaction of coal and polymeric materials not only has attractive environmental implications but also has the potential to enhance the economic viability of traditional liquefaction processes. by exploiting the higher H/C ratio of the polymeric material and using it as a hydrogen source, the overall process demand for molecular hydrogen and hydrogen donor solvents may be reduced. A series of model compound experiments has been conducted, providing a starting point for unraveling the complex chemistry underlying coliquefaction of coal and polymeric materials. Tetradecane (C(sub 14) H(sub 30)) was used as a polyethylene mimic, and 4-(naphthylmethyl)bibenzyl (NBBM) was used as a coal model compound. Neat and binary mixture reactions of tetradecane and NBBM were carried out in an inert atmosphere at both low and high pressures to establish a thermal baseline for subsequent catalytic experiments. Work in the past six months has focused on analysis of light gaseous products for neat reactions of tetradecane, resulting in mass balances greater than 94%. The experimental protocol developed in the previous project period was used to conduct experiments at elevated pressures more representative of coal liquefaction conditions, and both neat and binary mixture reactions of tetradecane and NBBM were examined. Mechanistic modeling studies were also initiated in order to support and quantify the mechanistic ideas put forth to explain the experimental observations.
NTIS
Coal; Hydrogen; Catalysts; Polyethylenes; Waste Disposal

20020006165 Sandia National Labs., Albuquerque, NM USA
Optical Spectroscopic Monitoring of Parachute Yarn Aging
Tallant, D. R.; Garcia, M. J.; Simpson, R. L.; Behr, V. L.; Whinery, L. D.; Apr. 01, 1999; 24p; In English
Report No.(s): DE2001-6727; SAND98-2606; No Copyright; Avail: Department of Energy Information Bridge

Optical spectroscopic techniques were evaluated as nondestructive monitors of the aging of parachutes in nuclear weapons. We analyzed thermally aged samples of nylon and Kevlar webbing by photoluminescence spectroscopy and reflection spectroscopy. Infrared analysis was also performed to help understand the degradation mechanisms of the polymer materials in the webbing. The photoluminescence and reflection spectra were analyzed by chemometric data treatment techniques to see if aged-induced changes in the spectra correlated to changes in measured tensile strength. A correlation was found between the shapes of the photoluminescent bands and the measured tensile strengths. Photoluminescent spectra can be used to predict the tensile strengths of nylon and Kevlar webbing with sufficient accuracy to categorize the webbing sample as above rated tensile strength, marginal or below rated tensile strength. The instrumentation required to perform the optical spectroscopic measurement

can be made rugged, compact and portable. Thus, optical spectroscopic techniques offer a means for nondestructive field monitoring of parachutes in the enduring stockpile.
NTIS
Nondestructive Tests; Webbing; Aging (Materials); Nylon (Trademark); Kevlar (Trademark)

20020006175 NASA Ames Research Center, Moffett Field, CA USA
Infrared Spectroscopy of Polycyclic Aromatic Hydrocarbon Cations, 3, The Members
Hudgins, D. M., NASA Ames Research Center, USA; Allamandola, L. J., NASA Ames Research Center, USA; [1994]; 1p; In English
Contract(s)/Grant(s): RTOP 188-44-57-01; No Copyright; Avail: Issuing Activity; Abstract Only

In spite of the fact that the infrared spectroscopic properties of only a few isolated ionized polycyclic aromatic hydrocarbons (PAHs) are known, gaseous, ionized PAHs are thought to be responsible for a very common family of infrared interstellar emission bands. In order to provide a data base to test this hypothesis and, if borne out, to use this emission band family as a probe of many different interstellar environments, we are carrying out a thorough study of the infrared spectroscopic properties of neutral and ionized PAHs in argon matrices. Here we present the near and mid-infrared spectra of the cations of the five most thermodynamically favored PAHs up to coronene: phenanthrene, pyrene, benzo[e]pyrene, benzo[ghilperylene, and coronene. The properties of naphthalene, the first member of the series, are given elsewhere. The spectra of perdeuterated phenanthrene and pyrene are also reported. For those molecules which have been previously studied (pyrene, d(10)-pyrene, and coronene), band positions and relative intensities are in agreement. In all cases we report additional features. Absolute integrated absorbance values are given for the phenanthrene, perdeutero-phenanthrene, pyrene, benzo[ghi]perylene, and coronene cations. With the exception of coronene,the cation bands corresponding to the CC modes are typically 2-5 times more intense than those of the CH out-of-plane bending vibrations. For the cations the CC stretching and CH in-plane bending modes give rise to bands which are an order of magnitude stronger than for the neutral species, and the CH out-of-plane bends produce bands which are 5-20 times weaker than in the neutral species. This behavior is similar to that found in most other PAH cations studied to date. The astronomical implications of these PAH cation spectra are also discussed.
Author
Cations; Infrared Spectroscopy; Polycyclic Aromatic Hydrocarbons; Astronomy; Ionized Gases

20020006222 Spire Corp., Bedford, MA USA
Nanograin, Quasicrystalline, Multiphase Coatings for Reduced Friction an Wear ***Final Report, 16 Sep. 1999 - 14 Sep 2000***
Namavar, Fereydoon; Sep. 2000; 31p; In English
Contract(s)/Grant(s): F49620-99-C-0067
Report No.(s): AD-A395399; AFRL-SR-BL-TR-01-0514; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent progress in the development of quasicrystals (QCs) as low-friction, hard materials makes these alloys ideal candidates for protective coatings. However one disadvantage of quasicrystals is that they are quite brittle. to overcome this problem, we are taking advantage of nonstructural materials and produce coatings which consist of a nanograin quasicrystals and metal. Ultra smooth, nanograin Al-Cu-Fe-Cr and Al-Cu-Fe coatings with a nanohardness of 13 and 14 GPa respectively, were produced by Ion-beam assisted deposition (IBAD) and Pulsed laser Deposition (PLD) using targets prepared by the Materials Preparation Center at Ames Laboratory. Subsequent analysis by Ames Laboratory suggests that the coatings of Al-Cu-Fe-Cr produced are quasicrystalline in nature although an orthorhombic approximant cannot be ruled out by the data presented here. Ultra smooth, nanograin Al-Cu-Fe thin films produced where substantially depleted in Al and enriched in Fe relative to the composition region in which quasicrystals can be produced in this system. However, nanohardness and x-ray data suggest that our AlCuFe coatings may be consist of quasicrystals of AlCuFe and iron alloys. Clearly additional work in Phase 2 is necessary to determine the appropriate conditions for producing quasicrystalline thin films of Al-Cu-Fe using the production method used.
DTIC
Crystal Structure; Protective Coatings; Brittleness

20020006229 Analytic Sciences Corp., San Antonio, TX USA
Physical and Optical Evaluation of Reflection Dielectric Laser Eye Protection (LEP) Spectacles ***Interim Report, Aug. 1996-May 1997***
Maier, Dennis A.; Brockmeier, William R.; Hasten, Jerry D.; Edsall, Peter R.; Sep. 2001; 51p; In English
Contract(s)/Grant(s): F41624-97-D-9000; Proj-3257
Report No.(s): AD-A395372; 96-5000-74-2; AFRL-HE-BR-TR-2001-0147; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The physical properties, optical quality, spectral transmittance and laser protection measurements of reflective dielectric laser eye protection (LEP) spectacles supplied by Pilkington Optronics are reported. Research was performed under the Wideband Attenuating Reflective Dielectric Out-of-band Visor Evaluation (WARDOVE) Program whose objective was to define, develop and evaluate reflective dielectric coated out-of-band ALEP visors in the same manner that dye-based absorptive ALEP visors were previously evaluated. Vision performance and human factors evaluations of both reflective dielectric and dye-based LEP spectacles and visors were conducted in the laboratory, in weapon system trainers (WST), and in flight operations. The data presented here document the measured physical performance of the WARDOVE spectacle samples with WD1 and WD2 dielectric coatings prior to any environmental exposure. Discussion of the samples that were evaluated, an overall summary of the physical performance measured, a description of the test methods and instruments, and the detailed data collected are given.
DTIC
Coatings; Dielectric Properties; Visors; Evaluation; Eye Protection

20020006803 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Accelerated Corrosion Analysis of E-Coated Steel Box Panels to Determine Reapplication Intervals for Carwell Inhibitor
Placzankis, Brian E.; Miller, Chris E.; Buckley, Paul F.; Beatty, John H.; Sep. 2001; 18p; In English; Original contains color images
Report No.(s): AD-A395457; ARL-RP-34; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Box Panel specimens of e-coated steel painted with Chemical Agent Resistant Coating (CARC) and treated with CARWELL commercial corrosion inhibitor were exposed to GM 9540P cyclic corrosion and to the vehicle accelerated corrosion test track at the Aberdeen Test Center at Aberdeen Proving Ground, MD. The box panels were chosen to simulate closed interior spaces found on typical military vehicles such as door panels on trucks. Panels with and without the CARWELL pretreatment were exposed for 100 cycles of GM 9540P. CARWELL treated panels were placed on the truck and monitored for crevice corrosion in the lap joint to determine the reapplication interval of the CARWELL treatment. No evaluation of the effectiveness and suitability of using CARWELL on exterior, unenclosed surfaces was performed.
DTIC
Accelerated Life Tests; Chemical Attack; Coating; Corrosion Prevention; Protective Coatings

20020006823 Sandia National Labs., Albuquerque, NM USA
Polyurethane Foam Impact Experiments and Simulations
Chhabildas, L. C.; Kipp, M. E.; Reinhart, W. D.; Wong, M. K.; Jun. 17, 1999; 6p; In English
Report No.(s): DE2001-7874; SAND98-2871C; No Copyright; Avail: Department of Energy Information Bridge

Uniaxial strain impact experiments have been performed to obtain shock compression and release response of a 0.22 g/cu cm polyurethane foam in a configuration where the foam impacts a thin target witness plate. Wave profiles from a suite of ten experiments have been obtained, where shock amplitudes range from 40 to 500 MPa. A traditional p-(alpha) porous material model generally captures the material response. A fully three-dimensional explicit representation of the heterogeneous foam structure modeled with numerical simulations recovers some of the high frequency aspects of the particle velocity records.
NTIS
Axial Strain; Polyurethane Foam; Simulation; Impact Tests; Mechanical Properties

20020006825 Oak Ridge National Lab., TN USA
Correlation of Nanoindentation and Conventional Mechanical Property Measurements
Rice, P. M.; Feb. 14, 2001; 6p; In English
Report No.(s): DE2001-775420; P01-109943; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A series of model ferritic alloys and two commercial steels were used to develop a correlation between tensile yield strength and nano-indentation hardness measurements. The NanoIndenter-II(reg-sign) was used with loads as low as 0.05 g(sub f) (0.490 mN) and the results were compared with conventional Vickers microhardness measurements using 200 and 500 g(sub f) (1.96 and 4.90 N) loads. Two methods were used to obtain the nanohardness data: (1) constant displacement depth and (2) constant load. When the nanohardness data were corrected to account for the difference between projected and actual indenter contact area, good correlation between the Vickers and nanohardness measurements was obtained for hardness values between 0.7 and 3 GPa. The correlation based on constant nanoindentation load was slightly better than that based on constant nanoindentation displacement. Tensile property measurements were made on these same alloys, and the expected linear relationship between Vickers hardness and yield strength was found, leading to a correlation between measured changes in nanohardness and yield strength changes.
NTIS
Mechanical Properties; Nanoindentation; Displacement; Vickers Hardness; Tensile Properties

20020006852 Kansas City Plant, Kansas City, MO USA

Britz-Heidbrink Inc. Mini-CRADA, Powder Coating of Animal Enclosures

Smith, M. D.; Jan. 04, 2000; 9p; In English

Report No.(s): DE2001-750158; KCP-613-6196; CRADA 96-KCP-1040; No Copyright; Avail: Department of Energy Information Bridge

The goal of this CRADA was to combine the powder coating material and application techniques and laboratory testing capabilities of FM and T with the manufacturing, real-world testing, and practical knowledge available to BHI in a limited study to determine if coated stainless steel would provide the durability needed to justify additional work in this area. The coating materials chosen had to have low reflectivity and be easily sanitized, non-toxic, pleasant in appearance, and durable for the lifetime of the stainless steel product. The materials also had to be capable of withstanding the daily abuse of animal contact, impact with walls or other hard surfaces, and exposure to a variety of lighting and climatic conditions. FM and T and BHI worked together to investigate coating materials that under normal conditions would be exposed, at least weekly, to 180 F to 260 F washing and sanitization procedures that include strong detergents and phosphoric acid. After a proper cleaning method for the bare panels was established, six different powder coatings were selected and tested. The coatings were selected for their known resistance to harsh chemicals. Sample panels of each coating passed 1000 hours of continuous salt fog exposure and 24-hour constant submersion in heated disinfectant solutions. Actual cage panels were then coated and installed in a high-pressure spray washer at a medical research facility for accelerated real-world testing. In the high-pressure spray washer, the panels received the equivalent of one year's exposure to harsh chemicals in one week. In addition to the exposure to the harsh sanitizing chemicals, the test panels never had a chance to get completely dry. In actual use, the panels would have been cleaned once a week and would have been essentially dry the rest of the time. Constant soak in wet conditions is one of the most difficult tests of paint durability. The accelerated aging indicated that five of the six coatings tested are able to withstand the wear and tear of everyday use for extended periods of time, equivalent to 7-10 years.

NTIS

Coatings; Coating; Powder (Particles); Stainless Steels; Animals; Enclosures

20020008177 Department of Energy, National Energy Technology Lab., Pittsburgh, PA USA

Metal-Matrix Composites and Thermal Spray Coatings for Earth Moving Machines

Kiser, M. T.; Jul. 01, 2001; 3p; In English

Report No.(s): DE2001-786857; FC26-01NT41054-01; No Copyright; Avail: Department of Energy Information Bridge

First quarter activities were limited to initial project discussions, laboratory preparation, and some initial coupon preparation. Technical discussions were held with the subcontractors to clearly define their role in the project. Detailed preparation of the pressure casting lab were started. Initial test coupons were sprayed and provided to Oak Ridge National Lab for infrared lamp fusion trials.

NTIS

Sprayers; Metal Matrix Composites; Infrared Radiation

20020008183 Oak Ridge National Lab., TN USA

Cooperative Research and Development Agreement Final Report for Cooperative Research and Development Agreement Number ORNL93-0237 Adhesive Bonding Technologies for Automotive Structural Composites

Boeman, R. G.; May 02, 2001; 94p; In English

Report No.(s): DE2001-786767; ORNL/TM-2001/2; No Copyright; Avail: Department of Energy Information Bridge

In 1993, the Oak Ridge National Laboratory (ORNL) entered into a Cooperative Research and Development Agreement (CRADA) with the Automotive Composites Consortium (ACC) to conduct research and development that would overcome technological hurdles to the adhesive bonding of current and future automotive materials. This effort is part of a larger Department of Energy (DOE) program to promote the use of lighter weight materials in automotive structures for the purpose of increasing fuel efficiency and reducing environmental pollutant emissions. In accomplishing this mission, the bonding of similar and dissimilar materials was identified as being of primary importance to the automotive industry since this enabling technology would give designers the freedom to choose from an expanded menu of low mass materials for component weight reduction.

NTIS

Automobiles; Adhesive Bonding; Exhaust Emission

20020008188 Department of Energy, Aiken, SC USA

Position Paper on Sludge Batch 2 Qualification Strategy and Simulant Composition

Elder, H. H.; Sep. 21, 2001; 26p; In English

Report No.(s): DE2001-786669; HLW-SDT-2000-00128-REV-0; No Copyright; Avail: Department of Energy Information Bridge

This report targets the sludge compositions used for glass testing (the 'Variability Study'), cold process simulation and makes recommendations as to sampling and qualification strategy.

NTIS

Glass; Simulation; Targets; Sludge

20020008190 Department of Energy, Aiken, SC USA

Use of Cation Excange Resins for Production of U3O8 Suitable for the Al-U3O8 Powder Metallurgy Process

Mosley, W. C.; Sep. 17, 2001; 33p; In English

Report No.(s): DE2001-786666; DPST-82-388; No Copyright; Avail: Department of Energy Information Bridge

This report describes the production of U3O8 powders from three types of cation exchange resins: Dowex 50W, a strong acid, sulfonate resin; AG MP-50, a macroporous form of sulfonate resin; and Bio-Rex 70, a weak acid, carboxylic resin.

NTIS

Resins; Powder (Particles); Powder Metallurgy; Ion Exchanging

20020008639 Pacific Northwest National Lab., Richland, WA USA

Chemical and Radiochemical Analysis of Consolidated Sludge Samples from the K East Basin

Elmore, M. R.; Schmidt, A. J.; Silvers, K. L.; Thornton, B. M.; Dec. 22, 2000; 12p; In English

Report No.(s): DE2001-772360; PNNL-13360; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report describes results from analyses performed to characterize the consolidated sludge samples collected from the Hanford K East Basin in March and April 1999. The consolidated sludge samples were collected to provide additional material needed for the evaluation and design of systems that will be used to manage the K Basin sludge (i.e., disposition the sludge to T Plant for interim storage). The analytical results given in this report add to the knowledge on the composition of the K Basin sludge and provide specific information on this sludge necessary to plan and understand subsequent process testing. The following analyses were performed: weight percent (wt%) solids determination; uranium analysis by kinetic phosphorescence; plutonium isotope analysis by extraction chromatographic separation followed by alpha energy analysis (AEA); gross beta analysis; gamma energy analysis (GEA); and metals analysis by inductively coupled plasma atomic emission spectroscopy (ICP-AES).

NTIS

Chemical Analysis; Radiochemistry; Emission Spectra; Plasma Radiation; Chromatography

20020008641 Sandia National Labs., Albuquerque, NM USA

Effect of Surface Contamination on Adhesive Forces as Measured by Contact Mechanics

Emerson,; Giunta,; Miller,; Sorensen,; Pearson,; Dec. 18, 2000; 8p; In English

Report No.(s): DE2001-772160; SAND2000-3198C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The contact adhesive forces between two surfaces, one being a soft hemisphere and the other being a hard plate, can readily be determined by applying an external compressive load to mate the two surfaces and subsequently applying a tensile load to peel the surfaces apart. The contact region is assumed the superposition of elastic Hertzian pressure and of the attractive surface forces that act only over the contact area. What are the effects of the degree of surface contamination on adhesive forces. Clean aluminum surfaces were coated with hexadecane as a controlled contaminant. The force required to pull an elastomeric hemisphere from a surface was determined by contact mechanics, via the JKR model, using a model siloxane network for the elastomeric contact sphere. Due to the dispersive nature of the elastomer surface, larger forces were required to pull the sphere from a contaminated surface than a clean aluminum oxide surface.

NTIS

Adhesives; Contamination; Surface Distortion; Compression Loads; Metal Surfaces

20020008746 Corps of Engineers, Engineer Research and Development Center, Champaign, IL USA

Chrome Plating Projects at Watervliet Arsenal, Fiscal Year 2000 ***Final Report***

Northrup, Jearldine I.; Baird, Joyce C.; Franklin, Dave; Darcy, Phil; Sep. 2001; 18p; In English

Report No.(s): AD-A396131; ERDC/CERL-SR-01-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes two projects conducted at Watervliet Arsenal (WVA), NY, during Fiscal Year 2000. The first project included an upgrade of the crane and hoist in the minor parts chrome plating facility. Another problem was the facility's existing chromic acid and electro-polish pumps, which were sealed pumps. The corrosive media, pressure, and high temperature in the process streams caused the pump seals to break frequently. The second project included upgrades to two chromic acid pumps, three electropolish pumps, and one emergency waste pump in the 120-mm chrome plating facility. The hoist and crane upgrade and the design of the tank temperature controls produced a number of benefits including: reduction of energy costs; accurate temperature monitoring of critical processes; safer use of crane hoists; increased production capacity; chrome plating scrubber air compliance monitoring; reduction in scrap and rework; and connection to site-wide EMIS. Benefits of pump upgrading to sealless magnetic drive units include reduction in: plating facility downtime; maintenance equipment/labor costs; hazardous chemical spills through leaking seals; operation/maintenance chemical exposures; wastewater sent to the treatment plant; energy costs; and an increase in plating efficiency.
DTIC
Chromium; Plating; Environmental Monitoring; Air Quality

20020008989 Army Engineer Research and Development Center, Vicksburg, MS USA
Molecular Weight Distribution of the Final Products of TNT-Hydroxide Reaction ***Final Report***
Felt, Deborah R.; Larson, Steven L.; Hansen, Lance D.; Aug. 2001; 23p; In English
Report No.(s): AD-A395988; ERDC/EL-TR-01-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Explosives contamination of groundwater, surface water and soil has occurred at military sites throughout the world. Base-catalyzed transformation of 2,4,6-Trinitrotoluene (TNT) could potentially be used as part of a rapid, low-cost, and minimally resource-intensive technology for detoxifying explosives in soil and water. In order to identify the chemical properties of the final products of the TNT- hydroxide reaction and indicate possible reaction mechanisms, radiolabeled (14C) TNT was challenged with hydroxide and the reaction was allowed to proceed to completion. 14C labeled final products were separated by solvent/solvent extraction and acid/base chemistry. 14C TNT-hydroxide reaction final products were analyzed by scintillation counting to identify the final products of the TNT-hydroxide reaction, their distribution in the final reaction mixture, and their molecular weight fractions. Most (98 percent) of the final products of the TNT-hydroxide reaction are polar compounds that vary in molecular weight from 3,000-6,000 Daltons (Da) to is less than 100 Da. Organic acids with pKa of>8 account for 8.4 percent of polar transformation products of the TNT-hydroxide reaction. The majority (66.5 percent) of the non-polar products were in the small (is less than 100) molecular weight range. The results from this study could give insight into the chemistry of the TNT-hydroxide reaction.
DTIC
Contamination; Toxicity; Molecular Weight; Hydroxides; Trinitrotoluene; Reaction Kinetics

20020008993 Pennsylvania State Univ., University Park, PA USA
Molecular Modeling of Natural Organic Matter Interactions With Cations, Mineral Surfaces and PAHs ***Final Report, 1 Oct. 1998-30 Sep. 2001***
Kubicki, James D.; Oct. 29, 2001; 6p; In English
Contract(s)/Grant(s): B0014-99-1-0094
Report No.(s): AD-A395964; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Understanding the mechanisms of organic-mineral and organic-colloid interactions will help determine under which conditions organic contaminants will be bioavailable or sequestered. This project combines spectroscopic (i.e., ATR-FTIR = Attenuated Total Reflectance-Fourier Transform Infrared) and microscopic (i.e., HRTEM = High Resolution Transmission Electron Microscopy) studies with molecular modeling, in order to help elucidate the mechanisms of organic-mineral interaction and binding. The overall goal of this research is to predict biological environmental effects from chemical knowledge of contaminated sites. Interactions of several key chemical parameters can either enhance or decrease the environmental impact of a given contaminant concentrations. Thus, this research leads to better risk assessment capability and savings in sediment management costs.
DTIC
Cations; Organic Materials; Chemical Composition; Minerals; Fourier Analysis; Contamination

20020009008 Army Armament Research, Development and Engineering Center, Benet Weapons Lab., Watervliet, NY USA
Properties of Thick Sputtered Tantalum Used for Protective Gun Tube Coatings ***Final Report***
Matson, Dean W.; McClanahan, Edwin D.; Lee, Sabrina L.; Windover, Donald; Oct. 2001; 22p; In English
Report No.(s): AD-A395895; ARCCB-TR-01019; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Thick tantalum coatings were deposited on the bore surfaces of 25-mm inner diameter cylindrical gun steel substrates using a high-rate triode-sputtering apparatus. Sputtering parameters affecting the tantalum phase and microstructure were investigated. Prior work has indicated that the sputtering gas species and substrate temperature during deposition affect the characteristics of the tantalum coatings. In the work presented here, we report on experimental studies aimed at evaluating additional phase and microstructural effects resulting from changes in sputtering gas species and substrate bias during the deposit. Tantalum deposits of 75 to 140 micrometers thickness were evaluated using x-ray diffraction, optical microscopy, and microindentation hardness measurements. Coatings deposited using krypton gas, a 200 C substrate temperature, and 3.5 mTorr gas pressure also showed little variation when deposited at substrate biases ranging from 50 to 150 V. However, the tantalum coatings produced under similar conditions with an unbiased (floating) substrate were found to be the beta phase of the material and had a columnar microstructure. Beta-phase tantalum was produced at low substrate biases (less than/- 50 V) when using xenon as the sputtering gas. Both phase and microstructure of the tantalum coating could be altered in mid-run by adjusting the sputtering parameters and appeared independent of the phase and microstructure of the underlying coating.
DTIC
Tantalum; Sputtering; Protective Coatings

20020009020 Argonne National Lab., IL USA
Structure of charged polymer chains in confined geometry
Gilbert, E. P.; Auvray, L.; Lal, J.; Dec. 15, 2000; 8p; In English
Report No.(s): DE2001-772135; ANL/IPNS/CP-103674; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The intra- and interchain structure of sodium poly(styrenesulphonate) when free and when confined in contrast matched porous Vycor has been investigated by SANS. When confined, a peak is observed whose intensity increases with molecular weight and the 1/q scattering region is extended compared to the bulk. We infer that the chains are sufficiently extended, under the influence of confinement, to highlight the large scale disordered structure of Vycor. The asymptotic behavior of the observed interchain structure factor is = 1/q(sup 2) and = 1/q for free and confined chains respectively.
NTIS
Polymers; Molecular Chains; Order-Disorder Transformations; Porosity

20020009027 Houston Univ., TX USA
Laboratory Study on the Oxidation of Arsenic 3 to Arsenic 5
Ghurye, G.; Clifford, D.; Mar. 2001; 102p; In English
Report No.(s): PB2001-108523; No Copyright; Avail: National Technical Information Service (NTIS)

A one-year laboratory study was performed to determine the ability of seven oxidants to oxidize As(III) to As(V). These included chlorine, permanganate, ozone, chlorine dioxide, monochloramine, a solid-phase oxidizing media, and 254 nm ultraviolet light. Chlorine and permanganate rapidly oxidized As(III) to As(V) in the pH range of 6.3 to 8.3. Dissolved manganese, dissolved iron, sulfide and TOC slowed the rate of oxidation slightly, but essentially complete oxidation was obtained in less than one minute with chlorine and permanganate under all conditions studied.
NTIS
Arsenic; Oxidation; Water Quality

20020009057 Southwest Research Inst., San Antonio, TX USA
Low Volatile Organic Compound (VOC) Chemical Agent Resistant Coating (CARC) Removal and Disposal ***Final Report, 1 Oct. 1998-30 Nov. 2000***
Cundiff, Charles H.; Leverette, Robert M.; Varner, Jason R.; Feb. 2001; 78p; In English
Contract(s)/Grant(s): F09603-95-D-0176-RZ02
Report No.(s): AD-A396107; SWRI-01-1357-106; AFRL-ML-WP-TR-2001-4128; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The overall objective of this project was to develop a Low Volatile Organic Compound (VOC) Chemical Agent Resistant Coating (CARC) system for use on Army, Marine Corps, and Air Force systems suitable for use on military equipment by services in which the materials and processes for the reformulation, application, stripping and disposal are optimized and in compliance with current requirements.
DTIC
Volatile Organic Compounds; Protective Coatings

20020009613 Department of Energy, Savannah River Site, Aiken, SC USA

Analysis of Americium in Transplutonium Process Solutions

Ferguson, R. B.; Mar. 09, 2001; 3p; In English

Report No.(s): DE2001-780118; DPSPU-71-30-17; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

One of the more difficult analyses in the transplutonium field is the determination of americium at trace levels in a complex matrix such as a process dissolver solution. Because of these conditions a highly selective separation must precede the measurement of americium. The separation technique should be mechanically simple to permit remote operation with master-slave manipulators. For subsequent americium measurement by the mass spectroscopic isotopic-dilution technique, plutonium and curium interferences must also have been removed.

NTIS

Americium; Plutonium; Spectroscopic Analysis; Curium; Solutions

20020009654 Hawaii Univ., Office of Research Services, Honolulu, HI USA

Construction, Delivery, and Testing of a Flow-Cell to Measure Adhesion Strengths of Hard-Fouling Organisms on Foul-Release Coatings in Hawaii ***Final Report, 1 Jun. 2000-30 Jun 2001***

Hadfield, Michael G.; Smith, Celia M.; Nov. 11, 2001; 3p; In English

Contract(s)/Grant(s): N00014-00-1-0755

Report No.(s): AD-A396188; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A precision flow cell for measuring shear stresses exerted on hard fouling organisms attached to experimental coatings was constructed at Harbor Branch Oceanographic Institution, delivered to the Kewalo Marine Laboratory (KML) of the University of Hawaii, assembled, and calibrated. The flow cell was equipped at the KML with a binocular microscope to which a video camera is attached, allowing simultaneous viewing and videotaping of attached hard-fouling organisms (principally the polychaete tube worm Hydroides elegans and the barnacle Balanus amphitrite) as they are subjected to increasing flow velocities, and thus shear stresses, in natural seawater. Tests of glass surfaces demonstrated that the hard foulers could not be removed by shear forces comparable to those on the hull of a large naval ship under near maximal speed. Small hard-fouling invertebrates were similarly not removed from a series of silicone-based experimental coatings provided by General Electric's paints dept. We await delivery of other coatings by ONR, DARPA or private developers to further exploit this excellent, precision instrument. Because of the lack of materials for testing, no presentations (other than to ONR) or publications have resulted from this instrument yet.

DTIC

Adhesion; Shear Stress; Protective Coatings; Antifouling

20020009687 Department of Energy, Aiken, SC USA

High Bias of DCAP and Aa Analyses of Hg(I)

Holcomb, H. P.; May 17, 2001; 5p; In English

Report No.(s): DE2001-781331; DPSPU-85-272-34; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This brief, but definitive, study indicates that the relatively new spectrometric techniques, DCAP and AA (Atomic Absorption), give high values for mercury when employed to analyze solutions that contain Hg(I) per se or that contain soluble mercury which is or has been subject to reducing conditions.

NTIS

Bias; Mercury (Metal); Spectrometers

20020010208 National Renewable Energy Lab., Golden, CO USA

Increasing Productivity and Reducing Emissions through Enhanced Control of Die Casting Lubricants: NICE3 Metalcasting Fact Sheet

Wogsland, J.; Jan. 25, 2001; 2p; In English

Report No.(s): DE2001-781659; DOE/GO-102001-0946; NREL/FS-810-27622; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Fact sheet written for the NICE3 Program on a new process that improves the efficiency and productivity of die casting operations.

NTIS

Lubricants; Dies

20020010602 Sandia National Labs., Albuquerque, NM USA

SH-SAW Sensor Platform for Chemical Detection in Aqueous Solutions

Casalnuovo, S.; Cernosek, R.; Josse, F.; Ricco, A.; Zhou, R.; Jul. 20, 1999; 8p; In English

Report No.(s): DE2001-9630; SAND99-1899C; No Copyright; Avail: Department of Energy Information Bridge

Chemically sensitive polymers coated on delay lines utilizing shear horizontal surface acoustic wave (SH-SAW) sensors are investigated for the detection of organic analytes in liquid environments. The SH-SAW sensor platform was designed and fabricated on 36(degree) rotated Y-cut LiTaO3. by depositing a SiO2 dielectric layer over the entire device prior to applying the polymer film, partial electrical passivation of the interdigital transducers (IDT) is obtained while increasing the mass sensitivity of the device. Changes in the mechanical properties of the chemically sensitive polymer materials were clearly detectable through a frequency shift at least one order of magnitude larger than that of a coated-quartz crystal resonator (QCR) in a similar experiment. NTIS

Dielectrics; Interdigital Transducers

20020010603 Sandia National Labs., Albuquerque, NM USA

Integrated Surface Acoustic Wave-Based Chemical Microsensor Array for Gas-Phase Chemical Analysis Microsystems

Casalnuovo, S. A.; Frye-Mason, G. C.; Heller, E. J.; Hietala, V. M.; Kottenstette, R. J.; Jul. 20, 1999; 7p; In English

Report No.(s): DE2001-9629; SAND99-1898C; No Copyright; Avail: Department of Energy Information Bridge

This paper describes preliminary results in the development of an acoustic wave (SAW) microsensor array. The array is based on a novel configuration that allows for three sensors and a phase reference. Two configurations of the integrated array are discussed: a hybrid multichip-module based on a quartz SAW sensor with GaAs microelectronics and a fully monolithic GaAs-based SAW. Preliminary data are also presented for the use of the integrated SAW array in a gas-phase chemical micro system that incorporates microfabricated sample collectors and concentrators along with gas chromatography (GC) columns. NTIS

Gas Chromatography; Microelectronics; Gas Analysis

20020010607 Sandia National Labs., Albuquerque, NM USA

Dialkylenecarbonate-Bridged Polysilsesquioxanes: Hybrid Organic-Inorganic Sol-Gels with a Thermally Labile Bridging Group

Assink, R. A.; Baugher, B. M.; Beach, J. V.; Loy, D. A.; Shea, K. J.; Jul. 20, 1999; 8p; In English

Report No.(s): DE2001-9617; SAND99-1895C; No Copyright; Avail: Department of Energy Information Bridge

In this paper, we introduce a new approach for altering the properties of bridged polysilsesquioxane xerogels using post-processing mobilization of the polymeric network. The bridging organic group contains latent functionalities that can be liberated thermally, photochemically, or by chemical means after the gel has been processed to a xerogel. These modifications can produce changes in density, volubility, porosity, and or chemical properties of the material. Since every monomer possesses two latent functional groups, the technique allows for the introduction of high levels of functionality in hybrid organic-inorganic materials. Dialkylenecarbonate-bridged polysilsesquioxane gels were prepared by the sol-gel polymerization of bis(triethoxysilylpropyl)carbonate and bis(triethoxysilyli sobutyl)-carbonate. Thermal treatment of the resulting non-porous xerogels and aerogels at 300-350 C resulted in quantitative decarboxylation of the dialkylenecarbonate bridging groups to give new hydroxyalkyl and olefinic substituted polysilsesquioxane monolithic xerogels and aerogels that can not be directly prepared through direct sol-gel polymerization of organotrialkoxysilanes.
NTIS

Organic Materials; Silicon; Gels

20020010951 Sandia National Labs., Albuquerque, NM USA

Direct Measurement of Extension and Force in Conductive Polymer Gel Actuators

Goods, S. H.; Whinnery, L. L.; Irvin, D. J.; Korellis, J. S.; Feb. 01, 2001; 18p; In English

Report No.(s): DE2001-781977; SAND2001-8166; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The synthesis of a polythiophene-based conductive polymer gel is described. Preliminary measurements of the electrochemically driven extension and force response of this gel are reported when driven under the action of an applied square-wave potential. Over each square wave interval (i.e., one oxidation pulse followed by one reduction pulse), the axial change in dimension was found to be approximately 2%. Some hysteresis was noted in that the cylindrical specimens did not return to

their original axial dimension. The axial pressure generated by the expansion of the gel against a fixed surface was also measured and found to be on the order of 15 kPa.
NTIS
Actuators; Gels; Oxidation; Polymer Chemistry

20020011016 NASA Ames Research Center, Moffett Field, CA USA
The C-H Dissociation Energy of C2H6
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; [1994]; 1p; In English
Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only
The C-H bond energy in C2H6 is computed to be 99.76 +/- 0.35 kcal/mol, which is in excellent agreement with the most recent experimental values. The calculation of the C-H bond energy by direct dissociation and by an isodesmic reaction is discussed. Author
Heat of Dissociation; Ethane

20020011374 Research Triangle Inst., Research Triangle Park, NC USA
Coatings Guide(TradeName): An Online Information Resource
Kosusko, M.; Archibald, C. H.; 2001; 18p; In English; AWMA Annual Meeting, 24-28 Jun. 2001, Orlando, FL, USA
Report No.(s): PB2002-100295; No Copyright; Avail: National Technical Information Service (NTIS)
The Coatings Guide (trademark) is a free online information training resource that focuses on alternative, low-emission coatings for metal and plastic substrates. Developed cooperatively by the USA Environmental Protection Agency's (EPA's) Office of Research and Development and Research Triangle Institute (RTI), its purposes are to provide unbiased information about coating technologies, focus attention on low-emission coatings, and help business deal with the cost considerations of switching to a new coating system. Many technical assistance providers have used the Coatings Guide (trademark) as a training tool. It is designed to be a one-stop shop for environmentally friendly coatings information on the Internet and provides several helpful tools for small businesses.
NTIS
Environment Protection; Coating; Education; Commerce

20020011866 Environmental Protection Agency, Air Pollution Prevention and Control Div., Research Triangle Park, NC USA
Environmental Technology Verification to Reduce the Risk of Using Innovative Coating Technologies
Kosusko, M.; 2001; 24p; In English; AWMA Annual Meeting, Orlando, FL, June 24-28, 2001, 24-28 Jun. 2001, Orlando, FL, USA
Report No.(s): PB2002-100296; EPA/600/A-01/062; No Copyright; Avail: National Technical Information Service (NTIS)
The paper discusses the use of environmental technology verification (ETV) to reduce the risk of using innovative coating technologies. It presents key concepts of the ETV program, reviews the scope of the ETV program's coatings and coating equipment pilot (CCEP) and its use of the verification process, discusses benefits of verification, and reviews completed verification tests and those planned in the near future.
NTIS
Coatings; Risk

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20020006098 Los Alamos National Lab., NM USA
Plasma sprayed functionally graded and layered MoSi2-Al2O3 composites for high temperature sensor sheath application
Vaidya, R.; Jan. 01, 2001; 11p; In English
Report No.(s): DE2001-773607; LA-UR-01-194; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Protective sensor sheaths are required in the glass industry for sensors that are used to measure various properties of the melt. Molten glass presents an extremely corrosive elevated temperature environment, in which only a few types of materials can survive. Molybdenum disilicide (MoSi(sub 2)) has been shown to possess excellent corrosion resistance in molten glass, and is thus a candidate material for advanced sensor sheath applications. Plasma spray-forming techniques were developed to fabricate

molybdenum dilicide-alumina (Al(sub 2)O(sub 3)) laminate and functionally graded composite tubes with mechanical properties suitable for sensor sheath applications. These functionally graded materials (FGMs) were achieved by manipulating the powder hoppers and plasma torch translation via in-house created computer software. Molybdenum disilicide and alumina are thermodynamically stable elevated temperature materials with closely matching thermal expansion coefficients. Proper tailoring of the microstructure of these MoSi(sub 2)-Al(sub 2)O(sub 3) composites can result in improved strength, toughness, and thermal shock resistance. This study focuses on the mechanical performance of these composite microstructures.
NTIS
Aluminum Oxides; Plasma Spraying; Mechanical Properties; Disilicides; Molybdenum Compounds; Composite Structures; Fabrication

20020006154 Oak Ridge National Lab., TN USA
In-Process Detection of Weld Defects Using Laser-Based Ultrasonic Lamb Waves
Carter, R. H.; Jan. 04, 2001; 35p; In English
Report No.(s): DE2001-772901; ORNL/SUB/87-SA946/08; No Copyright; Avail: Department of Energy Information Bridge
The research program of the Materials Response Group at Virginia Tech addresses the need for reliable and durable ceramic composites to perform in high temperature applications. Areas of current research are characterization of oxide/oxide hot gas filter tubes and dense Nextel/SiC tubes. The focus of this report will be on the characterization of the Nextel/SiC tubes.
NTIS
Welding; Defects; Detection; Mechanical Properties; Nondestructive Tests; Ceramic Matrix Composites

20020006186 NASA Langley Research Center, Hampton, VA USA
Pistons and Cylinders Made of Carbon-Carbon Composite Materials
Rivers, H. Kevin, Inventor, NASA Langley Research Center, USA; Ransone, Philip O., Inventor, NASA Langley Research Center, USA; Northam, G. Burton, Inventor, NASA Langley Research Center, USA; Schwind, Francis A., Inventor, NASA Langley Research Center, USA; Nov. 21, 2000; 10p; In English; Division of US-Patent-Appl-SN-808290, filed 28 Feb. 1997
Patent Info.: Filed 11 Jan. 2000; NASA-Case-LAR-15493-1; US-Patent-6,148,785; US-Patent-Appl-SN-480421; US-Patent-Appl-SN-808290; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An improved reciprocating internal combustion engine has a plurality of engine pistons, which are fabricated from carbon---carbon composite materials, in operative association with an engine cylinder block, or an engine cylinder tube, or an engine cylinder jug, all of which are also fabricated from carbon-carbon composite materials.
Author
Carbon-Carbon Composites; Fabrication; Piston Engines; Cylindrical Bodies

20020006818 Johns Hopkins Univ., Dept. of Materials Science and Engineering, Baltimore, MD USA
Materials Research Center for Excellence ***Final Report, 10 Jul. 1995-9 Aug. 1997***
Wagner, James; Jan. 15, 1998; 40p; In English
Contract(s)/Grant(s): DAAH04-95-2-0006
Report No.(s): AD-A395616; ARO-3417.1-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report details results from a program supported through the ARO to establish technical collaborative links between investigators at the Johns Hopkins University and their technical counterparts at the Army Research Laboratories/Materials Directorate. With technical program guidance primarily from Dr. James McCauley, eight research tasks were pursued. For each task an investigator at the ARL Materials Directorate provided guidance and, in many cases, close collaboration toward achieving the research task goals. Each of these programs has built collaborative interaction between JHU and ARL and, we hope, has formed the basis for a long term collaborative interaction. In addition to the eight research tasks supported, the program has made accommodation for seven ARL researchers to be housed at the Johns Hopkins Homewood campus. Both office space and designated laboratory space are occupied and used by these researchers. Among these visiting scientists are principal collaborators for three of the research tasks. Three ARL/MD scientists also have matriculated as PhD candidates in the Johns Hopkins Department of Materials Science and Engineering. Thus, a total of ten ARL scientists have been housed on-site at Johns Hopkins. Tasks discussed include corrosion protection, compliant smart materials, metal matrix composites, Tungsten penetrators, nondestructive evaluation, chemical barriers elastomers, silicon surface modification, and the processing of ductile iron.
DTIC
Mechanical Properties; Materials Science; Metal Matrix Composites; Smart Materials

20020006819 Massachusetts Inst. of Tech., Space Systems Lab., Cambridge, MA USA

Theoretical and Experimental Studies of Vibro-Acoustic Systems ***Final Report, 1 Apr. 1996-31 Dec. 2000***

Wong, Jonathan K.; Miller, David W.; Aug. 17, 2001; 185p; In English

Contract(s)/Grant(s): F49620-96-1-0290

Report No.(s): AD-A395609; 11-01; AFRL-SR-BL-TR-01-0500; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Structural-acoustic vibration is one of the major sources of payload failure during launch. Past research on the topic of structural-acoustic vibration control has focused on actuating a single structural layer to minimize the amount of energy flowing across the boundary. This thesis investigates the use of a dual layer approach to address the structural-acoustic problem and compares the results to a single layer approach. Four different controller configurations were used to experimentally determine which configuration is best suited for multi-layer transmission control. The four controller configurations were the Multi-Input Multi-Output (MIMO) Controller, the Successive Loop Closure (SLC) Controller, the Interference Controller and the Power Diode Controller. The MIMO Controller used a single state-space controller to actively control the two active plates, while the other three configurations used a single controller to actively control each plate. The SLC Controller and the Interference Controller are different because the design order of the two plate controllers for the Interference Controller is reversed compared to the SLC Controller. The Power Diode Controller implements a power diode on one of the two structural plates. The power diode is designed to attenuate acoustic transmission across the plate in one direction only as compared to typical controllers that attenuate acoustic transmission across the plate in both directions. Although the four controller configurations were different, they shared a common goal-to minimize the system's response over the 40-1000 Hz broadband frequency region. The SLC Controller performed the best by posting a 2.08 dB reduction across the broadband region, compared to a 1.06 dB reduction posted by the worst performing controller. These reductions only refer to the differences in open and closed loop performances of the dual layer configuration.

DTIC

Acoustics; Controllers; Vibrational Stress; Sound Transmission; Acoustic Propagation; Control Theory

20020006895 Nondestructive Testing Information Analysis Center, Austin, TX USA

Nondestructive Evaluation (NDE) of Advanced Fiber Reinforced Polymer Composites

Yolken, H. T.; Matzkanin, George A.; Bartel, Jill E.; Jul. 2001; 72p; In English

Contract(s)/Grant(s): SPO700-97-D-4003

Report No.(s): AD-A395598; NTIAC-TA-01-01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Fiber reinforced polymer composite materials continue to be used in a large number of applications ranging from aerospace to automotive, industrial and consumer products. The high stiffness-to-weight ratio, low electromagnetic reflectance, and the ability to embed sensors and actuators have made fiber reinforced composites an attractive alternative construction material for primary aircraft structures. In many other cases, fiber reinforced polymer composite materials are being developed and used to replace metal components, in particular in corrosive environments.

DTIC

Fiber Composites; Nondestructive Tests; Polymer Matrix Composites; Aircraft Construction Materials

20020008018 Norwegian Defence Research Establishment, Kjeller, Norway

Depleted Uranium Ammunition and its Effects ***Ammunsijon Med Utarmet Uran: Bakgrunn of Virkninger***

Hoibraten, Steinar, Norwegian Defence Research Establishment, Norway; Dullum, Ove, Norwegian Defence Research Establishment, Norway; Aas, Pal, Norwegian Defence Research Establishment, Norway; Oct. 02, 2001; 56p; In Norwegian; Original contains color illustrations

Contract(s)/Grant(s): FFIBM Proj. 699/136

Report No.(s): FFI/RAPPORT-2001/04471; ISBN 82-464-0552-5; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The report initially discusses the physical properties of depleted uranium and the uses of this material. Weapons applications are presented in detail. This is followed by an extensive discussion of possible health effects due to exposure to depleted uranium. In conclusion, no effects due to either depleted or natural uranium have been observed in the human body. Precausionary measures are recommended at sites where depleted uranium ammunition has been used. No adverse health effects due to depleted uranium are expected among the population at large or the soldiers in general in the Kosovo province in Yugoslavia, but some individuals may have been exposed to larger amounts of depleted uranium than the recommended limits.

Author

Exposure; Health; Human Body; Uranium

20020008127 Oak Ridge National Lab., TN USA

Nanophase Composites Produced by Ion Implantation: Properties, Problems, and Potential

Meldrum, A.; Jan. 10, 2001; 12p; In English

Report No.(s): DE2001-774679; P00-109271; No Copyright; Avail: Department of Energy Information Bridge

Ion implantation has become a versatile and powerful technique for synthesizing nanometer-scale clusters and crystals embedded in the near-surface region of a variety of hosts. The resulting nanocomposite materials often show unique optical, magnetic, and electronic properties. Here they review some of the principal features of this nanophase materials synthesis technique and discuss the outstanding experimental difficulties that currently hamper the development of devices based on the many unique properties of these nanocomposite materials. Possible solutions to these problems and future research directions are discussed. The following is a summary paper that is partially based on a recent invited article by the above authors to appear Advanced Materials.

NTIS

Ion Implantation; Nanocomposites

20020008199 Oak Ridge National Lab., TN USA

Relativistic Generalization of the Post-Prior Equivalence for. Reaction of Composite Particles

Wong, C. Y.; Jun. 04, 2001; 3p; In English

Report No.(s): DE2001-786323; P01-110969; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the non-relativistic description of the reaction of composite particles, the reaction matrix is independent of the choice of post or prior forms for the interaction. We generalize this post-prior equivalence to the relativistic reaction of composite particles by using Dirac's constraint dynamics to describe the bound states and the reaction process.

NTIS

Relativistic Particles; Equivalence

20020008990 Naval Postgraduate School, Monterey, CA USA

Multi-Level Technique for Stiffness and Strength Calculations of Woven Fabric Composite Plate and Shell Structures

Altekin, Ahmet; Jun. 2001; 74p; In English

Report No.(s): AD-A395985; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The stiffness and strength behavior of the woven fabric composite materials mainly depend on the properties of the fiber and matrix materials. A technique was developed to design and analyze woven fabric composites based on the micro-level properties of the fiber and matrix materials. The technique is based on the bilateral relationships among the fiber and matrix materials, the unidirectional composite (strand), the woven fabric layer and the laminated composite structure as in the given order. Simplified and efficient analytical models were developed for the relationship between any subsequent levels of woven fabric composite materials. The technique is used to predict the structural level stiffness and strength in terms of material and the geometric configuration of the woven fabric and lamination. Progressive damage or failure can also be simulated at the fiber and matrix level by using this technique.

DTIC

Structural Analysis; Fiber Composites; Mechanical Properties; Matrix Materials

20020009018 Collier Research and Development Corp., Hampton, VA USA

HITEMP Material and Structural Optimization Technology Transfer *Final Report*

Collier, Craig S., Collier Research and Development Corp., USA; October 2001; 60p; In English

Contract(s)/Grant(s): NAS3-97051; RTOP 708-31-13

Report No.(s): NASA/CR-2001-211166; E-13030; NAS 1.26:211166; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The feasibility of adding viscoelasticity and the Generalized Method of Cells (GMC) for micromechanical viscoelastic behavior into the commercial HyperSizer structural analysis and optimization code was investigated. The viscoelasticity methodology was developed in four steps. First, a simplified algorithm was devised to test the iterative time stepping method for simple one-dimensional multiple ply structures. Second, GMC code was made into a callable subroutine and incorporated into the one-dimensional code to test the accuracy and usability of the code. Third, the viscoelastic time-stepping and iterative scheme was incorporated into HyperSizer for homogeneous, isotropic viscoelastic materials. Finally, the GMC was included in a version of HyperSizer. MS Windows executable files implementing each of these steps is delivered with this report, as well as source code.

The findings of this research are that both viscoelasticity and GMC are feasible and valuable additions to HyperSizer and that the door is open for more advanced nonlinear capability, such as viscoplasticity.
Author
Micromechanics; Applications Programs (Computers); Structural Analysis; Stress Analysis; Viscoelasticity

20020009116 Los Alamos National Lab., NM USA
In-Situ Characterization of Matrix Response to Fiber Fractures
Hanan, J.; Mar. 01, 2001; 7p; In English
Report No.(s): DE2001-776143; LA-UR-01-1436; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Successful application of metal matrix composites often requires strength and lifetime predictions that account for the deformation of each constituent. However, the deformation of individual phases in composites usually differs significantly from their respective monolithic behaviors. For instance, generally little is known about the in-situ deformation of the metal matrix and fiber/matrix interface region, other than that it likely differs from the bulk material response. This article describes an approach to quantifying the in-situ deformation parameters using neutron diffraction measurements of matrix failure around a fiber fracture in a model composite consisting of an Al matrix and a single Al2O3 fiber. We also study the shear sliding resistance as it evolves through fiber fracture upon loading and unloading. Matching the stress/strain distributions predicted from micromechanical models to the measured strain distributions determined by neutron diffraction under applied tensile loading results in an estimate of the typically non-linear, stress-strain behavior of the metal matrix.
NTIS
Metal Matrix Composites; Deformation; Fiber-Matrix Interfaces; Stress-Strain Relationships; In Situ Measurement

20020009147 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Stuttgart, Germany
4th International Conference on High-Temperature Ceramic Matrix Composites
Oct. 2001; 169p; In English, 1 -3 Oct. 2001, Unknown
Contract(s)/Grant(s): F61775-01-W-F048
Report No.(s): AD-A395702; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The Book of Abstracts for 4th International Conference on High-Temperature Ceramic Matrix Composites (HT-CMC 4), 1 October 2001 - 3 October 2001. This is an interdisciplinary materials science conference. Topic to be covered include fibers, interfaces, interphases, non-oxide ceramic matrix composites, oxide/ oxide ceramic matrix composites, coatings, and applications of high-temperature ceramic matrix composites for aerospace.
DTIC
Ceramic Matrix Composites; Refractory Materials

20020009551 United Engineering Foundation, Inc., New York, NY USA
Special Issue: Processing of Fibers and Composites. Composites Part A: Applied Science and Manufacturing. Volume 32A 2001
Chawla, K. K.; Mortensen, A.; Manson, J.; January 2001; 199p; In English, 21-26 May 2000, Barga, Italy
Report No.(s): AD-A395322; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
This conference focused on the processing issues relevant to fibrous reinforcements and their composites. Its scope included polymeric, metallic, and ceramic fibers and their composites. The main goal was to examine aspects of processing composites across all classes of materials with a view toward the generation of materials featuring tailored sets of properties.
Derived from text
Composite Materials; Fiber Composites; Fibers

20020009562 NASA Ames Research Center, Moffett Field, CA USA
The Influence of SiC on the Ablation Response of Advanced Refractory Composite Materials
Bull, Jeffrey D., NASA Ames Research Center, USA; [1994]; 1p; In English; 19th Annual Conference on Composites, Materials and Structures, 9-10 Jan. 1995, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only
In continuing our studies of advanced refractory composite materials we have recently completed an arc-jet test series of a diverse group of ceramics and ceramic matrix composites. The compositions range from continuous fiber reinforced ceramics to monoliths. Many of these materials contain SiC and one objective of this test series was to identify the influence of SiC oxidation mechanisms on material performance. Hence the arc heater was operated at two conditions; one in which the passive oxidation of SiC would be dominant and the other where the active oxidation of SiC would be dominant. It is shown here that the active

oxidation mechanism of SiC does not dominate material performance when it is present at levels equal to or below 20 volume percent.
Author
Ceramic Matrix Composites; Silicon Carbides; Arc Heating; Performance Tests

20020010188 Oak Ridge National Lab., TN USA
Durability-Based Design Properties of Reference Crossply Carbon-Fiber Composite
Corum, J. M.; Apr. 16, 2001; 218p; In English
Report No.(s): DE2001-779794; ORNL/TM-2000/322; No Copyright; Avail: Department of Energy Information Bridge

This report provides recommended durability-based design properties and criteria for a crossply carbon-fiber composite for possible automotive structural applications. Although the composite utilized aerospace-grade carbon-fiber reinforcement, it was made by a rapid-molding process suitable for high-volume automotive use. The material is the first in a planned progression of candidate composites to be characterized as part of an Oak Ridge National Laboratory project entitled Durability of Carbon-Fiber Composites. The overall goal of the project, which is sponsored by the US Department of Energy's Office of Advanced Automotive Technologies and is closely coordinated with the Advanced Composites Consortium, is to develop durability-driven design data and criteria to assure the long-term integrity of carbon-fiber-based composite systems for automotive structural applications. The composite addressed in this report is a (+/- 45 deg) 3S crossply consisting of continuous Thornel T300 fibers in a Baydur 420 IMR urethane matrix. This composite is highly anisotropic with two dominant fiber orientations - 0/90 deg and +/- 45 deg. Properties and models were developed for both orientations. This document is in two parts. Part 1 provides design data and correlations, while Part 2 provides the underlying experimental data and models. The durability issues addressed include the effects of short-time, cyclic, and sustained loadings; temperature; fluid environments; and low-energy impacts (e.g., tool drops and kickups of roadway debris) on deformation, strength, and stiffness. Guidance for design analysis, time-independent and time-dependent allowable stresses, rules for cyclic loadings, and damage-tolerance design guidance are provided.
NTIS
Carbon Fibers; Durability; Fiber Composites; Ply Orientation

20020010238 Sandia National Labs., Albuquerque, NM USA
Aluminum Honeycomb Characteristics in Dynamic Crush Environments
Bateman, V. I.; Swanson, L. H.; Jul. 01, 1999; 112p; In English
Report No.(s): DE2001-9465; SAND99-1781; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Fifteen aluminum honeycomb cubes (3 in.) have been crushed in the Mechanical Shock Laboratory's drop table testing machines. This report summarizes shock experiments with honeycomb densities of 22.1 pcf and 38.0 pcf and with crush weights of 45 lb, 168 lb, and 268 lb. The honeycomb samples were crushed in all three orientations, W, L, and T. Most of the experiments were conducted at an impact velocity of (approx)40 fps, but higher velocities of up to 90 fps were used for selected experiments. Where possible, multiple experiments were conducted for a specific orientation and density of the honeycomb samples. All results are for Hexcel honeycomb except for one experiment with Alcore honeycomb and have been evaluated for validity. This report contains the raw acceleration data measured on the top of the drop table carriage, pictures of the crushed samples, and normalized force-displacement curves for all fifteen experiments. These data are not strictly valid for material characteristics in L and T orientations because the cross-sectional area of the honeycomb changed (split) during the crush. However, these are the best data available at this time. These dynamic crush data do suggest a significant increase in crush strength to 8000 psi ((approximately) 25-30% increase) over quasi-static values of (approximately)6000 psi for the 38.0 pcf Hexcel Honeycomb in the T-orientation. An uncertainty analysis is included and estimates the error in these data.
NTIS
Drop Tests; Honeycomb Structures; Mechanical Shock; Impact Velocity; Cubes (Mathematics)

20020010582 Old Dominion Univ., Dept. of Mechanical Engineering, VA USA
A Comparison of Quasi-Static Indentation and Drop-Weight Impact Testing on Carbon-Epoxy Laminates ***Final Report, 15 Dec. 1999 - 30 Sep. 2001***
Prabhakaran, R., Old Dominion Univ., USA; Nov. 19, 2001; 188p; In English
Contract(s)/Grant(s): NCC1-389
Report No.(s): ODURF-101491; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The project had two objectives: 1) The primary objective was to characterize damage tolerance of composite materials. to accomplish this, polymer matrix composites were to be subjected to static indentation as well as low-velocity impacts and the results analyzed. 2) A second objective was to investigate the effects of laser shock peening on the damage tolerance of aerospace

materials, such as aluminum alloys, in terms of crack nucleation and crack propagation. The impact testing was proposed to be performed using a Dynatup drop tower. The specimens were to be placed over a square opening in a steel platen and impacted with a hemispherical tup. The damage was to be characterized in the laminate specimens. The damage tolerance of aerospace alloys was to be studied by conducting fatigue tests on aluminum alloy specimens with prior shock peening treatment. The crack length was to be monitored by a microscope and the crack propagation rate, da/dN, determined.
Author
Epoxy Matrix Composites; Impact Tests; Crack Propagation; Damage; Laminates; Carbon Fiber Reinforced Plastics; Mechanical Properties

20020010599 Sandia National Labs., Albuquerque, NM USA
Development of Test Facility for Structural Evaluation of Composite Rotor Hubs
Dorrell, L.; Roach, D.; Jul. 20, 1999; 12p; In English
Report No.(s): DE2001-9642; SAND99-1902C; No Copyright; Avail: Department of Energy Information Bridge
The rotorcraft industry is constantly evaluating new types of lightweight composite materials that not only enhance the safety and reliability of rotor components, but also improve performance and extend operating life as well. The tests required for these evaluations are typically quite complex requiring massive test fixtures, in many cases, along with multiple actuators for loading test articles at various points simultaneously. This paper discusses the background for development of the facility, as well as hardware and overall system design and implementation. Additional topics that are covered include data acquisition, implementation of nondestructive inspection techniques during the test process, and some results from the initial test series performed in the facility.
NTIS
Rotary Wing Aircraft; Rotors

20020010630 Oak Ridge National Lab., TN USA
Recommended Minimum Test Requirements and Test Methods for Assessing Durability of Random-Glass-Fiber Composites
Battiste, R. L.; Corum, J. M.; Ren, W.; Ruggles, M. B.; Jun. 01, 1999; 81p; In English
Report No.(s): DE2001-9282; ORNL-6953; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report provides recommended minimum test requirements are suggested test methods for establishing the durability properties and characteristics of candidate random-glass-fiber polymeric composites for automotive structural applications. The recommendations and suggestions are based on experience and results developed at Oak Ridge National Laboratory (ORNL) under a US Department of Energy Advanced Automotive Materials project entitled 'Durability of Lightweight Composite Structures,' which is closely coordinated with the Automotive Composites Consortium. The report is intended as an aid to suppliers offering new structural composites for automotive applications and to testing organizations that are called on to characterize the composites.
NTIS
Fiber Composites; Glass; Durability

20020010916 NASA Langley Research Center, Hampton, VA USA
Decohesion Elements using Two and Three-Parameter Mixed-Mode Criteria
Davila, Carlos G., NASA Langley Research Center, USA; Camanho, Pedro P., Porto Univ., Portugal; [2001]; 11p; In English; American Helicopter Society Conference, 29 Oct. - 1 Nov. 2001, Williamsburg, VA, USA; Sponsored by American Helicopter Society, Inc., USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An eight-node decohesion element implementing different criteria to predict delamination growth under mixed-mode loading is proposed. The element is used at the interface between solid finite elements to model the initiation and propagation of delamination. A single displacement-based damage parameter is used in a softening law to track the damage state of the interface. The power law criterion and a three-parameter mixed-mode criterion are used to predict delamination growth. The accuracy of the predictions is evaluated in single mode delamination and in the mixed-mode bending tests.
Author
Accuracy; Delaminating; Finite Element Method; Cohesion; Computerized Simulation

20020011011 NASA Glenn Research Center, Cleveland, OH USA

The Applicability of the Generalized Method of Cells for Analyzing Discontinuously Reinforced Composites

Pahr, D. H., Technische Hochschule, Austria; Arnold, S. M., NASA Glenn Research Center, USA; November 2001; 36p; In English; Original contains color illustrations; Sponsored in part by Academic-Social Syndicate of Austria

Contract(s)/Grant(s): RTOP 708-72-42

Report No.(s): NASA/TM-2001-211165; E-13026; NAS 1.15:211165; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper begins with a short overview of the recent work done in the field of discontinuous reinforced composites, focusing on the different parameters which influence the material behavior of discontinuous reinforced composites, as well as the various analysis approaches undertaken. Based on this overview it became evident, that in order to investigate the enumerated effects in an efficient and comprehensive manner, an alternative approach to the computationally intensive finite-element based micromechanics approach is required. Therefore, an investigation is conducted to demonstrate the utility of utilizing the generalized method of cells (GMC), a semi-analytical micromechanics-based approach, to simulate the elastic and elastoplastic material behavior of aligned short fiber composites. The results are compared with (1) simulations using other micromechanical based mean field models and finite element (FE) unit cell models found in the literature given elastic material behavior, as well as (2) finite element unit cell and a new semianalytical elastoplastic shear lag model in the inelastic range. GMC is shown to definitely have a window of applicability when simulating discontinuously reinforced composite material behavior.

Author

Metal Matrix Composites; Elastic Properties; Micromechanics

20020011236 Lawrence Livermore National Lab., Livermore, CA USA

Structural integrity of affordable thick-section fiber composites

DeTeresa, S.; Jun. 01, 1999; 6p; In English

Report No.(s): DE2001-9806; UCRL-ID-134625; No Copyright; Avail: Department of Energy Information Bridge

The Long-Term Research Objectives are to advance the understanding of the mechanics of polymers and polymer composites; develop predictive capabilities as well as experimental characterization and validation tools for the mechanical behavior of these materials; and further develop our knowledge of structure-mechanical property relationships for this class of materials. The approach used was to develop novel experimental tools and use them to characterize the multiaxial failure and fatigue behavior of materials for thick-section fiber composite structures. These tools include capabilities for applying well-defined biaxial and triaxial stress states. These experiments are carefully chosen to provide results that can be used for discriminating evaluation of predictive failure models.

NTIS

Fiber Composites; Mechanical Properties; Polymers; Structural Failure

20020012289 Texas Univ., Center for Transportation Research, Austin, TX USA

Use of Carbon Fiber Reinforced Polymer Composites to Increase the Flexural Capacity of Reinforced Concrete Beams, *Sep. 1997 - Oct. 00*

Brena, S. F.; Bramblett, R. M.; Benouaich, M. A.; Wood, S. L.; Kreger, M. E.; April 2001; 250p; In English

Report No.(s): PB2002-100527; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

A large portion of the off-system bridges in Texas were constructed in the 1950s using vehicle loads that are less than the current design standards. As a result, the legal load that is permitted to cross these bridges is often limited and many are scheduled for replacement. The use of carbon fiber reinforced polymer (CFRP) composites to increase the flexural capacity of reinforced concrete bridges was investigated in this research project. The overall goal was to develop design procedures for strengthening existing bridges using CFRP to avoid replacement of bridges that have been functioning satisfactorily for many years. The first two phases of the research project are described in this report. A total of twenty-two, rectangular reinforced concrete beams were tested during the first phase of the project. The beams were strengthened using four CFRP systems and were subjected to monotonically increasing load. The primary test parameter was the layout of the CFRP system. Two layouts were identified that prevented premature debonding of the CRFP composites from the surface of the concrete. Eight rectangular beams were strengthened using two of the previously tested CFRP systems and were subjected to fatigue loads in the second phase of the project. The composite/concrete interface did not degrade under the fatigue loads. Strengthened beams sustained one million cycles at service levels with only a negligible influence on the measured behavior.

NTIS

Carbon Fiber Reinforced Plastics; Concretes; Flexural Strength; Polymers; Rectangular Beams; Mechanical Properties

20020012434 NASA Glenn Research Center, Cleveland, OH USA

The Applicability of the Generalized Method of Cells for Analyzing Discontinuously Reinforced Composites

Pahr, D. H., Wien Univ., Austria; Arnold, S. M., NASA Glenn Research Center, USA; November 2001; 38p; In English; Original contains color illustrations; Sponsored in part by the Academic-Social Syndicate of Austria

Contract(s)/Grant(s): RTOP 708-72-42

Report No.(s): NASA/TM-2001-211165; NAS 1.15:211165; E-13026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper begins with a short overview of the recent work done in the field of discontinuous reinforced composites, focusing on the different parameters which influence the material behavior of discontinuous reinforced composites, as well as the various analysis approaches undertaken. Based on this overview it became evident that in order to investigate the enumerated effects in an efficient and comprehensive manner, an alternative approach to the computationally intensive finite-element based micromechanics approach is required. Therefore, an investigation is conducted to demonstrate the utility of utilizing the generalized method of cells (GMC), a semi-analytical micromechanics-based approach, to simulate the elastic and elastoplastic material behavior of aligned short fiber composites. The results are compared with simulations using other micromechanical based mean field models and finite element (FE) unit cell models found in the literature given elastic material behavior, as well as finite element unit cell and a new semianalytical elastoplastic shear lag model in the inelastic range. GMC is shown to definitely have a window of applicability when simulating discontinuously reinforced composite material behavior.

Author

Fiber Composites; Finite Element Method; Micromechanics; Reinforced Plastics; Metal Matrix Composites

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20020005965 Argonne National Lab., IL USA

Mathematical modeling of the effects of aerobic and anaerobic chelate bioegradation on actinide speciation

Banaszak, J. E.; VanBriesen, J.; Rittmann, B. E.; Reed, D. T.; Mar. 19, 1998; 21p; In English

Report No.(s): DE2001-7848; ANL/CMT/CP-92718; No Copyright; Avail: Department of Energy Information Bridge

Biodegradation of natural and anthropogenic chelating agents directly and indirectly affects the speciation, and, hence, the mobility of actinides in subsurface environments. We combined mathematical modeling with laboratory experimentation to investigate the effects of aerobic and anaerobic chelate biodegradation on actinide (Np(IV/V), Pu(IV)) speciation. Under aerobic conditions, nitrilotriacetic acid (NTA) biodegradation rates were strongly influenced by the actinide concentration. Actinide-chelate complexation reduced the relative abundance of available growth substrate in solution and actinide species present or released during chelate degradation were toxic to the organisms. Aerobic bio-utilization of the chelates as electron-donor substrates directly affected actinide speciation by releasing the radionuclides from complexed form into solution, where their fate was controlled by inorganic ligands in the system. Actinide speciation was also indirectly affected by pH changes caused by organic biodegradation. The two concurrent processes of organic biodegradation and actinide aqueous chemistry were accurately linked and described using CCBATCH, a computer model developed at Northwestern University to investigate the dynamics of coupled biological and chemical reactions in mixed waste subsurface environments. CCBATCH was then used to simulate the fate of Np during anaerobic citrate biodegradation. The modeling studies suggested that, under some conditions, chelate degradation can increase Np(IV) solubility due to carbonate complexation in closed aqueous systems.

NTIS

Actinide Series; Aerobes; Biodegradation; Chelates; Chemical Reactions; Ligands; Neptunium Compounds; Plutonium Compounds

20020006118 Argonne National Lab., IL USA

Reduction of Np(VI) and Pu(VI) by organic chelating agents

Reed, D. T.; Aase, S. B.; Banaszak, J. E.; Mar. 19, 1998; 19p; In English

Report No.(s): DE2001-7847; ANL/CMT/CP-92715; No Copyright; Avail: Department of Energy Information Bridge

The reduction of NpO(2+) and PuO2(2+) by oxalate. citrate, and ethylenediaminetetraacetic acid (EDTA) was investigated in low ionic strength media and brines. This was done to help establish the stability of the An(VI) oxidation state in the presence

of organic complexants. The stability of the An(VI) oxidation state depended on the pH and relative strength of the various oxidation state-specific complexes. At low ionic strength and pH 6, NpO2O(2+) was rapidly reduced to form NpO2(+) organic complexes. At longer times, Np(IV) organic complexes were observed in the presence of citrate. PuO2(2+) was predominantly reduced to Pu(4+), resulting in the formation of organic complexes or polymeric/hydrolytic precipitates. The relative rates of reduction to the An(V) complex were EDTA > citrate oxalate. Subsequent reduction to An(IV) complexes, however, occurred in the following order: citrate EDTA oxalate because of the stability of the An(V)-EDTA complex. The presence of organic complexants led to the rapid reduction of NpO2(2+) and PuO2P(2+) in G-seep brine at pHs 5 and 7. At pHs 8 and 10 in ERDA-6 brine, carbonate and hydrolytic complexes predominated and slowed down or prevented the reduction of An(VI) by the organics present.
NTIS
Chelation; Plutonium Oxides; Brines; Neptunium Compounds; Reduction (Chemistry)

20020006136 Federal Energy Technology Center, Morgantown, WV USA
Thermodynamic modeling of volatile hazardous metal behavior in the Vortec Vitrification System
Nowok, J. W.; Hurley, J. P.; Jul. 31, 2000; 45p; In English
Contract(s)/Grant(s): FC21-94MC31388
Report No.(s): DE2001-774500; DE-FC21-94MC31388-37; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The thermochemical equilibrium calculations indicate that at the temperature of a propane--air flame, some volatilization of uranium, plutonium, technetium, and cesium will occur. The expected concentrations of plutonium, technetium, and cesium in the flame will be very low because of the small maximum concentration of these elements in the projected feed materials for the first 30-day test. The quantities volatilized can generally be decreased by operating the flame in a fuel-rich mode, although this will lead to greater carbon monoxide production, which may be more objectionable. The concentrations of chlorine and fluorine, at least at the maximum levels in the projected Vortec feed, are not projected to greatly influence the vaporization rates. Therefore, blending to reduce the concentrations of those elements would most likely not be effective in reducing metal vaporization. Most of the elements vaporized condense by the time the gas cools to 2000 F. These elements would condense either on surfaces near the front of the heat recuperator or on entrained particulates or homogeneously as relatively pure submicron particles. Cesium would be expected to condense at the lower temperatures near the rear of the recuperator, although the expected maximum concentration in the Vortec feed material is extremely low so it should be greatly diluted by other particulates. The elements that condense on other entrained particles will form enriched surface coatings. Particles larger than 10(micro)m or so will be collected in the scrubber. Smaller particles, especially the submicron particles formed from homogeneous nucleation, should be largely collected in the HEPA filter. Deposits formed in the heat recuperator can normally be handled via sootblowing. To reduce handling problems, we suggest that the recuperator be oriented vertically so that the deposits blown off of the heat exchanger fall directly into the molten glass. The large size of the deposits should help to reduce the rate of revaporization, allowing the volatile elements to be removed with the glass. The volatile elements that do not deposit on system surfaces will be concentrated in the smaller particles. Therefore, the HEPA ash will be greatly enriched in these elements. If the HEPA filter is itself sent to a melter, the elements may revaporize and multiply the problems related to metal vaporization significantly. Therefore, the HEPA filters should be disposed of without high-temperature processing. Also, to reduce the formation of these very small particles, it is helpful to include in the feed larger particles to act as condensation nuclei that can then be collected in the scrubber. This can be accomplished by using feed materials with a fraction consisting of particles small enough that they will not be collected in the cyclone in the melter, but large enough that they will easily be collected by the scrubber. This is one advantage that firing bituminous coal has over gas firing; it provides a source of ash particles of the right size range to serve as nucleation sites, but large enough (depending on the coal) so that they can usually be collected efficiently in the scrubber system.
NTIS
Thermodynamics; Vitrification; Hazardous Materials; Metals; Actinide Series; Transition Metals

20020006203 Illinois Inst. of Tech., Chicago, IL USA
Density Functional Theory Applied to Pt and Pt Alloy Clusters and Adsorbate ***Final Report, 5 Jun. 2000-4 Jun 2001***
Smotkin, Eugine; Sep. 26, 2001; 20p; In English
Contract(s)/Grant(s): DAAD19-00-1-0095
Report No.(s): AD-A395484; ARO-40894.1-CH-RIP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This DURIP Grant progress report describes the use of the Silicon Graphics (SGI) ORIGIN 2400 server with eight R12000 CPUs and 512 Megs of RAM for every node (1 node = 2 CPUs). Using this advanced and powerful multiprocessor SGI server, we were able to dramatically speed and further advance our computational Density Functional calculations on CO absorbed on

Pt and alloy clusters. Our recent data presented at the ARO Workshop on 'Applications of First-Principles-Based Computational Methods to the Design of Electrochemical Power Systems' Berkeley, CA, August 31, 2001 included XANES data which showed that the catalyst particles at the anode of fuel cells are metallic.
DTIC
Multiprocessing (Computers); Platinum Alloys; Central Processing Units; Adsorption; Density (Mass/Volume)

20020006211 Notre Dame Univ., IN USA
Studies of Ionic and Free Radical Reactions in Supercritical Water ***Final Report, 1 Apr. 1997-31 Mar. 2001***
Brennecke, Joan F.; Sep. 26, 2001; 9p; In English; Prepared in cooperation with Western Michigan University
Contract(s)/Grant(s): DAAG55-97-1-0025
Report No.(s): AD-A395438; ARO-35719.2-CH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The goal of this project was to study the kinetics of fundamental free radical and ionic reactions in supercritical water (SCW). The first finding is that true diffusion controlled reactions are not impeded or enhanced by density inhomogeneities. This is based on a study of anthracene triplet-triplet annihilation in SCW at temperatures to 450 C. A second finding, based on a study of the reaction of xanthenium cations with amylamine, is that the rates of ion-neutral reactions in subcritical water follow simple Arrhenius behavior and can be easily extrapolated from ambient temperature measurements. The third finding is that the rate of hydroxyl radical addition to an aromatic ring in subcritical and supercritical water is well below the diffusion controlled limit and it is decidedly non-Arrhenius, with a rapid increase at temperatures above 300 C. This was determined by a pulse radiolysis study of the addition of hydroxyl radical to nitrobenzene at 250 bar and temperatures between 25 C and 390 C. We have been able to model this unusual behavior with a three-step mechanism that successfully predicts the rapid increase in the rate at supercritical temperatures. These studies provide fundamental kinetics upon which one can base modeling of supercritical water oxidation processes with elementary reactions.
DTIC
Supercritical Fluids; Water; Reaction Kinetics; Hydroxyl Radicals; Ionic Reactions

20020006216 Centre de Recherche en Calcul Applique, Montreal, Quebec Canada
Analytical Validation of Flamelet-Based Models for Non-Premixed Turbulent Combustion ***Final Report, 15 Apr. 1998-14 Apr 2001***
Bourlioux, A.; Sep. 15, 2001; 9p; In English
Contract(s)/Grant(s): DAAG55-98-1-0220
Report No.(s): AD-A395415; ARO-38674.2-CL; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The aim of the project was to validate various implementations of the flamelet approach to turbulent combustion modeling, in particular in the context of large eddy simulations of turbulent flames. A hybrid mathematical-numerical-asymptotic approach has been used by Bourlioux and her students, in collaboration with Majda, to systematically exploit Majda and co-workers theoretical results in an applied computational framework. The idealized models utilized in the project were amenable to rigorous asymptotic predictions regarding the effective behavior of turbulent flames at large scales in terms of their effective burning rate. New numerical tools were designed to carry on the asymptotic procedures for relevant test-cases. A strong emphasis was placed on providing the physical intuition behind the various turbulent regimes identified by the theory. The asymptotic predictions were compared with ad-hoc modeling procedures to identify their pros and cons. Additionally, direct numerical simulations were carried on for the idealized test-cases to provide practitioners with some intuition regarding the relationship between the theoretical asymptotic limit results and finite parameters realizations.
DTIC
Turbulent Combustion; Large Eddy Simulation; Turbulent Flames; Combustion Chemistry

20020006241 Los Alamos National Lab., NM USA
Process monitoring and control with chemin, a miniaturized ccd-based instrument for simultaneous XRD/XRF analysis
Vaniman, D.; Bish, D.; Jun. 01, 1999; 10p; In English
Report No.(s): DE2001-772939; LA-UR-99-3467; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
There is a large variety of mining and manufacturing operations where process monitoring and control can benefit from on-site analysis of both chemical and mineralogic constituents. CHEMIN is a CCD-based instrument capable of both X-ray fluorescence (XRF; chemical) and X-ray diffraction (XRD; mineralogic) analysis. Monitoring and control with an instrument like CHEMIN can be applied to feedstocks, intermediate materials, and final products to optimize production. Examples include control of cement feedstock, of ore for smelting, and of minerals that pose inhalation hazards in the workplace. The combined XRD/XRF capability of CHEMIN can be used wherever a desired commodity is associated with unwanted constituents that may

be similar in chemistry or structure but not both (e.g., Ca in both gypsum and feldspar, where only the gypsum is desired to make wallboard). In the mining industry, CHEMIN can determine mineral abundances on the spot and enable more economical mining by providing the means to quickly and frequently assay the material being mined, at minimal cost. In manufacturing, CHEMIN could be used to spot-check the chemical composition and crystalline makeup of a product at any stage of production. Analysis by CHEMIN can be used as feedback in manufacturing processes where rates of heating, process temperature, mixture of feedstocks, and other variables must be adjusted in real time to correct structure and/or chemistry of the product (e.g., prevention of periclase and alkali sulfate coproduction in cement manufacture).
NTIS
X Ray Fluorescence; X Ray Diffraction; Mineralogy; Charge Coupled Devices

20020006249 Federal Energy Technology Center, Morgantown, WV USA
Measurement of surface alpha contamination using electret ion chambers
Ebadian, M. A.; Jan. 01, 1999; 40p; In English
Report No.(s): DE2001-772510; DE-FG01-95EW55094-58; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Electret ion chambers (EICs) are known to be inexpensive, reliable, passive, integrating devices used for measurement of ionizing radiation. Their application for measurement of alpha contamination on surfaces was recently realized. This two-year project deals with the evaluation of electret ion chambers with different types of electrets and chambers for measurement of surface alpha contamination, their demonstration at U.S. Department of Energy (DOE) sites, a cost-benefit comparison with the existing methods, and the potential deployment at DOE sites. During the first year (FY98) of the project, evaluation of the EICS was completed. It was observed that EICS could be used for measurement of free release level of alpha contamination for transuranics (100 dpm/100 cm(sup 2) fixed). DOE sites, where demonstration of EIC technology for surface alpha contamination measurements could be performed, were also identified. During FY99, demonstration and deployment of EICS at DOE sites are planned. A cost-benefit analysis of the EIC for surface alpha contamination measurement will also be performed.
NTIS
Ionizing Radiation; Electrets; Ionization Chambers; Radiation Measurement

20020006503 Case Western Reserve Univ., Cleveland, OH USA
New Microlayer and Nanolayer Polymer Composites ***Interim Report, 1 Jan.-31 Dec. 2000***
Baer, Eric; Hiltner, Anne; Dec. 2000; 8p; In English
Contract(s)/Grant(s): DAAG55-98-1-0311
Report No.(s): AD-A395804; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One-dimensional photonic materials with applications to optical limiting and optical switching have been developed in conjunction with the Naval Research Laboratory. This was accomplished by synergistically combining nanolayer coextrusion methodology with dispersion of nonlinear dyes and careful control of nanolayer refractive indices. Novel ultrathin nanolayered polymers were created with layer thicknesses less than the radius of gyration of the macromolecule. Under these constrained conditions, crystalline layers approximately 11 nm thick were produced with two-dimensional hierarchical structures. by inclusion of gold or graphite nanoparticles, systems with novel electro-optical characteristics can he developed. High barrier, injection moldable systems have been produced by microlayering a polymer with good water barrier and a polymer with good oxygen barrier. Taking advantage of differences in melting points, layer integrity was maintained during injection molding in between the two melting points. This concept, which utilizes and maintains the large interfacial surface area achieved with microlayering, is broadly applicable to highly immiscible polymeric systems.
DTIC
Electro-Optics; Composite Materials; Nanocomposites; Optical Switching

20020006519 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan
Correlation of Reaction Rate Constants in Mixed Liquid Solvents by an Excess Function
Kato, Haruo, Kyushu Univ., Japan; Yonezawa, Setsuko, Kyushu Univ., Japan; Arai, Yasuhiko, Kyushu Univ., Japan; Technology Reports of Kyushu University; November 2001; ISSN 0023-2718; Volume 74, No. 6, pp. 629-633; In Japanese; Copyright; Avail: Issuing Activity

An empirical approach is proposed to correlate reaction rate constants in mixed liquid solvents based on the concept of excess quantity. As a reference value of reaction rate constant at the same condition (temperature and composition) of the reactants, the mole fraction averaged value and the logarithmic averaged value were adopted. The excess reaction rate constants, given by the difference between the experimental results and the reference values, were correlated by RedlichKister type excess function with

two constants. The present approach was applied to Diels-Alder reaction of maleic anhydride with isoprene in n-hexane + nitrobenzene mixed solvent. The experimental reaction rate constants previously reported were successfully correlated based on both reference values.
Author
Numerical Analysis; Diels-Alder Reactions; Solvents

20020006530 Lawrence Livermore National Lab., Livermore, CA USA
XANES, EXAFS and Kbeta spectroscopic studies of the oxygen-evolving complex in Photosystem II
Robblee, J. H.; Dec. 01, 2000; 240p; In English
Report No.(s): DE2001-773946; LBNL-47159; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A key question for the understanding of photosynthetic water oxidation is whether the four oxidizing equivalents necessary to oxidize water to dioxygen are accumulated on the four Mn ions of the oxygen evolving complex (OEC), or whether some ligand-centered oxidations take place before the formation and release of dioxygen during the S(sub 3) (r-arrow) (S(sub 4)) (r-arrow) S(sub 0) transition. Progress in instrumentation and flash sample preparation allowed us to apply Mn K(beta) X-ray emission spectroscopy (Kb XES) to this problem for the first time. The K(beta) XES results, in combination with Mn X-ray absorption near-edge structure (XANES) and electron paramagnetic resonance (EPR) data obtained from the same set of samples, show that the S(sub 2) (r-arrow) S(sub 3) transition, in contrast to the S(sub 0) (r-arrow) S(sub 1) and S(sub 1) (r-arrow) S(sub 2) transitions, does not involve a Mn-centered oxidation. This is rationalized by manganese (mu)-oxo bridge radical formation during the S(sub 2) (r-arrow) S(sub 3) transition. Using extended X-ray absorption fine structure (EXAFS) spectroscopy, the local environment of the Mn atoms in the S(sub 0) state has been structurally characterized. These results show that the Mn-Mn distance in one of the di-(mu)-oxo-bridged Mn-Mn moieties increases from 2.7 (angstrom) in the S(sub 1) state to 2.85 (angstrom) in the S(sub 0) state. Furthermore, evidence is presented that shows three di-(mu)-oxo binuclear Mn(sub 2) clusters may be present in the OEC, which is contrary to the widely held theory that two such clusters are present in the OEC. The EPR properties of the S(sub 0) state have been investigated and a characteristic 'multiline' signal in the S(sub 0) state has been discovered in the presence of methanol. This provides the first direct confirmation that the native S(sub 0) state is paramagnetic. In addition, this signal was simulated using parameters derived from three possible oxidation states of Mn in the S(sub 0) state. The dichroic nature of X-rays from synchrotron radiation and single-crystal Mn complexes have been exploited to selectively probe Mn-ligand bonds using XANES and EXAFS spectroscopy. The results from single-crystal Mn complexes show that dramatic dichroism exists in these complexes, and are suggestive of a promising future for single-crystal studies of PS II.
NTIS
Photosynthesis; Water; Oxidation; Spectroscopic Analysis

20020006534 Los Alamos National Lab., NM USA
Fundamental thermodynamics of actinide-bearing mineral waste forms
Williamson, M.; Huang, J.; Putnam, R.; Jan. 01, 2001; 20p; In English
Report No.(s): DE2001-774353; LA-UR-01-387; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In September 2000, the US and Russia reached an agreement to jointly disposition roughly 68 metric tons of weapons usable plutonium. In Russia, 34 metric tons of weapons grade plutonium will be dispositioned by burning the plutonium as mixed oxide (MOX) fuel. In the US, 25 metric tons of plutonium recovered from pits and clean metal will likewise be dispositioned by burning as mixed oxide (MOX) fuel and about 9 metric tons of plutonium stored throughout the DOE (Department of Energy) complex will be dispositioned by immobilization in a ceramic which will then be encapsulated in high level waste (HLW) glass. In all cases, the plutonium will be made equal to or less attractive for reuse in nuclear weapons than the much larger and growing inventory of plutonium in spent nuclear fuel. This threshold of unattractiveness is commonly referred to as the spent fuel standard. In the US, the final products from plutonium disposition, irradiated fuel and ceramic encapsulated HLW, will be emplaced in the Federal Waste Repository, which is assumed to be Yucca Mountain. The ceramic form selected for the disposition of plutonium is composed of a series of titanate-based phases which are generally referred to as SYNROC (short for Synthetic Rock). The particular formulation that was selected is composed of about 80 vol % pyrochlore, about 15 vol % brannerite, and about 5 vol % rutile. If impurities are present in the PuO(sub 2) feed material, about a half a dozen other phases can also form. The most common of these are zirconolite and a silicate glass. A screening process conducted in 1995, resulted in the selection of borosilicate glasses and titanate-based ceramics (e.g. SYNROCs) as the best available options for immobilization of plutonium. In 1998, a pyrochlore-rich ceramic form was selected in preference to a boro-silicate glass form. More information about the

development and selection of the ceramic formulation can be found in the Plutonium Immobilization Programs Baseline Formulation report.
NTIS
Containment; Thermodynamic Properties; Waste Disposal; Spent Fuels; Radioactive Wastes; Waste Management; Nuclear Weapons

20020006761 Sandia National Labs., Albuquerque, NM USA
Thermal Measurements from a Series of Tests with a Large Cylindrical Calorimeter on the Leeward Edge of a JP-8 Pool Fire in Cross-Flow
Suo-Anttila,; Gritzo,; Jul. 01, 2001; 184p; In English
Report No.(s): DE2001-786626; SAND2001-1986; No Copyright; Avail: Department of Energy Information Bridge
As part of the full scale fuel fire experimental program, a series of PJ-8 pool fire experiments with a large cylindrical calorimeter (3.66 m diameter), representing a C-141 aircraft fuselage, at the lee end of the fuel pool were performed at Naval Air Warfare Center, Weapons Division (NAWCWPNS). The series was designed to support Weapon System Safety Assessment (WSSA) needs by addressing the case of a transport aircraft subjected to a large fuel fire. The data collected from this mock series will allow for characterization of the fire environment via a survivable test fixture. This characterization will provide important background information for a future test series utilizing the same fuel pool with an actual C-141 aircraft in place of the cylindrical calorimeter.
NTIS
Fires; JP-8 Jet Fuel; Safety Factors; Support Systems; Systems Engineering; Cross Flow

20020006763 Department of Energy, Aiken, SC USA
Demonstration of Small Tank Tetraphenylborate Precipitation Process Using Savannah River Site High Level Waste
Peters, T. B.; Sep. 10, 2001; 63p; In English
Report No.(s): DE2001-786597; WSRC-TR-2001-00211; No Copyright; Avail: Department of Energy Information Bridge
This report details the experimental effort to demonstrate the continuous precipitation of cesium from Savannah River Site High Level Waste using sodium tetraphenylborate. In addition, the experiments examined the removal of strontium and various actinides through addition of monosodium titanate.
NTIS
Precipitation; Strontium; Grasslands; Actinide Series

20020006764 Department of Energy, Aiken, SC USA
Influence of Water Addition on Crystalline Silicotitanate Column Operation
Stallings, M. E.; Sep. 11, 2001; 13p; In English
Report No.(s): DE2001-786595; WSRC-TR-2001-00264; No Copyright; Avail: Department of Energy Information Bridge
The proposed use of crystalline silicotitanate (CST) for removal of radiocesium from Savannah River high level waste has received significant research over the past few years. Engineering evaluations of the proposed flow sheet identified several risks. These risks include chemical and thermal stability of the resin, gas generation in the large ion exchange columns, and size reduction and sampling issues for interfacing with the Defense Waste Processing Facility. Research into these potential risks provided information that mitigates or eliminates these risks.
NTIS
Thermal Stability; Radioactivity; Ion Exchanging; Waste Water

20020006917 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan
Reaction Rate Near the Critical Point of Mixed Liquid Solvent
Kato, Haruo, Kyushu Univ., Japan; Toh, Nobumasa, Kyushu Univ., Japan; Yonezawa, Setsuko, Kyushu Univ., Japan; Arai, Yasuhiko, Kyushu Univ., Japan; Technology Reports of Kyushu University; November 2001; ISSN 0023-2718; Volume 74, No. 6, pp. 623-627; In Japanese; Copyright; Avail: Issuing Activity
Snyder and Eckert have reported that Diels-Alder reaction rate of maleic anhydride with isoprene is enhanced near the critical point of the n-hexane + nitrobenzene liquid mixture. This fact in mixed liquid solvent is very interesting and should be compared with the reaction rate of the same Diels-Alder reaction near the critical point of a supercritical fluid (gaseous state). We re-examined the experimental result of Snyder and Eckert tinder the same experimental condition. However, the enhancement in reaction rate was not observed clearly. The present results show that the reaction mechanism near the critical point of mixed

liquid solvent may differ from that of gas-liquid critical point. Further, the reaction rate constants in mixed liquid solvent can be correlated by using the transition-state theory couple with the regular solution theory.
Author
Critical Point; Solvents; Anhydrides; Diels-Alder Reactions

20020007927 National Defence Research Establishment, Umea, Sweden
Suggestion on Novel Peptidomimetics for the Rhodopsin-bound Conformation of Transducin's C-terminal Segment Gta (340-350)
Tunemalm, A. K.; May 2000; 26p; In Swedish
Report No.(s): PB2001-107729; FOA-R-00-0154-862-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
If the chemical structure of a ligand is known, molecular modelling can be used to design structurally simplified lead compounds with receptor activity. By using (theoretical) conformational search, knowledge of a simplified structure's ability to mimic the active conformation of a ligand can be gained. Molecular modelling techniques can be used to reduce the time-demanding step of designing new compounds (antidotes, drugs and other active substances) by reducing the number of lead compounds that need to be synthesized and tested with respect to activity. In this report, a number of peptide mimetics for the G-protein Transducin's C-terminal segments Gt(alpha)(340-350) is presented. These have been selected using molecular modelling techniques with the aim to mimic Transducin's conformation when bound to the receptor Rhodospin. The purpose with these lead compounds was to see if the conformation of Gt(alpha)(340-350), proposed by transferred-NOE (TRNOE), was correct. With shown activity towards Rhodopsin, these compounds might be able to inhibit the GTP-GDP exchange and by that the light cascade.
NTIS
Peptides; Models; Molecular Structure; Ligands; Antidotes

20020008091 Sandia National Labs., Albuquerque, NM USA
Quantitative Temperature Imaging in Gas-Phase Turbulent Thermal Convection by Laser-Induced Fluorescence of Acetone
Kearney,; Reyes,; Dec. 13, 2000; 31p; In English
Report No.(s): DE2001-771537; SAND2000-3118C; No Copyright; Avail: Department of Energy Information Bridge
In this paper, an acetone planar laser-induced fluorescence (PLIF) technique for nonintrusive, temperature imaging is demonstrated in gas-phase (Pr = 0.72) turbulent Rayleigh-Benard convection at Rayleigh number, Ra = 1.3 x 10(exp 5). The PLIF technique provides quantitative, spatially correlated temperature data without the flow intrusion or time lag associated with physical probes and without the significant path averaging that plagues most optical heat-transfer diagnostic tools, such as the Mach-Zehnder interferometer, thus making PLIF an attractive choice for quantitative thermal imaging in easily perturbed, complex three-dimensional flow fields. The instantaneous (20-ns integration time) thermal images presented have a spatial resolution of 176 x 176 x 500 micrometers and a single-pulse temperature measurement precision of +/- 5.5 K, or 5.4% of the total temperature difference. These images represent a 2-D slice through a complex, 3-D flow allowing for the thermal structure of the turbulence to be quantified. Statistics such as the horizontally averaged temperature profile, rms temperature fluctuation, two-point spatial correlations, and conditionally averaged plume structures are computed from an ensemble of 100 temperature images. The profiles of the mean temperature and rms temperature fluctuation are in good agreement with previously published data, and the results obtained from the two-point spatial correlations and conditionally averaged temperature fields show the importance of large-scale coherent structures in this turbulent flow.
NTIS
Acetone; Laser Induced Fluorescence; Turbulent Flow; Rayleigh-Benard Convection; Temperature Measurement; Imaging Techniques

20020008115 Federal Energy Technology Center, Morgantown, WV USA
Advanced Combustor Design Concept to Control NOx and Air Toxics
Eddings, E. G.; Pershing, D. W.; Molina, A.; Sarofim, A. F.; Spinti, J. P.; Mar. 29, 1999; 212p; In English
Report No.(s): DE2001-774952; DE-FG22-94PC94223-11; No Copyright; Avail: Department of Energy Information Bridge
Direct coal combustion needs to be a primary energy source for the electric utility industry and for heavy manufacturing during the next several decades because of the availability and economic advantage of coal relative to other fuels and because of the time required to produce major market penetration in the energy field. However, the major obstacle to coal utilization is a set of ever-tightening environmental regulations at both the federal and local level. It is, therefore, critical that fundamental research be conducted to support the development of low-emission, high-efficiency pulverized coal power systems. The objective of this

program was to develop fundamental understanding regarding the impact of fuel and combustion changes on NOx formation, carbon burnout, and air toxic emissions from pulverized coal (pc) combustion. During pc combustion, nitrogen in the coal can be oxidized to form nitrogen oxides (NOx). The 1990 Clean Air Act Amendments established much stricter NOx emissions limits for new and existing coal-fired plants, so there has been renewed interest in the processes by which NOx forms in pc flames. One of the least understood aspects of NOx formation from pc combustion is the process by which char-N (nitrogen remaining in the char after devolatilization) forms either NOx or N2, and the development of a fundamental understanding of this process was a major focus of this research. The overall objective of this program was to improve the ability of combustion system designers and boiler manufacturers to build high efficiency, low emission pulverized coal systems by improving the design tools available to the industry. The specific program goals were to: use laboratory experiments and modeling to develop fundamental understanding for a new submodel for char nitrogen oxidation (a critical piece usually neglected in most NOx models); and use existing bench scale facilities to investigate alternative schemes to stabilize slowly mixed flames which have the potential of producing ultra-low NOx levels with high carbon burnout. Also characterize the air toxic emissions from these flames; and develop new char nitrogen model for use with a comprehensive combustion model that can be applied to the design and analysis of new and existing boilers.
NTIS
Charring; Coal; Combustion; Flames; Nitrogen; Nitrogen Oxides

20020008128 Oak Ridge National Lab., TN USA
Novel Mesoporous Uranium-Oxide Based Catalysts for Removal of Volatile Hydrocarbons and Chloro-Organic Compounds: Synthesis and Reactivity Studies
Konduru, M. V.; Jan. 09, 2001; 2p; In English
Report No.(s): DE2001-774676; P00-109043; No Copyright; Avail: Department of Energy Information Bridge
Catalytic combustion of volatile hydrocarbons and chloro-organic compounds at low temperatures provides an environmentally benign as well as an energy efficient route for their removal. The removal of chloro-organic compounds has been reported to occur at moderate temperatures (less than 673 K) with the use of supported and unsupported uranium-oxide-based catalysts that exhibit exceptionally high activity. The highly active uranium-oxide-based catalysts, synthesized by conventional catalyst preparation techniques, are nonporous materials where the bulk of the uranium-oxide catalysts may not be involved in the reaction. The use of molecular assemblies of surfactants or related substances as structure directors has led to the synthesis of highly ordered mesoporous aluminosilicates and various transition metal oxides with very high surface areas. These methods have been used in the present study for the synthesis of novel mesoporous supported and unsupported uranium-oxide-based catalysts that should exhibit exceptionally high activity for the thermal oxidation of volatile hydrocarbons and chloro-organic compounds. The synthesis and use of ordered porous uranium-oxide-based catalysts would not only greatly enhance the catalyst efficiency chloro-organic compounds but also provide an effective approach for the utilization of for the destruction of volatile hydrocarbon and large amounts of depleted uranium from nuclear fuel production.
NTIS
Catalysts; Hydrocarbons; Uranium Oxides; Volatile Organic Compounds

20020008145 Brookhaven National Lab., Upton, NY USA
X-ray scattering studies of correlated polarons in La(0.7)Ca(0.3)MnO(3)
Nelson, C. S.; Zimmermann, M.; Hill, J. P.; Gibbs, D.; Kiryukhin, V.; Aug. 16, 2000; 4p; In English
Report No.(s): DE2001-773960; BNL-67881; KC020201; No Copyright; Avail: Department of Energy Information Bridge
We report x-ray scattering studies of diffuse peaks in the paramagnetic insulating phase of La(sub 0.7)Ca(sub 0.3)MnO(sub 3). The peaks occur at a (0.5 0 0)/(0 0.5 0)-type wavevector, and are found to disappear abruptly upon cooling through the transition into the ferromagnetic metallic phase. Based on the wavevector and measured correlation length of 1-2 lattice constants, the peaks are found to be consistent with the formation of CE-type bipolarons, and their collapse at T(sub c) is attributed to the energy gain associated with itineracy in the ferromagnetic state.
NTIS
X Ray Scattering; Polarons; Ferromagnetic Materials

20020008161 Federal Energy Technology Center, Morgantown, WV USA
Feasibility analysis for installing a circulating fluidized bed boiler for cofiring multiple biofuels and other wastes with coal at penn state university
Miller, B. G.; Jawdy, C.; Oct. 09, 2000; 47p; In English
Report No.(s): DE2001-774491; DE-FG26-00NT40809-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Pennsylvania State University, under contract to the US Department of Energy, National Energy Technology Laboratory is performing a feasibility analysis on installing a state-of-the-art circulating fluidized bed boiler and ceramic filter emission control device at Penn State University Park campus for cofiring multiple biofuels and other wastes with coal or coal refuse, and developing a test program to evaluate cofiring multiple biofuels and coal-based feedstocks. The objective of the project is being accomplished using a team that includes personnel from Penn State Energy Institute and the Office of Physical Plant, Foster Wheeler Energy Corporation, Foster Wheeler Development Corporation, and Cofiring Alternatives. The major emphasis of work during this reporting period was to assess the types and quantities of potential feedstocks and collect samples of them for analysis. Approximately twenty different biomass, animal waste, and other wastes were collected and analyzed.
NTIS
Coal; Biomass Energy Production; Biomass; Waste Utilization

20020008180 Department of Energy, National Energy Technology Lab., Pittsburgh, PA USA
Mercury release from disturbed anoxic soils
Solc, J.; Bolles, B. A.; Jul. 16, 2001; 125p; In English
Report No.(s): DE2001-786847; FC26-98FT40320-20; No Copyright; Avail: Department of Energy Information Bridge
The primary objectives of experiments conducted at the Energy & Environmental Research Center (EERC) were to provide information on the secondary release of mercury from contaminated anoxic sediments to an aqueous environment after disturbance/change of in situ physical conditions and to evaluate its migration and partitioning under controlled conditions, including implications of these processes for treatment of contaminated soils.
NTIS
Soils; Energy Technology; Anoxia; Mercury (Metal)

20020008187 Oak Ridge National Lab., TN USA
Analytical Methods Development in Support of the Caustic Side. Solvent Extraction System
Maskarinec, M. P.; Jul. 17, 2001; 46p; In English
Report No.(s): DE2001-786754; ORNL/TM-2001/130; No Copyright; Avail: Department of Energy Information Bridge
The goal of the project reported herein was to develop and apply methodsfor the analysis of the major components of the solvent system used in the Caustic-Side Solvent Extraction Process (CSSX). These include the calix(4)arene, the modifier, 1-(2,2,3,3-tetrafluoro propoxy)-3-(4-sec- butylphenoxy)-2-propanol and tri-n-octylamine. In addition, it was an objective to develop methods that would allow visualization of other components under process conditions. These analyses would include quantitative laboratory methodsfor each of the components, quantitative analysis of expected breakdown products (4-sec-butylphenol and di-n-octylamine), and qualitative investigations of possible additional breakdown products under a varietyof process extremes. These methods would also provide a framework for process analysis should a pilot facility be developed.
NTIS
Solvent Extraction; Quantitative Analysis; Alkalies; Solvents; Radioactive Wastes

20020008237 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
Chemical Kinetics and Aerodynamics of Ignition ***Final Report, 5 Jun. 1997-4 Jun 2001***
Law, Chung K.; Oct. 04, 2001; 16p; In English
Contract(s)/Grant(s): DAAG55-97-1-0315
Report No.(s): AD-A395878; ARO-36401.13-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The importance of auto- and forced ignition in the operation of practical combustion devices such as the Diesel engine suggests that better understanding and enhanced performance of these devices rely on knowledge of the separate and coupled roles of the complex chemical kinetics and unsteady and turbulent aerodynamics that are present in such systems. This investigation adopted the counterflow configuration, with its well defined flow time, and employed laser-based experimentation, computational simulation with detailed chemistry and transport, turbulent modeling, and analysis with reduced mechanisms in an attempt to achieve a comprehensive understanding of the various controlling processes and parameters. The chemical kinetic portion involved the experimental determination of the ignition temperature as a function of the fuel concentration, system pressure, and flow strain rate for selected hydrocarbons up to C8, and the subsequent modeling and development of detailed, simplified, and reduced kinetic mechanisms governing ignition of these fuels. The aerodynamic portion of the program involved experimental measurement and numerical modeling of the flow field present immediately prior to ignition in a turbulent counterflow, as well

as the determination of ignition temperatures as a function of turbulent intensity and the other parameters investigated in laminar flows.
DTIC
Mathematical Models; Reaction Kinetics; Unsteady Aerodynamics; Laminar Flow; Diesel Engines; Ignition Temperature

20020008248 Rutgers - The State Univ., Dept. of Mechanical and Aerospace Engineering, Piscataway, NJ USA
Investigation of Preflame Reactions and Flame Propagation in Direct-Injection Diesel Enginees ***Final Report, 14 Sep. 1998-13 Sep 2001***
Rhee, T. K.; Sep. 2001; 115p; In English
Contract(s)/Grant(s): DAAG55-98-1-0494
Report No.(s): AD-A395729; ARO-38364.3-EG; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
It was to investigate (invisible) preflame reactions taking place in a direct injection compression ignition (DI-CI) engine during the ignition delay period and their effects on subsequent (visible) combustion reactions. The investigation was focused on the subject for an engine equipped with a high-pressure injection (HPI) unit in order to support the development of high-power-output diesel engines. The use of HPI was found to facilitate more air utilization in a DI-CI engine even operated with intake air at unusually high temperatures (e.g., encountered in uncooled engines). In order to achieve these goals, several new research methods were developed and advanced for the study, including Rutgers or Super Imaging System (SIS), spectrometric methods, and Rutgers Animation Program. The tools were employed on an optical single cylinder Cummins 903 engine. Among the significant results in system development is that the basic methods for high-speed imaging achievable at consecutive cycles, which shed some new insight into complex in-cylinder phenomena. The new research methods developed under the present ARO (Army Research Office) study permits observation of timed global pictures of preflame propagation under various engine-fuel conditions. New findings of the study include that the fuel injected into the cylinder immediately commences to chemically react, unlike the previous thought that there is a physical delay preceding actual chemical reactions. The reactions involved during the preflame reactions appear to be low-temperature kinetics controlled processes to affect the onset of visible-ray flame formation and combustion reactions. The preflame reaction species were found rapidly consumed as soon as the heat-releasing flame propagation took place.
DTIC
Diesel Engines; Flame Propagation; Reaction Kinetics; Chemical Reactions

20020008399 Oak Ridge National Lab., TN USA
Pressure Behavior of Actinides via Synchrotron Radiation
Haire, R. G.; Jan. 10, 2001; 11p; In English
Report No.(s): DE2001-774677; P00-109101; No Copyright; Avail: Department of Energy Information Bridge
Various aspects of performing high-pressure studies with radioactive f-elements using synchrotrons as sources of X-rays are discussed. For ultra-high pressures, intense well-focused beams of 10 to 30 microns in diameter and a single wavelength of 0.3 to 0.7 Angstroms are desired for angle dispersive diffraction measurements. Special considerations are necessary for the studies of transuranium elements under pressure at synchrotron facilities. Normally, with these actinides the pressure cells are prepared off-site and shipped to the synchrotron for study. Approved containment techniques must be provided to assure there is not a potential for the release of sample material. The goal of these high-pressure studies is to explore the fundamental science occurring as pressure is applied to the actinide samples. One of the primary effects of pressure is to reduce interatomic distances, and the goal is to ascertain the changes in bonding and electronic nature of the system that result as atoms and electronic orbitals are forced closer together. Concepts of the science being pursued with these f-elements are outlined. A brief discussion of the behavior of americium metal under pressure performed recently at the ESRF is provided as an example of the high-pressure research being performed with synchrotron radiation. Also discussed here is the important role synchrotrons play and the techniques/procedures employed in high-pressure studies with actinides.
NTIS
Actinide Series; Radioactive Isotopes; Synchrotron Radiation; Synchrotrons

20020008405 Argonne National Lab., IL USA
Short-Time-Response Measurements of Nitrogen Dioxide and Peroxyacetyl Nitrate by Fast Capillary Gas Chromatography with Luminol Detection
Marley, N. A.; Gaffney, J. S.; Drayton, P. J.; Dec. 07, 2000; 7p; In English
Report No.(s): DE2001-772112; ANL/ER/CP-103543; No Copyright; Avail: Department of Energy Information Bridge

The interaction of hydrocarbons and nitrogen oxides in sunlight to produce photochemical smog has been well studied over the years. In the past, the workhorse for the measurement of NO2 and NO was the chemiluminescent reaction with ozone. This method has detection limits of approximately 0.5 ppb in most commercial instruments, but it cannot detect NO2 directly; the instrument detects NO and uses hot catalytic surfaces to decompose all other nitrogen oxides (including NO2) to NO for detection. The main problem with the method is the inherent difficulty in detecting excited NO2, which emits over a broad region beginning at approximately 660 nm and has a maximum at 1270 nm, thus requiring a red-shifted photomultiplier for detection. The use of luminol for direct chemiluminescent detection of NO2 was demonstrated to have greater inherent sensitivity (detection limits of 5 ppt) than the indirect ozone chemiluminescence detection. In the luminol system, a gas-liquid reaction leads to light emission with a maximum at approximately 425 nm, at the maximum sensitivity for most photomultiplier tubes. This emission is responsible for the increased detection sensitivities. The biggest problem with this method for direct measurement of NO2 has been interference due to other soluble oxidants, particularly peroxyacyl nitrates (PANs).
NTIS
Atmospheric Chemistry; Chemiluminescence; Detection; Gas Chromatography; Nitrogen Dioxide

20020008617 North Carolina Univ., Dept. of Chemistry, Charlotte, NC USA
Rapid React IR Method for Monitoring Ester Interchange Catalysis ***Final Report, 1 Apr. 2000-31 Mar. 2001***
Gagne, Michel R.; Taylor, Alisha K.; Kissling, Rebecca M.; Aug. 24, 2001; 13p; In English; Original contains color images
Contract(s)/Grant(s): DAAG19-00-1-0021
Report No.(s): AD-A395734; ARO-40692.1-CH-RIP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The proposal funded the acquisition of a ReactIR spectrometer for use in ester interchange catalysis, a technique with potential utility in the destruction of chemical warfare (CW) agents. A method was developed for in situ monitoring of the decomposition of dimethyl methylphosphonate, a simulant for a P-based nerve agent. This method allowed a number of catalyst additives to be tested with the goal of optimizing performance.
DTIC
Esters; Catalysis; Chemical Reactions; Catalysts; Chemical Warfare

20020008638 Federal Energy Technology Center, Morgantown, WV USA
Anode, Cathode and Thin Film Studies for Low Temperature SOFC's
Huebner, W.; Anderson, H. U.; Nov. 01, 1999; 19p; In English
Report No.(s): DE2001-772380; DE-FG26-98FT40487-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this research the microstructure (left-right-arrow) property relations in solid oxide fuel cells (SOFC's) are being studied to better understand the mechanisms involved in cell performance. The overall aim is to fabricate SOFC's with controlled, stable, high performance microstructure. Most cathode studies were completed in the last DOE contract; studies during this year focused more on the influence of nonstoichiometry on the electrical performance. Studies indicate that nonstoichiometric La(x)SR(0.20)MnO3(x = 0.70, 0.75, and 0.79) cathode compositions exhibit the best properties. A series of studies using these compositions fired on at temperatures of 1100, 1200, 1300 and 1400 C were performed. In all instances, 1200 C was the optimum, with the x = 0.70 composition being the best. It has an overpotential of only 0.04V at 1 A/sq cm. SEM analyses indicated no second phases or interdiffusion is detectable. Studies on optimization of anode compositions yielded the optimum volume fraction of Ni (45vol%), the best sintering temperature/time (1400 C/2 h), and the best starting materials (glycine-nitrate derived NiO and normal YSZ). In essence these results simply reflect the optimum microstructure. As such, they are being used to guide the development of optimized anodes for lower temperature operation based on Cu/CeO2 cermets. Marked success has been achieved on the placement of thin YSZ electrolytes on porous Ni/YSZ electrodes. The process being used is a transfer technique in which dense YSZ films are initially fabricated on NaCl or polymeric substrates, followed by partial dissolution of the substrate and placement of the film on the porous substrate. This technique has allowed us to produce structures with film thicknesses ranging from 70 to 3000 nm, and grain sizes ranging from 2 to 300 nm. Cells based on electrolytes this thick should operate in the 400 - 700 C range.
NTIS
Anodes; Cathodes; Thin Films; Solid Oxide Fuel Cells

20020008646 Brookhaven National Lab., Upton, NY USA
Accelerators for ultrafast phenomena
Wishart, J. F.; Feb. 03, 2000; 16p; In English
Report No.(s): DE2000-752157; BNL-67147; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this chapter is to describe the technology that enables the investigation of radiation chemical phenomena at picosecond and femtosecond timescales. Several research groups have used femtosecond laser photoionization techniques to examine electron solvation dynamics and other processes relevant to early radiation chemistry events (1,2). This paper focuses on ultrafast studies using ionizing radiation, primarily electron beams, as the excitation source.
NTIS

20020008879 Oak Ridge National Lab. , TN USA
Lewis-Acid/Base Effects on Gallium Volatility in Molten Chlorides
Williams, D. F. ; Feb. 26, 2001 ; 26p ; In English
Report No.(s): DE2001-777695 ; ORNL/TM-2000/297 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

It has been proposed that GaCl(sub 3) can be removed by direct volatilization from a Pu-Ga alloy that is dissolved in a molten chloride salt. Although pure GaCl(sub 3) is quite volatile (boiling point, 201 C), the behavior of GaCl(sub 3) dissolved in chloride salts is different due to solution effects and is critically dependent on the composition of the solvent salt (i.e., its Lewis-acid/base character). In this report, the behavior of gallium in prototypical Lewis-acid and Lewis-base salts is compared. It was found that gallium volatility is suppressed in basic melts and enhanced in acidic melts. The implications of these results on the potential for simple gallium removal in molten salt systems are significant.
NTIS
Volatility ; Molten Salts ; Vaporizing ; Gallium ; Chlorides

20020008885 Oak Ridge National Lab. , TN USA
Irradiation Effects for the Pulsed Fast Neutron Analysis (PFNA) Cargo Interrogation System
Slater, C. O. ; Feb. 02, 2001 ; 554p ; In English
Report No.(s): DE2001-777672 ; ORNL/TM-2000/352 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

At the request of Safety and Ecology Corporation of Tennessee, radiation effects of the proposed Pulsed Fast Neutron Analysis (PFNA) Cargo Interrogation System have been examined. First, fissile cargo were examined to determine if a significant neutron signal would be observable during interrogation. Results indicated that ample multiplication would be seen for near critical bare targets. The water-reflected sphere showed relatively little multiplication. By implication, a fissile target shielded by hydrogenous cargo might not be detectable by neutron interrogation, particularly if reliance is placed on the neutron signal. The cargo may be detectable if use can be made of the ample increase in the photon signal. Second, dose rates were calculated at various locations within and just outside the facility building. These results showed that some dose rates may be higher than the target dose rate of 0.05 mrem/h. However, with limited exposure time, the total dose may be well below the allowed total dose. Lastly, estimates were made of the activation of structures and typical cargo. Most cargo will not be exposed long enough to be activated to levels of concern. On the other hand, portions of the structure may experience buildup of some radionuclides to levels of concern.
NTIS
Fast Neutrons ; Irradiation ; Radioactive Isotopes

20020009069 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA
Rotational Relaxation in Carbon Monoxide
Phipps, Stephen P. ; Jan. 2001 ; 182p ; In English
Report No.(s): AD-A396084 ; AFIT-CI01-298 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A02 , Microfiche

The results of an infrared-infrared pump-probe experiment investigating the rate of rotational self-relaxation in carbon monoxide are presented. Room-temperature CO molecules in the ground electronic and vibrational state were excited into the J = 0, 7, and 14 rotational levels of V = 2 using a pulsed, narrow-band optical parametric oscillator. A cw lead-salt diode laser, tuned to resonant transitions between v = 2 and 3, probed subsequent population changes in the J = 0 - 18 rotational levels. The time-dependent absorption linewidths of the probe transitions caused by the sub-Doppler GPO pump were also measured. The rotational populations were compared with theoretical predictions based on the statistical power gap, statistical power exponential gap, modified exponential gap, and energy corrected sudden rate constant models. The pump-probe data show that rotational energy transfer occurs faster and multi-quantum transitions occur more often than one would predict based on previously published CO-CO collision data. Homonuclear propensity is clearly evident in the pump-probe data but only for transitions with

small energy gaps. The linewidth measurements indicate the energy gap between rotational levels rather than the difference in angular momentum controls rotational energy transfer in carbon monoxide.
DTIC
Carbon Monoxide ; Optical Pumping

20020009125 Lawrence Livermore National Lab. , Livermore, CA USA
Research Program to Investigate the Fundamental Chemistry of Technetium ***Final Report***
Lukens, W. W. ; Fickes, M. J. ; Bucher, J. J. ; Burns, C. J. ; Edelstein, N. M. ; Dec. 23, 2000 ; 60p ; In English
Report No.(s): DE2001-775168 ; LBNL-47194 ; No Copyright ; Avail: Department of Energy Information Bridge
The purpose is to increase the basic scientific understanding of technetium chemistry to better understand the behavior of technetium in chemical environments relevant to DOE. Two important areas in need of study are the behavior of technetium in highly alkaline solutions similar to high-level nuclear waste, and its behavior in different waste forms. This research program addressed these two needs. Two separate approaches were used in this program. The first focus was to understand the basic solution chemistry of technetium, which underlies its behavior in the highly alkaline environment of the nuclear waste tanks located at the Savannah River and Hanford Sites. The specific problems at these sites are related to the anomalous oxidation state of technetium (Schroeder 1995). Although, at high pH, technetium should exist in its highest oxidation state as TcO4(-), soluble, lower-valent technetium species have been observed in certain wastes. The specific unknowns that this program sought to answer are the nature of lower valent technetium species that can be formed in highly alkaline solution and whether pertechnetate undergoes radiolytic reduction in highly alkaline solution when nitrate is present in excess. The second focus area is the behavior of technetium immobilized in various waste forms. The behavior of technetium in cement wastes was examined to gain information about its long-term stability. Specifically, this research examined the oxidation of reduced technetium species by components present in high-level waste that are incorporated into cement waste along with technetium.
NTIS
Technetium ; Radiolysis ; Radioactive Wastes ; Chemical Reactions

20020009166 State Univ. of New York , Research Foundation , Amherst, NY USA
Lithium Intercalation of Carbon-Nanotube Electrodes ***Final Report , 1 Dec. 1999-31 Oct. 2000***
Shaw, David T. ; Sep. 24, 2001 ; 6p ; In English
Contract(s)/Grant(s): F49620-00-1-0203 ; Proj-2303
Report No.(s): AD-A395600 ; AFRL-SR-BL-TR-01-0533 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
High aligned multiwall nanotubes (MCNTs) have been obtained by catalytic decomposition of carbon-containing organic compounds by plasma-enhanced hot-filament chemical vapor deposition (PEHFCVD) on nickel substrates. Such a MCNT-based structure serves as a convenient material for studying the electrode process of lithium-ion intercalation. Lithium insertion electrochemical measurements were performed and charge/discharge capacities were determined. Results showed the MCNT arrays inserted and de-inserted lithium with considerable irreversible capacities. This may have resulted from the formation of acetone/alcohol insoluble films on MCNT arrays. Future studies should concentrate on the effects of MCNT-array conditions (e.g., opened or closed ends, nanotube size, length and density) on the intercalation irreversibilities.
DTIC
Electrodes ; Carbon Nanotubes ; Lithium ; Intercalation ; Electrochemistry

20020009499 Oak Ridge National Lab. , TN USA
Ozone treatment of soluble organics in produced water
Klasson, K. T. ; Mar. 20, 2001 ; 18p ; In English
Report No.(s): DE2001-777770 ; R01-110251 ; No Copyright ; Avail: Department of Energy Information Bridge
Oil production is shifting from shallow wells (0-650 ft water depth) to offshore, deep water operations (2,600 ft.). Production from these operations is now approaching 20%. by 2007, it is projected that as much as 70% of the U.S. oil production will be from deep water operations. The crude oil from these deep wells is more polar, thus increasing the amount of dissolved hydrocarbons in the produced water. Early data from Gulf of Mexico (GOM) wells indicate that the problem with soluble organics will increase significantly as deep water production increases. Existing physical/chemical treatment technologies used to remove dispersed oil from produced water will not remove dissolved organics. GOM operations are rapidly moving toward design of high capacity platforms that will require compact, low cost, efficient treatment processes to comply with current and future water quality regulations. This project is an extension of previous research to improve the applicability of ozonation and will help address the petroleum industry-wide problem of treating water containing soluble organics. The goal of this project is to maximize oxidation of water soluble organics during a single pass operation. The project investigates: (1) oxidant production by

electrochemical and sonochemical methods, (2) increasing the mass transfer rate in the reactor by forming microbubbles during ozone injection into the produced water, and (3) using ultraviolet irradiation to enhance the reaction if needed. Industrial collaborators include Chevron, Shell, Phillips, BP Amoco, Statoil, and Marathon Oil through a joint project with the Petroleum Environmental Research Forum (PERF). The research and demonstration program consists of three phases: (1) Laboratory testing in batch reactors to compare effectiveness of organics destruction using corona discharge ozone generation methods with hydrogen peroxide generated sonochemically and to evaluate the enhancement of destruction by UV (ultraviolet) light and microbubble spraying; (2) Continuous flow studies to determine the efficacy of various contactors, the dependency of organics destruction on process variables, and scale-up issues; and (3) Field testing of a prototype system in close collaboration with an industrial partner to generate performance data suitable for scale-up and economic evaluation.
NTIS
Water Treatment ; Organic Compounds ; Ozone ; Crude Oil ; Underwater Resources

20020009575 Brookhaven National Lab. , Upton, NY USA
Cathodic reduction of passive films on iron in borate and phosphate buffer ph 8.4: different mechanisms revealed by in situ techniques
Schmuki, ; Virtanen, ; Isaacs, ; Mar. 25, 2001 ; 10p ; In English
Report No.(s): DE2001-780779 ; BNL-68216 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The electrochemical behavior of passive Fe and thin, sputter-deposited films of Fe(sub 2)O(sub 3) was studied in borate and phosphate buffer pH 8.4 solutions. Cyclic voltammograms and in situ light absorption measurements--which enable the monitoring of the oxide film thickness--indicate a similar behavior of the Fe electrode in both pH 8.4 solution, especially a presence of a oxide-free surface at low cathodic potentials. However, X-ray absorption near edge structure (XANES) studies--which allow a simultaneous monitoring of changes in the samples' average valency and thickness - reveal that the reactions taking place during reduction of the passive film on iron are completely different for the two electrolytes. In borate buffer (pH 8.4), reduction leads to a complete dissolution of the passive film and the end product of reduction is soluble Fe(2+). In phosphate buffer (pH 8.4), there is no dissolution in a direct step to low cathodic potentials, but the resulting reduction product is metallic iron. Hence, the formation of the bare oxide-free metal surface at cathodic potentials takes place by different mechanisms in the two pH 8.4 solutions, depending on the type of anion present in the solution.
NTIS
Borates ; Iron ; Electrochemical Corrosion ; Electromagnetic Absorption ; Absorption Spectroscopy

20020009586 Brookhaven National Lab. , Upton, NY USA
Phase retrieval from two defocused images by the transport of intensity equation formalism with fast fourier transform
Volkov, ; Zhu, ; Aug. 05, 2001 ; 2p ; In English
Report No.(s): DE2001-780679 ; BNL-68154 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The problem of phase retrieval from intensity measurements plays an important role in many fields of physical research, e.g. optics, electron and x-ray microscopy, crystallography, diffraction tomography and others. In practice the recorded images contain information only on the intensity distribution I(x,y) = (Psi)*(Psi) = (vert-bar)A(vert-bar)(sup 2) of the imaging wave function (Psi) = A*exp(-i(var-phi)) and the phase information (var-phi)(x,y) is usually lost. In general, the phase problem can be solved either by special holographic/interferometric methods, or by non-interferometric approaches based on intensity measurements in far Fraunhofer zone or in the Fresnel zone at two adjacent planes orthogonal to the optical axis. The latter approach uses the transport-of-intensity equation (TIE) formalism, introduced originally by Teague (1) and developed later in (2). Applications of TIE to nonmagnetic materials and magnetic inductance mapping were successfully made in (3,4). However, this approach still needs further improvement both in mathematics and in practical solutions, since the result is very sensitive to many experimental parameters.
NTIS
Phase Transformations ; Image Processing

20020009612 Department of Energy , Aiken, SC USA
Convalency of Neptunium(IV) Organometallics from (sup 237)Np Moessbauer Spectra
Karraker, D. G. ; Mar. 15, 2001 ; 28p ; In English
Report No.(s): DE2001-780257 ; DP-MS-79-93-REV-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The results of Np-237 Moessbauer spectra provide a picture of the bonding of Np-237 organometallics and their uranium analogues that could be obtained by no other method. In essence, Moessbauer results give a view of the compound from the

position of the neptunium nucleus; the work summarized in this paper shows that the Np-237 isomer shift results are consistent with available data and provide a useful picture of the bonding in actinide organometallics.
NTIS
Mossbauer Effect ; Neptunium Isotopes ; Organometallic Compounds ; Isomers ; Uranium

20020009641 Brookhaven National Lab. , Upton, NY USA
Peroxynitrite chemistry
Lymar, S. V. ; Nov. 29, 2000 ; 14p ; In English
Report No.(s): DE2001-777713 ; BNL-67862 ; KC030101 ; No Copyright ; Avail: Department of Energy Information Bridge
This century old area of research has been experiencing a renaissance during the last decade, with the annual number of publications on the subject increasing from only one in 1990 to nearly 200 in the late-1990s. This renewed interest is stimulated by the discovery of biological roles of nitric oxide, distinguished by the 1998 Nobel prize, and the recognition that the conversion of nitric oxide into peroxynitrite may play major roles in human diseases associated with oxidative stress and in cellular defense against invading pathogens. Peroxynitrite (ONOO(sup (minus)))is a structural isomer of nitrate (NO(sub 3)(sup (minus))) that contains a peroxo bond. The physiological route to ONOO(sup (minus)) is provided by the combination of nitric oxide ((center-dot)NO) with superoxide ((center-dot)O(sub 2)(sup (minus))), an extremely rapid reaction occurring upon every encounter of these radicals (the upper dot denotes radical species). Both (center-dot)NO and (center-dot)O(sub 2)(sup (minus)) are the oxygen metabolic products simultaneously generated in a number of cell types within a human body. Compared to its precursors, peroxynitrite is a much stronger oxidant capable of oxidizing proteins, nucleic acids, and lipids.
NTIS
Nitric Oxide ; Isomers ; Organic Chemistry ; Nitrites ; Pathogens ; Inorganic Peroxides

20020009644 Oak Ridge National Lab. , TN USA
Sub-Microsecond Decay Time Phosphors for Pressure Sensitive Paint Applications
Allison, S. W. ; Mar. 22, 2001 ; 7p ; In English
Report No.(s): DE2001-777706 ; P01-110140 ; No Copyright ; Avail: Department of Energy Information Bridge
The results suggest that garnet phosphors can be engineered to function thermographically over desired temperature ranges by adjusting gallium content. Substituting gadolinium for the yttrium in the host matrix also has an effect but it is not as large. A silicate phosphor showed the greatest temperature dependence though it could not be excited to fluoresce by a blue LED. All the garnet phosphors could be excited with such a blue source. Two phosphors tested showed an increase in intensity with temperature. Other garnet and silicate materials as mentioned above will be tested in the future. In addition, some perovskite phosphors, such as GdAlO3:Ce, will also be investigated.
NTIS
Perovskites ; Pressure Sensitive Paints ; Thermography ; Gadolinium-Gallium Garnet ; Phosphors ; Fluorescence

20020009652 Army Armament Research, Development and Engineering Center , Benet Labs. , Watervliet, NY USA
Chemical Equilibrium Code with Compressibility for Ablation and Erosion Calculations ***Final Report***
Dunn, S. ; Coats, D. ; Sopok, S. ; Oct. 2001 ; 16p ; In English ; Presented at the JANNAF Combustion Meeting (33rd), Monterey, CA, October 1996. Prepared in collaboration with Software and Engineering Associates, Inc., Carson City, NV
Contract(s)/Grant(s): Proj-622624H1800
Report No.(s): AD-A396193 ; ARCCB-TR-01021 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A version of the LeRC CET chemical equilibrium code, which includes B(sub a) value calculations for thermochemical erosion, was modified to include nonideal gas effects. The compressibility models that were added to the code were the BKW, Corner/Lennard-Jones Potential(LJP) and NBS models. Compressibility effects on species production for a variety of gun propellants were computed. These results were compared to the standard BLAKE code and were in agreement within the repeatability of the BLAKE code results. The effects of compressibility on values of the erosion rate blowing parameter, B(sub a), and hot wall/gas enthalpy, h(sub gw), were computed.
DTIC
Ablation ; Erosion ; Compressibility ; Compressibility Effects ; Chemical Equilibrium

20020009686 Department of Energy , Aiken, SC USA
Chemical Resistivity of Silver Mordenite and Berl Sadles
Holcomb, H. P. ; May 17, 2001 ; 7p ; In English
Report No.(s): DE2001-781332 ; DPSPU-85-272-91 ; No Copyright ; Avail: Department of Energy Information Bridge ,

Microfiche

This report discusses results of testing to determine the chemical resistance of pellets of silver mordenite and silver mordenite, reduced form. For comparison Berl saddles were tested under similar conditions. Silver mordenite has been proposed as a replacement for the saddles that remove iodine in the off-gas treatment system from the canyon dissolvers.

NTIS

Silver ; Corrosion Resistance

20020010130 National Inst. of Standards and Technology , (BFRL) , Gaithersburg, MD USA

User's Guide for FAST: Engineering Tools for Estimating Fire Growth and Smoke Transport

Peacock, R. D. ; Reneke, P. A. ; Jones, W. W. ; Bukowski, R. W. ; Forney, G. P. ; 2000 ; 210p ; In English

Report No.(s): PB2000-101914 ; NIST/SP-921 ; No Copyright ; Avail: CASI ; A03 , Microfiche ; A10 , Hardcopy

FAST is a collection of fire modeling tools which uses the underlying fire model CFAST and adds the routines of FIREFORM to provide engineering calculations of fire phenomena in compartmented structures. This manual provides documentation and examples for using FAST. It describes how to install the software on a computer and provides a guide for the use of FAST using examples.

NTIS

Fires ; Smoke ; Transport Properties ; Computer Programs ; User Manuals (Computer Programs) ; Computerized Simulation

20020010132 National Inst. of Standards and Technology , (BFRL) , Gaithersburg, MD USA

Technical Reference for CFAST: An Engineering Tool for Estimating Fire and Smoke Transport

Jones, W. W. ; Forney, G. P. ; Peacock, R. D. ; Reneke, P. A. ; 2000 ; 198p ; In English

Report No.(s): PB2000-100842 ; NIST/TN-1431 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A03 , Microfiche

CFAST is a zone model capable of predicting the environment in a multi-compartment structure subjected to a fire. It calculates the time evolving distribution of smoke and fire gases and the temperature throughout a building during a user-specified fire. This report describes the equations which constitute the model, the physical basis for these equations, data which are used by the model, and details of the operation of the computer program implementing the model. The means by which one can add new phenomena are detailed, as are the variables and structure of the model. A set of comparisons between the model and a range of real-scale fire experiments is presented. In general, the CFAST model compares favorably with the experiments examined in this report. Although differences between the model and the experiments were clear, they can be explained by limitations of the model and of the experiments.

NTIS

Computer Programs ; Fires ; Smoke ; Transport Properties ; Buildings

20020010153 Thermoscience Inst. , Moffett Field, CA USA

Computed Potential Energy Surfaces and Minimum Energy Pathway for Chemical Reactions

Walch, Stephen P. , Thermoscience Inst. , USA ; [1994] ; 1p ; In English

Contract(s)/Grant(s): RTOP 537-02-20 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Computed potential energy surfaces are often required for computation of such observables as rate constants as a function of temperature, product branching ratios, and other detailed properties. We have found that computation of the stationary points/reaction pathways using CASSCF/derivative methods, followed by use of the internally contracted CI method with the Dunning correlation consistent basis sets to obtain accurate energetics, gives useful results for a number of chemically important systems. Applications to complex reactions leading to NO and soot formation in hydrocarbon combustion are discussed.

Author

Potential Energy ; Chemical Reactions ; Reaction Kinetics

20020010191 Federal Energy Technology Center , Morgantown, WV USA

Tunable composite membranes for gas separations

Ferraris, J. P. ; Balkus, K. J. ; Musselman, I. H. ; Oct. 01, 1998 ; 15p ; In English

Report No.(s): DE2001-780905 ; DE-FG22-94PC94222-16 ; No Copyright ; Avail: Department of Energy Information Bridge

No abstract available.

NTIS

Composite Materials ; Membranes ; Fabrication ; Transport Theory ; Gases

20020010192 Federal Energy Technology Center , Morgantown, WV USA

Tunable composite membranes for gas separations

Ferraris, J. P. ; Balkus, K. J. ; Musselman, I. H. ; Jan. 01, 1999 ; 16p ; In English

Report No.(s): DE2001-780907 ; DE-FG22-94PC94222-17 ; No Copyright ; Avail: Department of Energy Information Bridge

Poly 2-(3-thienyl)ethylacetate (PAET) was synthesized and solution cast as thin films to form dense membranes. These membranes are mechanically robust and are redox active, holding out promise as gas separation materials. The permeability properties of PAET membranes were evaluated for N2 (0.048 (+-) 0.008 Barrers), O2 (0.24 (+-) 0.02 Barrers), CH4 (0.081 (+-) 0.005 Barrers), and CO2 (1.4 (+-) 0.1 Barrers). The corresponding selectivity values ((alpha)) were: O2/N2 = 5.1, CO2/N2 = 29, and CO2/CH4 = 18.

NTIS

Synthesis (Chemistry) ; Gases ; Composite Materials ; Membranes ; Polymer Chemistry ; Permeability

20020010198 Pennsylvania State Univ. , University Park, PA USA

Development of Advanced In-Situ Techniques for Chemistry Monitoring and Corrosion Mitigation in SCWO Environments

Macdonald, D. D. ; Lvov, S. N. ; Mar. 31, 2000 ; 42p ; In English

Report No.(s): DE2001-781020 ; DOE/ER/62303 ; No Copyright ; Avail: Department of Energy Information Bridge

This project is developing sensing technologies and corrosion monitoring techniques for use in super critical water oxidation (SCWO) systems to reduce the volume of mixed low-level nuclear waste by oxidizing organic components in a closed cycle system where CO2 and other gaseous oxides are produced, leaving the radioactive elements concentrated in ash. The technique uses water at supercritical temperatures under highly oxidized conditions by maintaining a high fugacity of molecular oxygen in the system, which causes high corrosion rates of even the most corrosive resistant reactor materials. This project significantly addresses the high corrosion shortcoming through development of (a) advanced electrodes and sensors for in situ potentiometric monitoring of pH in high subcritical and supercritical aqueous solutions, (b) an approach for evaluating the association constants for 1-1 aqueous electrolytes using a flow-through electrochemical thermocell; (c) an electrochemical noise sensor for the in situ measurement of corrosion rate in subcritical and supercritical aqueous systems; (d) a model for estimating the effect of pressure on reaction rates, including corrosion reactions, in high subcritical and supercritical aqueous systems. The project achieved all objectives, except for installing some of the sensors into a fully operating SCWO system.

NTIS

Corrosion ; In Situ Measurement ; Oxidation ; Reaction Kinetics ; Supercritical Fluids ; Electrolytes ; Water Temperature

20020010199 Department of Energy , Aiken, SC USA

Effect of Nitrite/Nitrate concentrations on Corrosivity of Washed Precipitate

Congdon, J. W. ; Mar. 28, 2001 ; 11p ; In English

Report No.(s): DE2001-781032 ; DPST-86-604 ; No Copyright ; Avail: Department of Energy Information Bridge

Cyclic polarization scans were performed using A-537 carbon steel in simulated washed precipitate solutions of various nitrite and nitrate concentrations. The results of this study indicate that nitrate is an aggressive anion in washed precipitate. Furthermore, a quantitative linear log-log relationship between the minimum effective nitrite concentration and the nitrate concentration was established for washed precipitate with other ions at their average compositions.

NTIS

Nitrates ; Nitrites ; Corrosion ; Carbon Steels ; Precipitates

20020010223 Brookhaven National Lab. , Upton, NY USA

In situ studies of corrosion using x-ray absorption near spectroscopy (xanes)

Isaacs, H. S. ; Schmuki, P. ; Virtanen, S. ; Mar. 25, 2001 ; 12p ; In English

Report No.(s): DE2001-782049 ; BNL-68340 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Applications of x-ray absorption near-edge spectroscopy (XANES) and the design of cells for in situ corrosion studies are reviewed. Passive films studies require very thin metal or alloy layers be used having a thickness of the order of the films formed because of penetration of the x-ray beam into the metal substrate. The depth of penetration in water also limits the thickness of solutions that can be used because of water reduces the x-ray intensity. Solution thickness must also be limited in studies of conversion layer formation studies because the masking of the Cr in solution. Illustrative examples are taken from the anodic

behavior of Al-Cr alloys, the growth of passive films on Fe and stainless steels, and the formation of chromate conversion layers on Al.
NTIS
Absorption ; Corrosion ; Spectroscopy ; Absorption Spectroscopy ; Aluminum Alloys

20020010224 Brookhaven National Lab. , Upton, NY USA
Characterization of salt particle induced corrosion processes by synchrotron generated x-ray fluorescence and complementary surface analysis tools
Neufeld, A. K. ; Cole, I. S. ; Bond, A. M. ; Isaacs, H. S. ; Furman, S. A. ; Mar. 25, 2001 ; 11p ; In English
Report No.(s): DE2001-782050 ; BNL-68339 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The benefits of using synchrotron-generated X-rays and X-ray fluorescence analysis in combination with other surface analysis techniques have been demonstrated. In studies of salt-induced corrosion, for example, the detection of Rb ions in the area of secondary spreading when salt-containing micro-droplets are placed on zinc surfaces, further supports a mechanism involving cation transport during the corrosion and spreading of corrosive salt on exposed metal surfaces. Specifically, the new analytical data shows that: (a) cations are transported radially from a primary drop formed from a salt deposit in a thin film of secondary spreading around the drop; (b) subsequently, micro-pools are formed in the area of secondary spreading, and it is likely that cations transported within the thin film accumulate in these micro-pools until the area is dehydrated; (c) the mechanism of cation transport into the area of secondary spreading does not include transport of the anions; and (d) hydroxide is the counter ion formed from oxygen reduction at the metal surface within the spreading layer. Data relevant to iron corrosion is also presented and the distinct differences relative to the zinc situation are discussed.
NTIS
X Ray Fluorescence ; Hydroxides ; Dehydration ; Corrosion ; Synchrotrons

20020010227 Lawrence Livermore National Lab. , Livermore, CA USA
Thermostatics and thermokinetics of closed combustion systems
Kuhl, A. L. ; Oppenheim, A. K. ; Spektor, R. ; Jun. 18, 1999 ; 9p ; In English
Report No.(s): DE2001-9372 ; UCRL-JC-134676 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The paper presents a formalism for defining the intrinsically non-linear behavior of a closed combustion system in terms especially suited for its control. Its implementation is illustrated by application to a diesel engine.
NTIS
Combustion ; Diesel Engines

20020010228 Lawrence Livermore National Lab. , Livermore, CA USA
After-burning of nitropenta products in a calorimeter
Kuhl, A. L. ; Neuwald, P. ; Reichenbach, H. ; Jun. 18, 1999 ; 6p ; In English
Report No.(s): DE2001-9374 ; UCRL-JC-134680 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Explored here are the 'after-burning' effects for explosions of Nitropenta (NP) charges in air. Detonation of the charge transforms the solid explosive (C HNO 5 8412 , also known as PETN) into gaseous products that are rich in carbon and CO, which subsequently act as a fuel. When these hot ((approximately)3500 K) gases mix with air, rapid combustion (after-burning) takes place. The dynamics of this exothermic process was studied in 'pressure calorimeter' experiments performed at EMI.
NTIS
Afterburning ; Explosions ; Combustion ; Calorimeters

20020010229 Lawrence Livermore National Lab. , Livermore, CA USA
Combustion of TNT products in a confined explosion
Ferguson, R. E. ; Kuhl, A. L. ; Oppenheim, A. K. ; Jun. 18, 1999 ; 6p ; In English
Report No.(s): DE2001-9375 ; UCRL-JC-134681 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The effects of turbulent combustion of detonation products gases in a confined explosion are explored via laboratory experiments and high-resolution numerical simulations. The expanded products from the detonation of a TNT charge are rich in C and CO, which act as a fuel. When these hot gases mix with air, they are oxidized to CO2, thereby releasing 2482 Cal/g in addition to the 1093 Cal/g deposited by the detonation wave. In this case, the exothermic power is controlled by the turbulent mixing rate, rather than by chemistry. A kinetic law of turbulent combustion is suggested for this process. Pressure histories from

the numerical simulations were in good agreement with the experimental measurements--demonstrating that the numerical model contains the fundamental mechanism that controls the exothermic process.
NTIS
Combustion ; Explosions ; Combustion Products ; Turbulent Combustion ; Exothermic Reactions ; Carbon Dioxide

20020010383 Federal Energy Technology Center , Morgantown, WV USA
Tunable composite membranes for gas separations
Ferraris, J. P. ; Balkus, K. J. ; Musselman, I. H. ; Jul. 01, 1998 ; 13p ; In English
Report No.(s): DE2001-780902 ; DE-FG22-94PC94222-15 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Smooth, dense, uniformly thick membranes were solution cast from poly(3-octylthiophene) (POT) and their permeability properties were investigated for N(sub 2), O(sub 2), CH(sub 4), and CO(sub 2) (P(sub N(sub 2)) = 5.8 (+-) 0.4, P(sub O(sub 2)) = 15.6 (+-) 0.8, P(sub CH(sub 4)) = 17.8 (+-) 1.4, P(sub CO(sub 2)) = 63.6 (+-) 2.2 Barrers), and selectivity properties were calculated ((alpha)(sub O(sub 2)/N(sub 2)) = 2.7 (+-) 0.2, (alpha)(sub CO(sub 2)/N(sub 2)) = 11.2 (+-) 0.8, (alpha)(sub CO(sub 2)/CH(sub 4)) = 3.6 (+-) 0.2). NaY/POT composite membranes (20, 30, and 40% w/w zeolite) were prepared by stirring the polymer into a zeolitic suspension. Facilitated transport of gases (N(sub 2), O(sub 2), CH(sub 4), and CO(sub 2)) was observed for each of the zeolite loadings, the magnitude of which depended on the chemical nature of the gas and polymer/zeolite-penetrant interaction. Maximum facilitation was observed for 40% NaY/POT composite membranes (Facilitation ratio of N(sub 2) = 0.38 (+-) 0.03, O(sub 2) = 0.56 (+-) 0.02, CH(sub 4) = 0.13 (+-) 0.01, CO(sub 2) = 0.71 (+-) 0.02). An increase in the selectivity of gases was also observed for all zeolite loadings.
NTIS
Membranes ; Permeability ; Composite Materials

20020010632 Pacific Northwest National Lab. , Richland, WA USA
Model Calculations of Continuous-Wave Laser Ionization of Krypton
Cannon, B. D. ; Jul. 27, 1999 ; 27p ; In English
Report No.(s): DE2001-9150 ; PNNL-12253 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report describes modeling of a scheme that uses continuous-wave (CW) lasers to ionize selected isotopes of krypton with high isotopic selectivity. The models predict that combining this ionization scheme with mass spectrometric measurement of the resulting ions can be the basis for ultra-sensitive methods to measure Kr-85 in the presence of a 10(exp 11) excess of the stable krypton isotopes. Two experimental setups are considered in this model: the first setup is for krypton as a static gas, the second is for krypton in an atomic beam. In the static gas experiment, for a total krypton press of 10(exp -4) torr and 10 W of power in the cavity, the model predicts a total krypton ion current of 4.6 x 10(exp 8) s(sup -1) and for a Kr-85/Kr of 10(exp -11) a Kr-85 ion current of 3.5 s(sup -1) or about 10,000 per hour. The atomic beam setup allowed higher isotopic selectivity; the model predicts a Kr-85 ion current of 18 s(sup -1) or 65,000 per hour.
NTIS
Krypton 85 ; Ionization ; Continuous Wave Lasers ; Ion Currents

20020010898 NASA Ames Research Center , Moffett Field, CA USA
What is the Structure of FeC5H6(+)?
Bauschlicher, Charles W., Jr. , NASA Ames Research Center , USA ; Sodupe, Mariona , Autonoma de Barcelona Univ. , Spain ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 232-01-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Calculations performed using both density functional theory (DFT) and the modified coupled-pair functional (MCPF) approach show that FeC5H6(+) is more stable than HFeC5H5(+) by about 10 kcal/mol. The ground state of FeC5H6(+) is a quartet state derived from the 3d(sup 7) occupation of Fe+. For HFeC5H6(+), the MCPF 5 approach yields a sextet ground state while DFT yields a quartet; however, these two states are close in energy at both levels of theory.
Author
Molecular Structure ; Energy Levels

20020010905 Thermoscience Inst. , Moffett Field, CA USA
Characterization of the Minimum Energy Paths for the Reactions of CH(X(sup 2 Pi) and (1)CH2 with C2H2
Walch, Stephen P. , Thermoscience Inst. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 537-02-20 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The reactions of CH(sup 2 Pi) and singlet methylene (1)CH2 with acetylene lead to intermediates which may be important in soot formation. CH(sup 2 Pi) + acetylene leads to CHCHCH (C3H3), CHCCH (C3H2), and propargyl (CH2CCH). (1)CH2 + acetylene leads to cyclopropene and propargyl. All of these reaction products are formed with no barrier. Miller and Melius have previously discussed the dimerization of propargyl to give benzene. C3H3 and C3H2 can dimerize with no barrier to give benzene and para-benzyne, respectively. C3H3 and C3H2 can also add to smaller polynuclear aromatic hydrocarbons (PAH), and may be important species in forming larger PAH or fullerenes.
Author
Polycyclic Aromatic Hydrocarbons ; Reaction Products ; Benzene ; Fullerenes ; Methylene

20020010934 Federal Energy Technology Center , Morgantown, WV USA
Pillared Clays as Superior Catalysts for Selective Catalytic Reduction of Nitric Oxide
Yang, R. T. ; Long, R. Q. ; Mar. 31, 1999 ; 34p ; In English
Report No.(s): DE2001-9038 ; DE-FG22-96PC96206-05 ; No Copyright ; Avail: Department of Energy Information Bridge
In the last annual reports, we reported Cu-exchanged pillared clays as superior selective catalytic reduction (SCR) catalysts. During the past year we explored the possibilities with MCM-41, a new class of molecular sieve. In this report, Rh exchanged Al-MCM-41 is studied for the SCR of NO by C3H6 in the presence of excess oxygen. It shows a high activity in converting NO to N2 and N2O at low temperatures. In situ FT-IR studies indicate that Rh-NO(+) species (1910-1898/cm) is formed on the Rh-Al-MCM-41 catalyst in flowing NO/He, NO+O2/He and NO+C3H6+O2/He at 100-350 C. This species is quite active in reacting with propylene and/or propylene adspecies (e.g., pi-C3H5, polyene, etc.) at 250 C in the presence/absence of oxygen, leading to the formation of the isocyanate species (Rh-NCO, at 2174/cm, CO and CO2. Rh-NCO is also detected under reaction conditions. A possible reaction pathway for reduction of NO by C3H6 is proposed. In the SCR reaction, Rh-NO(+) and propylene adspecies react to generate the Rh-NCO species, then Rh-NCO reacts with O2, NO and NO2 to produce N2, N2O and CO2. Rh-NO(+) and Rh-NCO species are two main intermediates for the SCR reaction on Rh-Al-MCM-41 catalyst.
NTIS
Catalysts ; Clays ; Nitric Oxide

20020010935 Sandia National Labs. , Albuquerque, NM USA
Gas Phase Chemical Detection with an Integrated Chemical Analysis System
Baca, A. G. ; Casalnuovo, S. A. ; Frye-Mason, G. C. ; Heller, E. J. ; Hietala, S. L. ; Jul. 08, 1999 ; 8p ; In English
Report No.(s): DE2001-9015 ; SAND99-1810C ; No Copyright ; Avail: Department of Energy Information Bridge
Microfabrication technology has been applied to the development of a miniature, multi-channel gas phase chemical laboratory that provides fast response, small size, and enhanced versatility and chemical discrimination. Each analysis channel includes a sample concentrator followed by a gas chromatographic separator and a chemically selective surface acoustic wave detector array to achieve high sensitivity and selectivity. The performance of the components, individually and collectively, is described. The design and performance of novel micromachined acoustic wave devices, with the potential for improved chemical sensitivity, are also described.
NTIS
Chemical Analysis ; Detection ; Sound Waves ; Vapor Phases ; Gas Analysis

20020010950 Sandia National Labs. , Albuquerque, NM USA
Extinction Limits of Nonadiabatic, Catalyst-Assisted Flames in Stagnation-Point Flow
Margolis, S. B. ; Gardner, T. J. ; Feb. 01, 2001 ; 30p ; In English
Report No.(s): DE2001-781978 ; SAND2001-8172 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
An idealized geometry corresponding to a premixed flame in stagnation-point flow is used to investigate the effects of catalysis on extending the extinction limits of on adiabatic stretched flames. Specifically, a surface catalytic reaction is assumed to occur on the stagnation plane, thereby augmenting combustion in the bulk gas with a exothermic surface reaction characterized by a reduced activation energy. Assuming the activation energies remain large, an asymptotic analysis of the resulting flame structure yields a formula for the extinction limit as a function of various parameters. In particular, it is demonstrated that the presence of a surface catalyst can extend the burning regime, thus counterbalancing the effects of heat loss and flame stretch that tend to shrink it. The analysis is relevant to small-volume combustors, where the increased surface-to-volume ratio can lead to extinction of the nonadiabatic flame in the absence of a catalyst.
NTIS
Catalysts ; Combustion ; Extinction ; Premixed Flames ; Stagnation Point

20020011015 Thermoscience Inst. , Moffett Field, CA USA

Computed Potential Energy Surfaces and Minimum Energy Pathways for Chemical Reactions

Walch, Stephen P. , Thermoscience Inst. , USA ; [1994] ; 1p ; In English ; International Symposium on Molecular Dynamics , 24-26 Oct. 1994 , Minneapolis, MN , USA

Contract(s)/Grant(s): NCC2-478 ; NAS2-14031 ; RTOP 537-02-20 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Computed potential energy surfaces are often required for computation of such parameters as rate constants as a function of temperature, product branching ratios, and other detailed properties. For some dynamics methods, global potential energy surfaces are required. In this case, it is necessary to obtain the energy at a complete sampling of all the possible arrangements of the nuclei, which are energetically accessible, and then a fitting function must be obtained to interpolate between the computed points. In other cases, characterization of the stationary points and the reaction pathway connecting them is sufficient. These properties may be readily obtained using analytical derivative methods. We have found that computation of the stationary points/reaction pathways using CASSCF/derivative methods, followed by use of the internally contracted CI method to obtain accurate energetics, gives usefull results for a number of chemically important systems. The talk will focus on a number of applications including global potential energy surfaces, H + O2, H + N2, O(3p) + H2, and reaction pathways for complex reactions, including reactions leading to NO and soot formation in hydrocarbon combustion.

Author

Chemical Reactions ; Potential Energy ; Hydrocarbon Combustion ; Derivation ; Temperature Ratio

20020011019 NASA Ames Research Center , Moffett Field, CA USA

Computed Minimum Energy Pathway for Isomerization in Ketene

Walch, Stephen P. , Thermoscience Inst. , USA ; Lee, Timothy J. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English

Contract(s)/Grant(s): RTOP 537-02-20 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A minimum energy pathway for interchange of the CH groups in ketene via a C2v structure has been obtained using complete active space self consistent field (CASSCF) derivative methods with a polarized valence double zeta basis set to define the reaction pathway followed by multi-reference internally contracted configuration interaction (ICCI) calculations with a [3s3p2d/3s2p] basis set to determine the energetics. Qualitatively, the C2v structure is found to be a shallow minimum on the potential energy surface separated from ketene by a small barrier (0.2 kcal/mol), a second minimum, and a larger barrier (3.0 kcal/mol). The minimum energy pathway leading from the C2v minimum to ketene starts by simultaneous rotation of the farther CH group out of the plane and away from the oxygen followed by increase of the CCO angle and subsequent 1,2-migration of the H of the nearer CH group toward the carbon of the farther CH group.

Author

Ketenes ; Configuration Interaction ; Isomerization ; Potential Energy ; Oxygen ; Carbon

20020011143 NASA Ames Research Center , Moffett Field, CA USA

Theoretical Study of the Low-Lying States of MgN+2

Maitre, Philippe , NASA Ames Research Center , USA ; Bauschlicher, Charles W., Jr. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English

Contract(s)/Grant(s): RTOP 232-01-04 ; No Copyright ; Abstract Only; Available from CASI only as part of the entire parent document

The structure and binding energies of the low-lying states of MgN2+ have been computed at the multireference configuration interaction level of theory. The effect of Mg inner-shell correlation have been included using the core-polarization potential method. The charge-quadrupole interaction results in a linear 2Sigma+ ground state as expected. The excited states can arise from either the interaction of the 2-P state of Mg+ with N2 or from charge transfer states with Mg(sup 2+)N2- bonding character. The lowest lying excited state, 2-B2, is mixture of these two mechanisms, which results in a C2v, geometry with Mg atoms sitting at the N2 bond midpoint. The small barrier in the bending potential exists between this state and the 2-II State which is the lowest lying linear excited state.

Author

Magnesium ; Nitrogen ; Nuclear Binding Energy ; Configuration Interaction

20020011148 Oak Ridge National Lab. , TN USA

Flow-Through High-Pressure Electrical Conductance Cell for Determining of Ion Association of Aqueous Electrolyte Solutions at High Temperature and Pressure

Bianchi, H. ; Ho, P. C. ; Palmer, D. A. ; Wood, R. H. ; Sep. 12, 1999 ; 8p ; In English

Report No.(s): DE2001-9848 ; ORNL/CP-104265 ; KC-04-03-02-0 ; No Copyright ; Avail: Department of Energy Information

Bridge

A flow-through high-pressure electrical conductance cell was designed and constructed to measure limiting molar conductances and ion association constants of dilute aqueous solutions with high precision at high temperatures and pressures. The basic concept of the cell employs the principle developed at the University of Delaware in 1995, but overall targets higher temperatures (to 600 C) and pressures (to 300 MPa). At present the cell has been tested by measuring aqueous NaCl and LiOH solutions (10(exp -3) to 10(exp -5) mol/kg) to 405 C and 33 MPa with good results.

NTIS

Aqueous Solutions ; Electrolytes ; Electric Conductors

20020011149 Department of Energy , Aiken, SC USA

Technical Status Report on the Effect of Phosphate and Aluminum on the Development of Amorphous Phase Separation in Sodium Borosilicate Glasses

Cozzi, A. D. ; Dec. 03, 1998 ; 25p ; In English

Report No.(s): DE2001-9850 ; WSRC-TR-98-00327-Rev-1 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of the Tank Focus Area "Optimize Waste Loading" task is to enhance the definition of the acceptable processing window for high-level waste vitrification plants. One possible manner in which the acceptable processing window may be enhanced is by reducing the uncertainty of various compositional/property models through a specifically defined experimental plan. A reduction in model uncertainty can reduce limitations on current acceptance constraints and may allow for a larger processing or operational window. Enhanced composition/property model predictions coupled with an increased waste loading may decrease the processing time and waste glass disposal costs (i.e., overall lifecycle costs). One of the compositional/property models currently being evaluated by the Tanks Focus Area is related to the development of amorphous phase separation in multi-component borosilicate glasses. Described in this report is the current status for evaluating the effect of phosphorus and alumina on both simple sodium borosilicate and high-level waste glasses on the formation of amorphous phase separation. The goal of this subtask is to increase the understanding of the formation of phase separation by adding significant amounts (3-5 wt. percent) of phosphorus and alumina to well-characterized glasses. Additional scope includes evaluating the effects of thermal history on the formation of amorphous phase separation and durability of select glasses. The development of data, understanding, and quantitative description for composition and kinetic effects on the development of amorphous phase separation will continue in FY99. This effort will provide insight into the compositional and thermal effects on phase stability and will lead to a better understanding of the methods used to predict the development of amorphous phase separation in HLW glasses.

NTIS

Borosilicate Glass ; Phase Transformations ; Vitrification ; Radioactive Wastes

20020011164 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden

Evaluation of ScanSpec: An Imaging FTIR Spectrometer ***Utvaerdering av ScanSpec: En Bildalstrande FTIR-Spektrometer***

Berglund, M. ; December 1999 ; 70p ; In Swedish

Report No.(s): PB2001-108078 ; FOA-R-99-01382-615-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

The results from the different parts of the work have been summarized and conclusions have been drawn about the system performance. Furthermore some improvements for the systems are suggested.

NTIS

Imaging Spectrometers ; Infrared Spectra ; Systems Analysis

20020011176 Department of Energy , Operations Office , Richland, WA USA

Reaction rate constant for uranium in water and water vapor

Trimble, D. J. ; Nov. 09, 1998 ; 48p ; In English

Report No.(s): DE2001-11236 ; HNF-2853-Rev-0 ; No Copyright ; Avail: Department of Energy Information Bridge

The literature on uranium oxidation in water and oxygen free water vapor was reviewed. Arrhenius rate equations were developed from the review data. These data and equations will be used as a baseline from which to compare reaction rates measured for K Basin fuel.

NTIS

Reaction Kinetics ; Uranium ; Water Vapor

20020011235 Lawrence Livermore National Lab. , Livermore, CA USA

Hugoniots of aerogels involving carbon and resorcinol formaldehyde

Hrubesh, L. H. ; Ree, F. H. ; Schmidt, R. D. ; Shon, J. ; VanThiel, M. ; Jun. 24, 1999 ; 6p ; In English

Report No.(s): DE2001-9800 ; UCRL-JC-134714 ; No Copyright ; Avail: Department of Energy Information Bridge

Recently, a first-order phase transition is predicted in liquid carbon using atomistic simulation and Brenner bond order potential. There are also experimental data suggesting a possibility for a first-order phase transition. In light of this, a thermochemical equilibrium code (CHEQ) is used to provide guidance to experiments to find a liquid-liquid phase change in carbon foam and carbon-rich aerogel, resorcinol formaldehyde. Isotherms and Hugoniots were computed based on the previous analysis by van Thiel and Ree. The present calculations predict the liquid-liquid-graphite triple point to be at 5000 K and 5.2 GPa and its critical point to be at 6000 K and 8.8 GPa. The present Hugoniot calculations suggest that the liquid-liquid phase transition may be detected by performing a shock experiment with initial density of approximately 0.15 gm/cm(sup 3).

NTIS

Aerogels ; Carbon ; Formaldehyde ; Thermochemistry ; Hugoniot Equation of State ; Computerized Simulation

20020011238 Sandia National Labs. , Albuquerque, NM USA

Using Spatial Gradients to Model Localization Phenomena

Bammann, D. J. ; Mosher, D. ; Hughes, D. A. ; Moody, N. R. ; Dawson, P. R. ; Jul. 01, 1999 ; 49p ; In English

Report No.(s): DE2001-9812 ; SAND99-8588 ; No Copyright ; Avail: Department of Energy Information Bridge

We present the final report on a Laboratory-Directed Research and Development project, Using Spatial Gradients to Model Localization Phenomena, performed during the fiscal years 1996 through 1998. The project focused on including spatial gradients in the temporal evolution equations of the state variables that describe hardening in metal plasticity models. The motivation was to investigate the numerical aspects associated with post-bifurcation mesh dependent finite element solutions in problems involving damage or crack propagation as well as problems in which strain Localizations occur. The addition of the spatial gradients introduces a mathematical length scale that eliminates the mesh dependency of the solution. In addition, new experimental techniques were developed to identify the physical mechanism associated with the numerical length scale.

NTIS

Plastic Properties ; Position (Location) ; Mathematical Models ; Computational Grids ; Spatial Dependencies

20020011240 Department of Energy , Aiken, SC USA

Solubility of Plutonium (IV) Oxalate During Americium/Curium Pretreatment

Rudisill, T. S. ; Aug. 11, 1999 ; 44p ; In English

Report No.(s): DE2001-9831 ; WSRC-TR-99-00162 ; No Copyright ; Avail: Department of Energy Information Bridge

Approximately 15,000 L of solution containing isotopes of americium and curium (Am/Cm) will undergo stabilization by vitrification at the Savannah River Site (SRS). Prior to vitrification, an in-tank pretreatment will be used to remove metal impurities from the solution using an oxalate precipitation process. Material balance calculations for this process, based on solubility data in pure nitric acid, predict approximately 80 percent of the plutonium in the solution will be lost to waste. Due to the uncertainty associated with the plutonium losses during processing, solubility experiments were performed to measure the recovery of plutonium during pretreatment and a subsequent precipitation process to prepare a slurry feed for a batch melter. A good estimate of the plutonium content of the glass is required for planning the shipment of the vitrified Am/Cm product to Oak Ridge National Laboratory (ORNL). The plutonium solubility in the oxalate precipitation supernate during pretreatment was 10 mg/mL at 35 C. In two subsequent washes with a 0.25M oxalic acid/0.5M nitric acid solution, the solubility dropped to less than 5 mg/mL. During the precipitation and washing steps, lanthanide fission products in the solution were mostly insoluble. Uranium, and alkali, alkaline earth, and transition metal impurities were soluble as expected. An elemental material balance for plutonium showed that greater than 94 percent of the plutonium was recovered in the dissolved precipitate. The recovery of the lanthanide elements was generally 94 percent or higher except for the more soluble lanthanum. The recovery of soluble metal impurities from the precipitate slurry ranged from 15 to 22 percent. Theoretically, 16 percent of the soluble oxalates should have been present in the dissolved slurry based on the dilution effects and volumes of supernate and wash solutions removed. A trace level material balance showed greater than 97 percent recovery of americium-241 (from the beta decay of plutonium-241) in the dissolved precipitate, a value consistent with the recovery of europium, the americium surrogate. In a subsequent experiment, the plutonium solubility following an oxalate precipitation to simulate the preparation of a slurry feed for a batch melter was 21 mg/mL at 35 degrees C. The increase in solubility compared to the value measured during the pretreatment experiment was attributed to the increased nitrate concentration and ensuing increase in plutonium complexation. The solubility of the plutonium following a precipitant wash with 0.1M oxalic acid was unchanged. The recovery of plutonium from the precipitate slurry was greater than 97 percent allowing an estimation that approximately 92 percent of the plutonium in Tank 17.1 will report to the glass. The

behavior of the lanthanides and soluble metal impurities was consistent with the behavior seen during the pretreatment experiment. A trace level material balance showed that 99.9 percent of the americium w as recovered from the precipitate slurry. The overall recovery of americium from the pretreatment and feed preparation processes was greater than 97 percent, which was consistent with the measured recovery of the europium surrogate.
NTIS
Oxalates ; Plutonium 241 ; Solubility ; Vitrification ; Pretreatment ; Americium 241 ; Alkaline Earth Metals ; Curium

20020011365 DYNACS Engineering Co., Inc. , Cocoa Beach, FL USA
Evaluating Mass Analyzers as Candidates for Small, Portable, Rugged Single Point Mass Spectrometers for Analysis of Permanent Gases
Arkin, C. Richard , DYNACS Engineering Co., Inc. , USA ; Ottens, Andrew K. , Florida Univ. , USA ; Diaz, Jorge A. , Costa Rica Univ. , Costa Rica ; Griffin, Timothy P. , DYNACS Engineering Co., Inc. , USA ; Follestein, Duke , NASA Kennedy Space Center , USA ; Adams, Fredrick , NASA Kennedy Space Center , USA ; [2001] ; 2p ; In English ; ASMS Conference , 28-31 May 2001 , Chicago, IL , USA ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
For Space Shuttle launch safety, there is a need to monitor the concentration of H2, He, O2 and Ar around the launch vehicle. Currently a large mass spectrometry system performs this task, using long transport lines to draw in samples. There is great interest in replacing this stationary system with several miniature, portable, rugged mass spectrometers which act as point sensors which can be placed at the sampling point. Five commercial and two non-commercial analyzers are evaluated. The five commercial systems include the Leybold Inficon XPR-2 linear quadrupole, the Stanford Research (SRS-100) linear quadrupole, the Ferran linear quadrupole array, the ThermoQuest Polaris-Q quadrupole ion trap, and the IonWerks Time-of-Flight (TOF). The non-commercial systems include a compact double focusing sector (CDFMS) developed at the University of Minnesota, and a quadrupole ion trap (UF-IT) developed at the University of Florida. The System Volume is determined by measuring the entire system volume including the mass analyzer, its associated electronics, the associated vacuum system, the high vacuum pump and rough pump. Also measured are any ion gauge controllers or other required equipment. Computers are not included. Scan Time is the time required for one scan to be acquired and the data to be transferred. It is determined by measuring the time required acquiring a known number of scans and dividing by said number of scans. Limit of Detection is determined first by performing a zero-span calibration (using a 10-point data set). Then the limit of detection (LOD) is defined as 3 times the standard deviation of the zero data set. (An LOD of 10 ppm or less is considered acceptable.)
Derived from text
Evaluation ; Mass Spectrometers ; Miniaturization ; Gas Analysis ; Standard Deviation ; Portable Equipment

20020011618 Argonne National Lab. , IL USA
Properties of UNiAlD(sub 2.1) and UNiAlH(sub 2.3)
Bordallo, H. N. ; Christianson, A. ; Drulis, H. ; Havela, L. ; Iwasieczko, W. ; Jul. 30, 1999 ; 9p ; In English
Report No.(s): DE2001-11913 ; ANL/IPNS/CP-99683 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
UNiA.1crystallizes in the hexagonal ZrNiA1-type crystal structure consisting of U-Ni and U-Al basal plane layers. proportional to the lattice parameter The inter-uranium spacing du.u = 3.49 approximately is a (6.733), while the distance between the U-containing layers is given by c (4.035A). UNiAl orders antiferromagnetically (AF) at 19.3K, and exhibits heavy fermion features. Neutron-diffraction studies ki single crystals revealed a complex arrangement of magnetic moments with q=(O.1, 0.1, 0.5). Hybridization of the uranium 5f states with the electron states of the ligands plays a crucial role in the magnetic properties of UNiA1. Hydrogenation/deuteration of the material changes its inter-atomic distances, thus affecting the degree of hybridization, and its magnetic properties. In this work we address the effect of hydrogenation/deuteration on the magnetic and structural properties of UNiA1.
NTIS
Chemical Properties ; Uranium Compounds ; Magnetic Properties ; Neutron Diffraction ; Antiferromagnetism ; Hydrogenation

20020011686 NASA Glenn Research Center , Cleveland, OH USA
Thermodynamic Database for the NdO(1.5)-YO(1.5)-YbO(1.5)-ScO(1.5)-ZrO2 System
Jacobson, Nathan S. , NASA Glenn Research Center , USA ; Copland, Evan H. , NASA Glenn Research Center , USA ; Kaufman, Larry , Kaufman (Larry) , USA ; September 2001 ; 50p ; In English
Contract(s)/Grant(s): RTOP 714-04-60
Report No.(s): NASA/TM-2001-210753 ; E-12681 ; NAS 1.15:210753 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A database for YO(1.5)-NdO(1.5)-YbO(1.5)-ScO(1.5)-ZrO2 for ThermoCalc (ThermoCalc AB, Stockholm, Sweden) has been developed. The basis of this work is the YO(1.5)-ZrO2 assessment by Y. Du, Z. Jin, and P. Huang, 'Thermodynamic Assessment of the ZrO2-YO(1.5) System'. Experimentally only the YO(1.5)-ZrO2 system has been well-studied. All other systems are only approximately known. The major simplification in this work is the treatment of each single cation unit as a component. The pure liquid oxides are taken as reference states and two term lattice stability descriptions are used for each of the components. The limited experimental phase diagrams are reproduced.
Author
Data Bases ; Thermodynamics ; Zirconium Oxides ; Ceramics

20020011711 Sandia National Labs. , Albuquerque, NM USA
Silicon Nitride Membranes for Filtration and Separation
Galambos, P. ; Zavadil, K. ; Shul, R. ; Willison, C. G. ; Miller, S. ; Jul. 19, 1999 ; 13p ; In English
Report No.(s): DE2001-9504 ; SAND99-0422C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Semi-Permeable silicon nitride membranes have been developed using a Bosch etch process followed by a reactive ion etch (NE) process. These membranes were observed to allow air but not water to pass through them into surface micromachined, silicon nitride microfluidic channels. Membranes with this property have potential use in microfluidic systems as gas bubble traps and vents, filters to remove particles and gas partitioning membranes. Membrane permeation was measured as 1.6 x 10(exp -8) mol/m(sup 2)Pa s of helium for inline membranes at the entrance and exit of the silicon nitride microfluidic channels.
NTIS
Membranes ; Silicon Nitrides ; Filtration ; Separation

20020011733 Stanford Linear Accelerator Center , Menlo Park, CA USA
Two-Photon Processes at Intermediate Energies
Brodsky, S. J. ; Jun. 26, 2001 ; 17p ; In English
Report No.(s): DE2001-784948 ; SLAC-PUB-8883 ; No Copyright ; Avail: Department of Energy Information Bridge
Exclusive hadron production processes in photon-photon collisions provide important tests of QCD at the amplitude level, particularly as measures of hadron distribution amplitudes and skewed parton distributions. The determination of the shape and normalization of the distribution amplitudes has become particularly important in view of their importance in the analysis of exclusive semi-leptonic and two-body hadronic B-decays.
NTIS
Hadrons ; Quantum Chromodynamics ; Particle Production ; Particle Decay ; Particle Collisions

20020011872 National Defence Research Establishment , Avedelningen foer NBC Skydd , Umea, Sweden
Depleted Uranium. An Introduction *Utarmat uran. En Introduktion*
Sandstroem, B. ; Lidstroem, K. ; November 2000 ; 19p ; In Dutch
Report No.(s): PB2002-100400 ; FOA-R-00-01652-861-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
This report describes physical and chemical properties of depleted uranium and touches upon some current issues concerning its possible use. The work is based on a review of the scientific literature and experience from measurements of depleted uranium-containing samples.
NTIS
Chemical Properties ; Uranium ; Health Physics ; Nuclear Fuels

20020012232 Lawrence Livermore National Lab. , Livermore, CA USA
Sensitivity of natural gas HCCI combustion to fuel and operating parameters using detailed kinetic modeling
Aceves, S. ; Dibble, R. ; Flowers, D. ; Smith, J. R. ; Westbrook, C. K. ; Jul. 19, 1999 ; 12p ; In English
Report No.(s): DE2001-13756 ; UCRL-JC-135058 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper used the HCT (Hydrodynamics Chemistry and Transport) chemical kinetics code to analyze natural gas HCCI combustion in an engine. The HCT code has been modified to better represent the conditions existing inside an engine, including a wall heat transfer correlation. Combustion control and low power output per displacement remain as two of the biggest challenges to obtaining satisfactory performance out of an HCCI engine, and these are addressed in this paper. The paper considers the effect of natural gas composition on HCCI combustion, and then explores three control strategies for HCCI engines: DME (Dimethyl ether) addition, intake heating and hot EGR addition. The results show that HCCI combustion is sensitive to natural gas composition, and an active control may be required to compensate for possible changes in composition. The three control

strategies being considered have a significant effect in changing the combustion parameters for the engine, and should be able to control HCCI combustion.
NTIS
Natural Gas ; Combustion ; Combustion Control

20020012245 Sandia National Labs. , Albuquerque, NM USA
Modeling Transport in Gas Chromatography Columns for the Micro-ChemLab
Adkins, ; Frye-Mason, ; Hudson, ; Kottenstette, ; Matzke, ; September 1999 ; 12p ; In English
Report No.(s): DE2001-13078 ; SAND99-2031C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The gas chromatography (GC) column is a critical component in the microsystem for chemical detection (pChemLabTM) being developed at Sandia. The goal is to etch a ”meter-long” GC column onto a 1 square cm silicon chip while maintaining good chromatographic performance. Our design strategy is to use a modeling and simulation approach. We have developed an analytical tool that models the transport and surface interaction process to achieve an optimized design of the GC column. This analytical tool has a flow module and a separation module. The flow module considers both the compressibility and slip flow effects that may significantly influence the gas transport in a long and narrow column. The separation module models analyze transport and physico-chemical interaction with the coated surface in the GC column. It predicts the column efficiency and performance. Results of our analysis will be presented in this paper.
NTIS
Gas Chromatography ; Miniaturization ; Gas Transport

20020012262 National Inst. of Standards and Technology , Chemical Sciences and Technology Lab. , Gaithersburg, MD USA
Infrared Absorptiviy Temperature Dependence of Gas Phase Methanol and Sulfur Dioxide
Chu, P. M. ; Rhoderick, G. C. ; Johnson, P. A. ; Aug. 2001 ; 40p ; In English
Report No.(s): PB2001-108535 ; NISTIR-6773 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The infrared absorptivity of industrially relevant compounds, methanol and sulfur dioxide, are evaluated for temperatures ranging from 25 C to 200 C at 25 C increments using an FT (Fourier Transform) spectrometer with NIST (National Institute of Standards and Technology) primary gravimetric standards. This project was initiated to provide quality-assured reference data for communities measuring stack emissions by passive FT-IR (Infrared) and other infrared-based technologies. In order to correct for the sample and sample cell emission effects, sample and reference data are acquired with the infrared source on and with the source off. The average relative expanded uncertainty for the uncorrected absorption coefficients is 2.0% for absorptivity values greater than 10 to the minus 4th power ((micro)mol/mol)-1m-1, excluding the sample emission bias. The average relative expanded uncertainty is 2.5% for the absorption coefficient data corrected for sample emission effects. The emission correction tracks the blackbody emission of the sample cell and is both wavelength- and temperature-dependent. For temperatures up to 200 C, there is no emission correction for bands at 2600 cm to the minus 1 power and higher. In the fingerprint region, the emission correction becomes significant especially at temperatures above 100 C. At 200 C, the correction is approximately 10% for bands in the spectral region near 1000 cm to the minus 1 power. The magnitude of the emission correction depends on the design of the optical bench; therefore it is necessary to characterize the correction for each apparatus.
NTIS
Methyl Alcohol ; Sulfur Dioxides ; Absorptivity ; Infrared Spectroscopy ; Fourier Transformation ; Spectrometers

20020012274 National Defence Research Establishment , Avd. foer Vapen och Skydd , Tumba, Sweden
Travel Report from International Congress of Heterocyclic Chemistry (17th) in Vienna, August 1999 ***Reserapport Fran 17th International Congress of Heterocyclic Chemistry i Wein Augusti 1999***
Goede, P. ; Latypov, N. ; November 1999 ; 16p ; In Swedish
Report No.(s): PB2001-108129 ; FOA-R-99-01246-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The report contains material of special interest from the ’17th International Congress of Heterocyclic Chemistry’ in Vienna. The meeting was directed towards general heterocyclic chemistry, but new methodology and direct applied work in the field of energetic materials was also presented.
NTIS
Heterocyclic Compounds ; Conferences ; Organic Chemistry ; Inorganic Chemistry

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20020005954 Department of Energy , Aiken, SC USA
Material Corrosion and Plate-Out Test of Types 304L and 316L Stainless Steel
Zapp, P. E. ; Feb. 06, 2001 ; 18p ; In English
Report No.(s): DE2001-774482 ; WSRC-TR-2000-00434 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Corrosion and plate-out tests were performed on 304L and 316L stainless steel in pretreated Envelope B and Envelope C solutions. Flat coupons of the two stainless steels were exposed to 100 degrees C liquid and to 74 degrees C and 88 degrees C vapor above the solutions for 61 days. No significant corrosion was observed either by weight-loss measurements or by microscopic examination. Most coupons had small weight gains due to plate-out of solids, which remained to some extent even after 24-hour immersion in 1 N nitric acid at room temperature. Plate-out was more significant in the Envelope B coupons, with film thickness from less than 0.001 in. to 0.003-inches.
NTIS
Metal Plates ; Stainless Steels ; Corrosion Tests ; Corrosion Resistance

20020006084 Los Alamos National Lab. , NM USA
Influence of microstructural anisotropy on the spallation of 1080 eutectoid steel
Gray, G. T. ; Lopez, M. F. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783274 ; LA-UR-01-3148 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

While the influence of crystallographic texture on elastic and plastic constitutive response has seen extensive investigation in recent years, the influence of texture on the dynamic fracture of engineering materials remains less extensively explored. In particular, the influence of anisotropy, both textural and morphological, on the spallation behavior of materials remains poorly quantified. In this study, the spallation response of 1080-steel has been studied as a function of microstructural morphological anisotropy. In this study the influence of elongated MnS stringers, resident within a crystallographically isotropic eutectoid steel, on the spallation response of 1080 steel was investigated. That of a fully-pearlitic 1080 steel loaded to 5 GP-a was found to be dominated by the heterogeneous nucleation of damage normal and orthogonal to the MnS stringers. Delamination between the matrix pearlitic microstructure and the MnS stringers was seen to correlate to a significantly lower pull-back signal during transverse loading than to that parallel to the stringer axis. The pull-back signals and post-spallation metalllographic observations are discussed with reference to the influence of microstructural anisotropy on void nucleation and growth.
NTIS
Anisotropy ; Steels

20020006119 Argonne National Lab. , IL USA
Thermal contact resistance across a copper-silicon interface
Khounsary, A. ; Chojnowski, D. ; Assoufid, L. ; Worek, W. M. ; Oct. 27, 1997 ; 9p ; In English
Report No.(s): DE2001-7846 ; ANL/XFD/CP-92700 ; No Copyright ; Avail: Department of Energy Information Bridge

An experimental setup to measure the thermal contact conductance across a silicon-copper (Si-Cu) interface is described, and the results obtained are presented. The resulting thermal contact resistance data are used in estimating the thermo-mechanical and optical performance of optical substrates cooled by interfaced copper cooling blocks. Several factors influence the heat transfer across solid interfaces. These include the material properties, interface pressure, flatness and roughness of the contacting surfaces, temperature, and interstitial material, if any. Results presented show the variation of thermal contact conductance as a function of applied interface pressure for a Cu-Si interface. Various interstitial materials investigated include iridium foil, silver foil and a liquid eutectic (Ga-In-Sn). As expected, thermal contact resistance decreases as interface pressure increases, except in the case of the eutectic, in which it was nearly constant. The softer the interstitial material, the lower the thermal contact resistance, Liquid metal provides the lowest thermal contact resistance across the Cu-Si interface, followed by the iridium foil, and then the silver foil.
NTIS
Substrates ; Thermal Conductivity ; Thermal Resistance ; Silicon ; Copper ; Liquid Metals ; Metal Foils

20020006122 Sandia National Labs. , Albuquerque, NM USA

Rapid Tooling via Investment Casting and Rapid Prototype Patterns

Baldwin, M. D. ; Jun. 01, 1999 ; 14p ; In English

Report No.(s): DE2001-7794 ; SAND99-1318 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of this work to develop the materials processing and design technologies required to reduce the die development time for metal mold processes from 12 months to 3 months, using die casting of Al and Mg as the example process. Sandia demonstrated that investment casting, using rapid prototype patterns produced from Stereo lithography or Selective laser Sintering, was a viable alternative/supplement to the current technology of machining form wrought stock. A demonstration die insert (ejector halt) was investment cast and subsequently tested in the die casting environment. The stationary half of the die insert was machined from wrought material to benchmark the cast half. The two inserts were run in a die casting machine for 3,100 shots of aluminum and at the end of the run no visible difference could be detected between the cast and machined inserts. Inspection concluded that the cast insert performed identically to the machined insert. Both inserts had no indications of heat checking or degradation.

NTIS

Investment Casting ; Machining ; Tooling ; Wrought Alloys ; Aluminum

20020006250 Federal Energy Technology Center , Morgantown, WV USA

Melting, solidification, remelting, and separation of glass and metal

Ebadian, M. A. ; Nov. 01, 1998 ; 39p ; In English

Report No.(s): DE2001-772507 ; DE-FG01-95EW55094-55 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The ultimate goal of this project is to find an efficient way to separate the slag phase from the metal phase in the molten state. A basic knowledge of the thermal, transport, and metallurgical phenomena that occur in the melting and solidification of glass, metal, and their mixtures is the foundation of the development of the separation methods. In association with this project, an innovative liquid-liquid extractor/separator will be developed to meet the separation needs for efficient extraction/separation devices for the various DOE liquid waste treatment processes.

NTIS

Glass ; Melting ; Transport Properties

20020006328 Los Alamos National Lab. , NM USA

Nonequilibrium fluctuations in shock compression of polycrystalline alpha-iron

Yano, K. ; Jun. 01, 2001 ; 6p ; In English

Report No.(s): DE2001-783295 ; LA-UR-01-2961 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors report a numerical study of heterogeneous and nonequilibrium fluctuations in shock compression of alpha-iron at the grain level. A quasi-molecular code called DM2 is used to model the interactions of a plane shock wave with grain boundaries and crystal anisotropy over the pressure range 4-45 GPa. Highly transient eddies that were reported earlier are again observed. The authors show new features through an elementary statistical analysis. They are (1) a characteristic decay constant for the non-equilibrium fluctuation on the order of 20ns, (2) a resonance phenomenon at an intermediate shock pressure, and (3) a more uniform shock structure for very high pressures.

NTIS

Iron ; Plane Waves ; Grain Boundaries ; Shock Loads

20020006334 NASA Glenn Research Center , Cleveland, OH USA

Computational Thermodynamic Study to Predict Complex Phase Equilibria in the Nickel-Base Superalloy Rene N6

Copland, Evan H. , National Academy of Sciences - National Research Council , USA ; Jacobson, Nathan S. , NASA Glenn Research Center , USA ; Ritzert, Frank J. , NASA Glenn Research Center , USA ; September 2001 ; 46p ; In English

Contract(s)/Grant(s): RTOP 708-31-13

Report No.(s): NASA/TM-2001-210897 ; E-12775 ; NAS 1.15:210897 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A previous study by Ritzert et al. on the formation and prediction of topologically closed packed (TCP) phases in the nickel-base superalloy Rene' N6 is re-examined with computational thermodynamics. The experimental data on phase distribution in forty-four alloys with a composition within the patent limits of the nickel-base superalloy Rene' N6 provide a good basis for comparison to and validation of a commercial nickel superalloy database used with ThermoCalc. Volume fraction of the phases and partitioning of the elements are determined for the forty-four alloys in this dataset. The baseline heat treatment of 400

h at 1366 K was used. This composition set is particularly interesting since small composition differences lead to dramatic changes in phase composition. In general the calculated values follow the experimental trends. However, the calculations indicated no TCP phase formation when the experimental measurements gave a volume percent of TCP phase less than 2 percent. When TCP phases were predicted, the calculations under-predict the volume percent of TCP phases by a factor of 2 to 8. The calculated compositions of the gamma and gamma' phases show fair agreement with the measurements. However, the calculated compositions of the P Phase do not agree with those measured. This may be due to inaccuracies in the model parameters for P phase and/or issues with the microprobe analyses of these phases. In addition, phase fraction diagrams and sigma and P phase solvus temperatures are calculated for each of the alloys. These calculations indicate that P phase is the primary TCP phase formed for the alloys considered here at 1366 K. Finally, a series of isopleths are calculated for each of the seven alloying elements. These show the effect of each alloying element on creating TCP phases.
Author
Thermodynamics ; Computation ; Equilibrium ; Nickel Alloys ; Data Bases

20020006517 Johns Hopkins Univ. , Center for Nondestructive Evaluation , Baltimore, MD USA
X-ray Computed Tomography of Ultralightweight Metals ***Final Report***
Winter, John M., Jr. ; Green, Robert E., Jr ; Oct. 31, 2001 ; 31p ; In English
Contract(s)/Grant(s): N00014-97-1-G021
Report No.(s): AD-A395868 ; NRL-31-OCT-01 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In recent years, several universities, government laboratories, and private industries have been developing specific process technologies, analytical modeling tools, and characterization methods for highly porous metals and alloys frequently collectively termed "ultralightweight metals". The goal has been to achieve a family of metallic structures which are analogs to the organic cellular materials that exhibit high stiffness and a low specific weight. A number of quite different and distinct processes have evolved and are still largely not yet mature. to date, the imaging capabilities of x-ray computed tomography have not been generally employed to nondestructively examine the internal structure of the products formed by these various processes. This article briefly reviews the principles and terminology of x-ray computed tomography as it has evolved through successive generations and then presents several types of computed tomographic images of ultralightweight metallic specimens produced by different process technologies. The images for each specimen are preceded by a brief description of the process technology which created it.
DTIC
X Rays ; Computer Aided Tomography ; Metals ; Alloys

20020006526 Los Alamos National Lab. , NM USA
Mechanical behavior of molybdenum disilicide-based alloys
Misra, A. ; Sharif, A. ; Dec. 01, 2000 ; 7p ; In English
Report No.(s): DE2001-772831 ; LA-UR-00-6114 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We have investigated the mechanical behavior of the following single-phase polycrystalline alloys with the MoSi2 body-center tetragonal structure: MoSi2 alloyed with (approximately)2.5 at.% Re, MoSi2 alloyed with 2 at.% Al, MoSi2 alloyed with 1 at.% Nb, and MoSi2 alloyed with 1 at.% Re and 2 at.% Al. Several anomalies in the mechanical behavior of alloyed materials were observed. For example, (1) addition of only (approximately)2.5 at.% Re results in an order of magnitude increase in compressive strength at 1600 C, (2) additions of Nb and Al cause solution softening at near-ambient temperatures, and (3) quaternary MoSi2-Re-Al alloys show strengthening at elevated temperatures and reduction in flow stress with enhanced plasticity at near-ambient temperatures in compression. The mechanisms of anomalous solution hardening and softening are discussed.
NTIS
Mechanical Properties ; Alloying ; Molybdenum Alloys ; Disilicides

20020006771 National Renewable Energy Lab. , Golden, CO USA
Steel: Industry of the Future
Jan. 23, 2001 ; 8p ; In English
Report No.(s): DE2001-775994 ; DOE/GO-102001-1159 ; NREL/BR-810-29346 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This 8-page brochure describes the Office of Industrial Technologies' Steel Industry of The Future, a partnership between the Department of Energy and the steel industry established to increase industrial energy and cost efficiency.
NTIS
Steels ; Energy Conservation ; Industrial Energy

20020006772 National Renewable Energy Lab. , Golden, CO USA

Aluminum: Industry of the Future

Jan. 23, 2001 ; 8p ; In English

Report No.(s): DE2001-775971 ; NREL/BR-810-29340 ; DOE/GO-102001-1153 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This 8-page brochure describes the Office of Industrial Technologies' Aluminum Industry of the Future; a partnership between the Department of Energy and the aluminum industry established to increase industrial energy and cost efficiency.

NTIS

Industrial Energy ; Energy Conservation ; Aluminum

20020006826 Oak Ridge National Lab. , TN USA

Evaluation of Through-Thickness Changes in Primary Damage Production in Commercial Reactor Pressure Vessels

Stoller, R. E. ; Feb. 14, 2001 ; 14p ; In English

Report No.(s): DE2001-775418 ; P01-109978 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An extensive database of atomic displacement cascades in iron has been developed using the method of molecular dynamics (MD). More than 300 simulations have been completed at 100K with energies between 0.1 and 100 keV. This encompasses nearly all energies relevant to fission reactor irradiation environments since a 100 keV MD cascade corresponds to the average iron cascade following a collision with a 5.1 MeV neutron. Extensive statistical analysis of the database has determined representative average values for several primary damage parameters: the total number of surviving point defects, the fraction of the surviving point defects contained in clusters formed during cascade cooling, and a measure of the size distribution of the in-cascade point defect clusters. The cascade energy dependence of the MD-based primary damage parameters has been used to obtain spectrum-averaged defect production cross sections for typical fission reactor neutron energy spectra as a function of depth through the reactor pressure vessel. The attenuation of the spectrum-averaged cross sections for total point defect survival and the fraction of either interstitials or vacancies in clusters are quite similar to that for the NRT dpa. However, the cross sections derived to account for the energy dependence of the point defect cluster size distributions exhibit a potentially significant variation through the vessel. The production rate of large interstitial clusters decreases more rapidly than dpa whereas the production of large vacancy clusters is slower than dpa.

NTIS

Pressure Vessels ; Statistical Analysis ; Molecular Dynamics ; Damage

20020006829 Oak Ridge National Lab. , TN USA

Ductilization of Cr via Oxide Dispersions

Brady, M. P. ; Feb. 14, 2001 ; 13p ; In English

Report No.(s): DE2001-775413 ; P01-110018 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Work by Scruggs et al. in the 1960's demonstrated that up to 20% tensile ductility could be achieved at room-temperature in sintered and extruded powder metallurgical Cr alloyed with MgO. During sintering, much of the MgO converts to a MgCr(sub 2)O(sub 4) spinel, which was hypothesized to getter nitrogen from the Cr, rendering it ductile. Recent efforts at Oak Ridge National Laboratory (ORNL) have succeeded in duplicating this original effect. Preliminary results suggest that the ductilization mechanism may be more complicated than the simple nitrogen gettering mechanism proposed by Scruggs, as some ductility was observed at room-temperature in Cr-MgO alloys containing nitride precipitates. Results of microstructural characterization and room-temperature mechanical property studies are presented for Cr-6MgO-(0-2.2)Ti wt.% as a function of hot-pressing and extrusion. Possible mechanisms by which the MgO additions may improve the room-temperature ductility of Cr are discussed.

NTIS

Chromium Alloys ; Ductility ; Magnesium Oxides ; Alloying ; Mechanical Properties

20020006834 Argonne National Lab. , IL USA

Erosion/corrosion of machinable Tungsten in water

Collins, J. T. ; Dec. 20, 2000 ; 7p ; In English

Report No.(s): DE2001-775272 ; ANL/XFD/RP-103711 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

It was recently discovered that significant erosion/corrosion occurs with machinable tungsten when exposed to water, particularly when the water has dissolved oxygen present. The problem was first discovered about one and a half years ago when extensive corrosion was found inside the cooling channels of the L5-80 white beam slits located in sector 3-ID-A. Figure 1 and Figure 2 show cut-away sections of the tungsten slit; the water passages are severely corroded from the cooling water used to cool

the slit. The problem was brought to the attention of the world's two largest manufacturers of machinable tungsten, Mi-Tech Metals from Indianapolis, IN and Kulite Tungsten Corp. from East Rutherford, NJ. Neither company had any experience with this problem and were unaware that water could cause such significant corrosion, apparently the APS (Advanced Photon Source) was the first customer to ever use the material in this fashion.
NTIS
Corrosion ; Tungsten ; Water ; Oxygen

20020006841 Oak Ridge National Lab. , TN USA
Atomic Level Characterization of Neutron Irradiated Pressure Vessel Steels
Miller, M. K. ; Jan. 10, 2001 ; 12p ; In English ; Materials Research Society Fall Meeting
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774657 ; P00-109499 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Atom probe tomography provides one of the most effective tools to characterize the solute distribution and precipitation that occurs in pressure vessel steels and associated model alloys during irradiation. The three-dimensional atom probe is able to experimentally determine the elemental identities of the atoms and their spatial coordinates with near atomic resolution so that their distribution within small volumes of the specimen can be reconstructed and analyzed. This technique together with conventional atom probe field ion microscopy has been applied to many different types of pressure vessel steels and model alloys and has revealed and characterized several different nanostructural transformations. These radiation induced or enhanced processes lead to the formation of copper-nickel-manganese-silicon precipitates, and solute segregation to dislocations, dislocation loops, nanovoids and boundaries.
NTIS
Pressure Vessels ; Irradiation ; Tomography ; Neutrons

20020006864 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
ISMANAM 2000: International Symposium on Mechanically Alloyed and Metastable Nanocrystalline Materials
Savage, S. J. ; October 2000 ; 22p ; In English
Report No.(s): PB2001-108413 ; FOA-R-00-01625-318-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report reviews the International Symposium on Mechanically Alloyed and Metastable Nanocrystalline Materials held at the University of Oxford, England, in July 2000. A number of contributions especially relevant to the author's organization are summarized under the titles: 'Functional Materials' and 'Structural Materials.' Techniques for production of nanocrystalline materials are very briefly discussed, as are applications for such materials.
NTIS
Conferences ; Nanocrystals ; Alloying ; Metastable State

20020006898 Defence Science and Technology Organisation , Aeronautical and Maritime Research Lab. , Fishermans Bend, Australia
Thermographic Assessment of the Heat Dissipation Associated with Fatigue Crack Growth in Mild Steel
Rajic, N. ; Aug. 2001 ; 30p ; In English
Report No.(s): AD-A395590 ; DSTO-TR-1190 ; DSTO/AMRL-AR-011-962 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report examines the feasibility of predicting rates of crack growth in mild steel based on an evaluation of the crack tip dissipated energy. A numerical scheme is developed to provide a basis for the computation of dissipated power from measurements of temperature acquired using remote infrared detection. An experimental study is then described where measurements of crack-growth rate in mild-steel coupons exposed to constant amplitude cyclic loading are related to calculations of power dissipation. A simple linear relationship is indicated, with testing also providing some evidence of geometry independence, a key finding with regard to the possible use of dissipated energy as a fatigue characterization parameter. However, further testing involving a more complex loading sequence led to a noticeable change in relationship indicating that the heat dissipation rate is unlikely to offer a simple basis for the prediction of crack growth rate under all loading conditions.
DTIC
Fatigue (Materials) ; Steels ; Cracking (Fracturing)

20020007082 Los Alamos National Lab. , NM USA

Dynamic deformation and damage in cast gamma-TiAl during taylor cylinder impact: Experiments and model validation

Gray, G. ; Mar. 01, 2001 ; 10p ; In English

Report No.(s): DE2001-775575 ; LA-UR-01-1276 ; No Copyright ; Avail: Department of Energy Information Bridge

The dynamic deformation, damage evolution, and cracking in two cast gamma titanium aluminide alloys has been investigated experimentally and theoretically. The purpose of this study was to create and validate experimentally a finite-element model of the high speed impact of a cylindrical (gamma)-TiAl projectile into a steel block in order to evaluate the accuracy of (gamma) constitutive properties used in FEA simulations. In this paper the damage evolution, cracking, and validation of the constitutive response of Ti-48-2-2 and WMS cast gamma alloys is discussed. The utility of validating the high-rate impact behavior of engineering aerospace materials using Taylor cylinder impact testing is detailed.

NTIS

Titanium Aluminides ; Damage ; Impact Tests ; Mathematical Models ; Cylindrical Bodies ; Cast Alloys ; Taylor Series

20020008090 Sandia National Labs. , Albuquerque, NM USA

Elevated Temperature Creep Properties of Conventional 50Au-50Cu and 47Au 50Cu-3Ni Braze Alloys

Stephens, ; Schmale, ; Dec. 18, 2000 ; 18p ; In English

Report No.(s): DE2001-772055 ; SAND2000-3134C ; No Copyright ; Avail: Department of Energy Information Bridge

The elevated temperature creep properties of the 50Au-50Cu wt% and 47Au-50Cu-3Ni braze alloys have been evaluated over the temperature range 250-850 C. At elevated temperatures, i.e., 450-850 C, both alloys were tested in the annealed condition (2 hrs. 750 C/water quenched). The minimum strain rate properties over this temperature range are well fit by the Garofalo sinh equation. At lower temperatures (250 and 350 C), power law equations were found to characterize the data for both alloys. For samples held long periods of time at 375 C (96 hrs.) and slowly cooled to room temperature, an ordering reaction was observed. For the case of the 50Au-50Cu braze alloy, the stress necessary to reach the same, strain rate increased by about 15% above the baseline data. The limited data for ordered 47Au-50Cu-3Ni alloy reflected a smaller strength increase. However, the sluggishness of this ordering reaction in both alloys does not appear to pose a problem for braze joints cooled at reasonable rates following brazing.

NTIS

Brazing ; Creep Properties ; High Temperature ; Strain Rate

20020008092 Environmental Protection Agency , Washington, DC USA

Examination of Metals Transport Under Highly Alkaline Conditions

Jun. 19, 1997 ; 42p ; In English

Report No.(s): PB2001-107989 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report presents metal adsorption distribution coefficients (K values) for the metals barium (Ba), beryllium (Be), cadmium (Cd), chromium(III) (Cr(III)), and lead (Pb) in groundwater under the highly alkaline conditions possible with land disposal of cement kiln dust (CKD). K is the ratio of concentration sorbed to concentration in the dissolved phase at d equilibrium. The K values were determined using the U.S. EPA (Environmental Protection Agency) geochemical speciation model, d MINTEQA2. The above mentioned metals along with antimony, arsenic, chromium(VI), and thallium were the subject of an earlier metal transport study employing K values from the Hazardous Waste Identification Rule (HWIR). The purpose of the current study is to assess whether the K values from HWIR can be used in the highly alkaline conditions expected from d CKD disposal. Earlier in this study, an assessment of the applicability of HWIR K values to the d CKD disposal scenario identified Ba, Be, Cd, Cr(III), and Pb as the metals most likely to have adsorptive behavior significantly different from the HWIR Subtitle D landfill scenario. The Kd values for the metals presented in this report are the result of modifying the HWIR modeling parameters to reflect groundwater conditions expected in land disposal of CKD.

NTIS

Ground Water ; Metals ; Alkalinity ; Transport Properties ; Adsorptivity ; Water Pollution

20020008214 Atomic Energy Commission , Idaho Operations Office , Idaho Falls, ID USA

Oxidation and Volatilization from Tantalum Alloy T-222 During Air Exposure

Smolik, G. R. ; Petti, D. A. ; Sharpe, J. P. ; Schuetz, S. T. ; Oct. 31, 2000 ; 33p ; In English

Report No.(s): DE2001-776430 ; INEEL/EXT-2000-01455 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Tantalum alloys are one of the refractory metals with renewed consideration for high temperatures in fusion reactor applications. Tantalum alloys perform well in protective environments but oxidized readily in gases containing higher oxygen

levels. In addition, the radioactive isotope Ta-182 would be produced in tantalum and could be a significant contributor to dose if mobilized. Other isotopes of importance are produced from tungsten and hafnium. Mobilization of activated products during an accident with air ingress is therefore a safety issue. In this study, we measured the extent of oxidation and mobilization from tantalum alloy T-222 oxidized in flowing air between 500 and 1200 C. This alloy nominally contains 10 wt% tungsten, 2.5 wt% hafnium and 0.01 wt% carbon. We found that the mobilization of Ta and Hf was closely linked to the occurrence of oxide spalling. These elements showed no migration from the test chamber. Some W was mobilized by volatilization as evidenced by transport from the chamber. Tungsten volatilization could occur primarily during initial stages of oxidation before an oxide scale forms and impedes the process. The mobilization of Ta and W are presented in terms of the mass flux (g/m 2 -h) as a function of test temperature. These measurements along with specific designs, activation calculations, and accident scenarios provide information useful for dose calculations of future fusion devices.
NTIS
Air Flow ; Oxidation ; Tantalum Alloys

20020008674 Los Alamos National Lab. , NM USA
Properties and nanostructures of nano-materials processed by Severe Plastic Deformation (spd)
Zhu, Y. T. ; Mar. 01, 2001 ; 13p ; In English
Report No.(s): DE2001-776690 ; LA-UR-01-1739 ; No Copyright ; Avail: Department of Energy Information Bridge
Metallic materials usually exhibit higher strength but lower ductility after being plastically deformed by conventional techniques such as rolling, drawing and extrusion. In contrast, nanostructured metals and alloys processed by severe plastic deformation (SPD) have demonstrated both high strength and high ductility. This extraordinary mechanical behavior is attributed to the unique nanostructures generated by SPD processing. The combination of ultrafine grain size and high-density dislocations appears to enable deformation by new mechanisms not active in coarse-grained metals and alloys. These results demonstrate the possibility of tailoring the microstructures of metals and alloys by SPD to obtain superior mechanical properties. Nanostructured metals and alloys processed by SPD techniques have unique nanostructures not observed in nano-materials synthesized by other techniques such as the consolidation of nanopowders. The SPD-generated nanostructures have many features related to deformation, including high dislocation densities, and high- and low-angle grain boundaries in equilibrium or non-equilibrium states. Future studies are needed to investigate the deformation mechanisms that relate the unique nanostructures with the superior mechanical properties exhibited by SPD-processed metals and alloys.
NTIS
Nanostructures (Devices) ; Plastic Deformation ; Mechanical Properties

20020008883 Oak Ridge National Lab. , TN USA
Surface Treatment for Improving Sulfidation Resistance of Fossil Power Systems
Sikka, V. K. ; Mar. 09, 2001 ; 16p ; In English
Report No.(s): DE2001-777680 ; C/ORNL92-0143 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The purpose of the cooperative research and development agreement (CRADA) between ABB Combustion Engineering, Inc. and the Oak Ridge National Laboratory (ORNL) was to develop improved, longer life, and corrosion resistance surfaces for fossil power system components for use primarily in sulfidizing environments. Four surface protection techniques were to be explored. These included diffusion process, weld overlay, hot-isostatic processing, and various spraying methods. The work was to focus on Fe(sub 3) Al-based iron aluminide to increase the component life. The successful completion of the CRADA would have required the achievement of the following four goals: (1) fabrication development, (2) characterization and possibly modification of the alloy to optimize its manufacturability and environmental resistance, (3) testing and evaluation of the specimens, and (4) fabrication and testing of prototype parts. Because of lack of active participation from the participant, this CRADA did not achieve all of its goals and was terminated prematurely. Work carried out at ORNL on the CRADA is described in this report.
NTIS
Corrosion Resistance ; Sulfidation ; Surface Treatment ; Iron Aluminides ; Hot Isostatic Pressing

20020008884 Oak Ridge National Lab. , TN USA
Evaluation of Stainless Steels for Primary Surface Recuperator Applications
Swindeman, R. W. ; Feb. 21, 2001 ; 8p ; In English
Report No.(s): DE2001-777679 ; C/ORNL96-0453 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In 1996, a Cooperative Research and Development Agreement (CRADA) was undertaken between the Oak Ridge National Laboratory (ORNL) and Solar Turbines Incorporated to develop improved stainless steels for gas turbine recuperator applications. A team was assembled that consisted of materials and fabrication specialists from ORNL, Solar Turbines, Allegheny Ludlum Research Laboratory, and the University of California-San Diego. The development strategy was to (1) identify the materials performance requirements needed for long-time operation of a recuperator with inlet gas temperatures higher than current practice, (2) select candidate commercial and near-commercial alloys with potential for meeting the performance requirements, and (3) optimize thermal-mechanical processing to meet commercial production capabilities. The performance requirements were incorporated into three categories (fabricability, corrosion resistance, and mechanical strength) and teams were assigned to address each of these issues. The composition of the steels under consideration ranged from 18 to 25% chromium and from 8 to 25% nickel. Foils of thicknesses in the range 0.08 to 0.12 mm were produced by laboratory processing and by commercial processing. Thermal-mechanical processing was varied to obtain a range of grain sizes or to vary other physical metallurgical parameters. Oxidation experiments were undertaken in laboratory air and air with controlled water vapor contents at ORNL, Allegheny-Ludlum, and the University of California San Diego. Cyclic oxidation testing was included. Testing conditions were selected to enable models to be developed that included temperature, time, water content, and foil thickness as variables. Creep testing was performed in the temperature range of 677 C to 732 C for times extending beyond 10,000 h at ORNL and Solar Turbines. Optical, scanning, and analytical electron microscopy were used to examine the evolution of microstructure during aging, corrosion, and creep exposures. Based on the experimental work, optimized compositions and thermal-mechanical processing specifications were developed.

NTIS

Gas Turbines ; Stainless Steels ; Creep Properties ; Microstructure

20020009160 Science Applications, Inc. , McLean, VA USA

Appendix D: Kinetic Energy Penetrator Environmental and Health Considerations , Volume 1 , Summary Report

July 1990 ; 207p ; In English

Report No.(s): AD-A395638 ; No Copyright ; Avail: CASI ; A03 , Microfiche ; A10 , Hardcopy

The U.S. Army is currently formulating a strategy for future kinetic energy penetrating materials. This report addresses the environmental and health issues associated with depleted uranium (DU) and tungsten penetrators. The objective of this study was to perform a preliminary assessment to investigate the environmental and health issues associated with DU and tungsten penetrator manufacturing, testing and recycle facilities. This work also included an assessment of requirements for decontamination of ammunition peculiar equipment (APE) and industrial plant equipment (IPE) at U.S. Army manufacturing sites. Combat issues were also addressed.

DTIC

Environment Effects ; Ammunition ; Health ; Uranium ; Tungsten

20020009507 Los Alamos National Lab. , NM USA

Removal of carbon/deuterium from stainless steel and tungsten by transferred-arc cleaning

Hollis, K. J. ; Castro, R. G. ; Apr. 01, 2001 ; 9p ; In English

Report No.(s): DE2001-780365 ; LA-UR-01-2238 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Tungsten and stainless steel samples have been contaminated with deuterium and carbon to simulate deposited layers in magnetic-confinement fusion devices. Deuterium and carbon were co-deposited onto the sample surfaces using a deuterium plasma seeded with varying amounts of deuterated methane. Deuterium was also implanted into the samples in an accelerator to simulate hydrogen isotope ion implantation conditions in magnetic confinement fusion devices. Cathodic arc, or transferred-arc (TA) cleaning was employed to remove the deposits from the samples. The samples were characterized by ion beam analysis both before and after cleaning to determine deuterium and carbon concentrations present. The deuterium content was greatly reduced by the cleaning thus demonstrating the possibility of using the TA cleaning technique for removing deuterium and/or tritium from components exposed to D-T fuels. Removal of surface layers and significant reduction of subsurface carbon concentrations was also observed.

NTIS

Cleaning ; Stainless Steels ; Deuterium ; Carbon ; Tungsten

20020009603 Sandia National Labs. , Albuquerque, NM USA

Surface Hardening by Nanoparticle Precipitation in Ni(Al,O)

Myers, S. M. ; Follstaedt, D. M. ; Knapp, J. A. ; Apr. 01, 2001 ; 9p ; In English

Report No.(s): DE2001-780314 ; SAND2001-0912 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Ion implantation of O and Al were used to form nanometer-size precipitates of NiO or Al(sub 2)O(sub 3) in the near-surface of Ni. The yield strengths of the treated layers were determined by nanoindentation testing in conjunction with finite element modeling. The strengths range up to (approximately) 5 GPa, substantially above values for hard bearing steels. These results agree quantitatively with predictions of dispersion hardening theory based on the precipitate microstructures observed by transmission electron microscopy. Such surface hardening by ion implantation may be beneficial for Ni components in micro-electromechanical systems.

NTIS

Ion Implantation ; Surface Properties ; Nickel ; Precipitation Hardening ; Oxide Dispersion Strengthening

20020009608 Sandia National Labs. , Albuquerque, NM USA

Computer Simulation of Bubble Growth in Metals Due to He

Foiles, S. M. ; Hoyt, J. J. ; Mar. 01, 2001 ; 28p ; In English

Report No.(s): DE2001-780304 ; SAND2001-0661 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Atomistic simulations of the growth of helium bubbles in metals are performed. The metal is represented by embedded atom method potentials for palladium. The helium bubbles are treated via an expanding repulsive spherical potential within the metal lattice. The simulations predict bubble pressures that decrease monotonically with increasing helium to metal ratios. The swelling of the material associated with the bubble growth is also computed. It is found that the rate of swelling increases with increasing helium to metal ratio consistent with experimental observations on the swelling of metal tritides. Finally, the detailed defect structure due to the bubble growth was investigated. Dislocation networks are observed to form that connect the bubbles. Unlike early model assumptions, prismatic loops between the bubbles are not retained. These predictions are compared to available experimental evidence.

NTIS

Bubbles ; Computerized Simulation ; Helium ; Metals

20020009633 Oak Ridge National Lab. , TN USA

Effect of Mercury Velocity on Corrosion of Type 316L Stainless Steel in a Thermal Convection Loop

Pawel, S. J. ; Mar. 23, 2001 ; 42p ; In English

Report No.(s): DE2001-777774 ; ORNL/TM-2001/18 ; No Copyright ; Avail: Department of Energy Information Bridge

Two 316L thermal convection loops (TCLs) containing several types of 316L specimens circulated mercury continuously for 2000 h at a maximum temperature of 300 C. Each TCL was fitted with a venturi-shaped reduced section near the top of the hot leg for the purpose of locally increasing the Hg velocity. Results suggest that an increase in velocity from about 1.2 m/min (bulk flow) to about 5 m/min (reduced section) had no significant impact on compatibility of 316L with Hg. In addition, various surface treatments such as gold plating, chemical etching, polishing, and steam cleaning resulted in little or no influence on compatibility of 316L with Hg when compared to nominal mill annealed/surface ground material. A sensitizing heat treatment also had little/no effect on compatibility of 316L with Hg for the bulk specimen, although intergranular attack was observed around the specimen holes in each case. It was determined that carburization of the hole area had occurred as a result of the specimen fabrication process potentially rendering the specimens susceptible to corrosion by Hg at these locations. to avoid sensitization related compatibility issues for SNS components, selection of low carbon grades of stainless steel and control of the fabrication process is recommended.

NTIS

Corrosion ; Mercury (Metal) ; Stainless Steels ; Corrosion Test Loops

20020009638 Brookhaven National Lab. , Upton, NY USA

Vaporization of tungsten-metal in steam at high temperatures

Greene, ; Finfrock, ; Oct. 01, 2000 ; 32p ; In English

Report No.(s): DE2001-777720 ; BNL-52621 ; DP0404012 ; No Copyright ; Avail: Department of Energy Information Bridge

The vaporization of tungsten from the APT spallation target dominates the radiological source term for unmitigated target overheating accidents. Chemical reactions of tungsten with steam which persist to tungsten temperatures as low as 800 C result

in the formation of a hydrated tungsten-oxide which has a high vapor pressure and is readily convected in a flowing atmosphere. This low-temperature vaporization reaction essentially removes the oxide film that forms on the tungsten-metal surface as soon as it forms, leaving behind a fresh metallic surface for continued oxidation and vaporization. Experiments were conducted to measure the oxidative vaporization rates of tungsten in steam as part of the effort to quantify the MT radiological source term for severe target accidents. Tests were conducted with tungsten rods (1/8 inch diameter, six inches long) heated to temperatures from approximately 700 C to 1350 C in flowing steam which was superheated to 140 C. A total of 19 experiments was conducted. Fifteen tests were conducted by RF induction heating of single tungsten rods held vertical in a quartz glass retort. Four tests were conducted in a vertically-mounted tube furnace for the low temperature range of the test series. The aerosol which was generated and transported downstream from the tungsten rods was collected by passing the discharged steam through a condenser. This procedure insured total collection of the steam along with the aerosol from the vaporization of the rods. The results of these experiments revealed a threshold temperature for tungsten vaporization in steam. For the two tests at the lowest temperatures which were tested, approximately 700 C, the tungsten rods were observed to oxidize without vaporization. The remainder of the tests was conducted over the temperature range of 800 C to 1350 C. In these tests, the rods were found to have lost weight due to vaporization of the tungsten and the missing weight was collected in the downstream condensate system. The aerosol formed a fine white smoke of tungsten-oxide which was visible to the eye as it condensed in the laminar boundary layer of steam which flowed along the surface of the rod. The aerosol continued to flow as a smoke tube downstream of the rod, flowing coaxially along the centerline axis of the quartz glass tube and depositing by impaction along the outside of a bend and at sudden area contractions in the piping. The vaporization rate data from the 17 experiments which exceeded the vaporization threshold temperature are shown in Figure 5 in the form of vaporization rates (g/cm(sup 2) s) vs. inverse temperature (K(sup (minus)1)). Two correlations to the present data are presented and compared to a published correlation by Kilpatrick and Lott. The differences are discussed.
NTIS
Steam ; Tungsten ; Vaporizing ; High Temperature Tests ; Tungsten Oxides ; Induction Heating

20020009639 Brookhaven National Lab. , Upton, NY USA
Oxidation of inconel 718 in air at temperatures from 973 K to 1620 K
Greene, ; Finfrock, ; Oct. 01, 2000 ; 27p ; In English
Report No.(s): DE2001-777719 ; BNL-52620 ; DP0404012 ; No Copyright ; Avail: Department of Energy Information Bridge
As part of the APT project, it was necessary to quantify the release of tungsten from the APT spallation target during postulated accident conditions in order to develop accident source terms for accident consequence characterization. Experiments with tungsten rods at high temperatures in a flowing steam environment characteristic of postulated accidents revealed that considerable vaporization of the tungsten occurred as a result of reactions with the steam and that the aerosols which formed were readily transported away from the tungsten surfaces, thus exposing fresh tungsten to react with more steam. The resulting tungsten release fractions and source terms were undesirable and it was decided to clad the tungsten target with Inconel 718 in order to protect it from contact with steam during an accident and mitigate the accident source term and the consequences. As part of the material selection criteria, experiments were conducted with Inconel 718 at high temperatures to evaluate the rate of oxidation of the proposed clad material over as wide a temperature range as possible, as well as to determine the high-temperature failure limit of the material. Samples of Inconel 718 were inserted into a preheated furnace at temperatures ranging from 973 K to 1620 K and oxidized in air for varying periods of time. After oxidizing in air at a constant temperature for the prescribed time and then being allowed to cool, the samples would be reweighed to determine their weight gain due to the uptake of oxygen. From these weight gain measurements, it was possible to identify three regimes of oxidation for Inconel 718: a low-temperature regime in which the samples became passivated after the initial oxidation, an intermediate-temperature regime in which the rate of oxidation was limited by diffusion and exhibited a constant parabolic rate dependence, and a high-temperature regime in which material deformation and damage accompanied an accelerated oxidation rate above the parabolic regime.
NTIS
Inconel (Trademark) ; Oxidation ; Tungsten ; High Temperature ; Spallation ; Air

20020009643 Oak Ridge National Lab. , TN USA
Fracture Toughness Characterization of 304L and 316L and Alloy 718 After Irradiation in High-Energy, Mixed Proton/Neutron Spectrum
Sokolov, M. A. ; Mar. 16, 2001 ; 10p ; In English
Report No.(s): DE2001-777707 ; P01-110164 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper describes the fracture toughness characterization of annealed 304L and 316L stainless steels and precipitation hardened Alloy 718, performed at the Oak Ridge National Laboratory as a part of the experimental design and development for the Accelerator Production of Tritium (APT) target/blanket system. Materials were irradiated at 25 to 200 C by high-energy

protons and neutrons from an 800-MeV, 1-mA proton beam at the Los Alamos Neutron Science Center (LANSCE). The proton flux produced in LANSCE is nearly prototypic of anticipated conditions for significant portions of the APT target/blanket system. The objective of this testing program was to determine the change in crack-extension resistance of candidate APT materials from irradiation at prototypic APT temperatures and proton and neutron fluxes. J-integral-resistance (J-R) curve toughness tests were conducted in general accordance with the American Society for Testing and Materials Standard Test Method for Measurement of Fracture Toughness, E 1820-99, with a computer-controlled test and data acquisition system. J-R curves were obtained from subsize disk-shaped compact tension specimens (12.5 mm in diameter) with thicknesses of 4 mm or 2 mm. Irradiation up to 12 dpa significantly reduced the fracture toughness of these materials. Alloy 718 had the lowest fracture toughness in both the unirradiated and irradiated conditions. All irradiated specimens of Alloy 718 failed by sudden unstable crack extension regardless of dose or test temperature. Type 304L and 316L stainless steels had a high level of fracture toughness in the unirradiated condition and exhibited reduction in fracture toughness to saturation levels of 65 to 100 MPa(radical)m. The present reduction in fracture toughness is similar to changes reported from fission reactor studies. However, the currently observed losses in toughness appear to saturate at doses slightly lower than the dose required for saturation in reactor-irradiated steels. This difference might be attributed to the increased helium and hydrogen production associated with irradiation in the high-energy, mixed proton/neutron spectrum.

NTIS

Fracture Strength ; Heat Resistant Alloys ; Irradiation ; Neutron Spectra ; Protons ; Annealing ; Stainless Steels

20020009666 Uniformed Services Univ. of the Health Sciences , Bethesda, MD USA

Polarized Light Scattering as a Rapid and Sensitive Assay for Metal Toxicity to Bacteria ***Final Report , Jun. 1999-Jul. 2001***

Li, Z. Z. ; Czege, J. ; Bronk, B. V. ; Jul. 2001 ; 12p ; In English

Contract(s)/Grant(s): MDA905-99-10018 ; Proj-1400

Report No.(s): AD-A396158 ; AFRL-HE-WP-TR-2001-0149 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A new method that utilizes the scattering of polarized light from a suspension of bacteria to assay the effect of toxins is evaluated. The method compares the time dependence of changes in an angular scattering pattern obtained from a suspension of Escherichia coli bacteria with no toxin exposure to the corresponding, but reduced, changes that occur when there is exposure to a small concentration of certain toxicants. The changes are due to growth of a specially prepared population of these bacteria. The changes in the pattern normally reflect a change in average bacterial size due to growth, whereas the reduction of the change in pattern occurs when there is rapid cessation of bacterial growth. The method was tested with varying concentration of the ions of five different heavy metals. The results using this method during the first few minutes after exposure to the toxicant were compared to the relative survival of colony-forming units of the bacteria. The graphs for the two methods were found to be approximately parallel for each of the five metals examined. This result indicates that the toxic effect of these metals takes place relatively quickly for these bacteria. These results were compared with results available from the literature for the same metals but using other methods for measuring the toxicity to bacteria.

DTIC

Light Scattering ; Heavy Metals ; Escherichia ; Bacteria ; Polarized Light

20020009763 Pennsylvania State Univ. , University Park, PA USA

Behavior of Three Metallic Alloys Under Combined Axial-Shear Stress at 650 C ***Final Report***

Colaiuta, Jason F. , Pennsylvania State Univ. , USA ; October 2001 ; 166p ; In English

Contract(s)/Grant(s): NCC3-597 ; RTOP 708-31-13

Report No.(s): NASA/CR-2001-211162 ; E-13020 ; NAS 1.26:211162 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

Three materials, Inconel 718, Haynes 188, and 316 stainless steel, were tested under an axial-torsional stress state at 650 C. The objective of this study was to quantify the evolution of the material while in the viscoplastic domain. Initial and subsequent yield surfaces were experimentally determined to quantify hardening. Subsequent yield surfaces (yield surfaces taken after a preload) had a well-defined front side, in the prestrain direction, but a poorly defined back side, opposite the prestrain direction. Subsequent yield surfaces exhibited isotropic hardening by expansion of the yield surface, kinematic hardening by translation of the yield surface, and distortional hardening by flattening of the yield surface in the direction opposite to the last prestrain. An existing yield function capable of representing isotropic, kinematic, and distortional hardening was used to fit each yield surface.

Four variables are used to describe each surface. These variables evolve as the material state changes and have been regressed to the yield surface data.
Author
Axial Stress ; Inconel (Trademark) ; Stainless Steels ; Yield Strength ; Stellite (Trademark)

20020010126 Oak Ridge National Lab. , TN USA
Design and Product Optimization for Cast Light Metals
Viswanathan, S. , Oak Ridge National Lab. , USA ; Mar. 30, 2001 ; 94p ; In English
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-777630 ; C/ORNL94-0319 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The main phases that are present in A356 aluminum alloy castings are the primary aluminum and eutectic silicon phases. It is the morphology of these phases, together with the microporosity, that determines the mechanical properties, notably the fatigue life of structural aluminum alloy castings. As part of a program to develop optimized tooling for the design of the casting process for structural A356 aluminum alloy components, models have been developed and used for predicting phase fractions, microstructural length scales, and fraction microporosity. Thermophysical properties needed for the numerical simulation of fluid flow, heat transfer, solidification, and solidification shrinkage have been measured. The permeability of interdendritic liquid in the mushy zone has been evaluated experimentally. This report documents all aspects of the development of the models for the prediction of microstructural length scales and fraction microporosity. The length scales are the primary dendrite size, secondary dendrite arm spacing and cell spacing for the primary aluminum phase, and the particle/rod length, diameter and spacing for the silicon phase. The microstructure models predict phase evolution during solidification and the final length scales after solidification, and consider the mechanisms governing the growth of the primary aluminum and silicon phases. A comprehensive methodology taking into account solidification, shrinkage-driven interdendritic fluid flow, hydrogen precipitation, and porosity evolution has been developed for the prediction of microporosity fraction. The predictions are validated by comparison with independent experimental measurements by other researchers and with data from the literature. The models are implemented in a computational framework consistent with those of commercial casting codes, allowing them to be easily incorporated in commercial casting simulation software.
NTIS
Aluminum Alloys ; Mechanical Properties ; Castings ; Fatigue (Materials)

20020010127 Oak Ridge National Lab. , TN USA
Role of Ledge Nucleation/Migration in 'Omega' Plate Thickening Behavior in Al-Cu-Mg-Ag Alloys
Hutchinson, C. R. , Oak Ridge National Lab. , USA ; Mar. 16, 2001 ; 11p ; In English ; 130th Annual Meeting and Exhibition of the Minerals, Metals, and Materials Society (TMS)
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-777629 ; P01-110138 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The thickening kinetics of (Omega) plates in an Al-4Cu-0.3Mg-0.2Ag (wt. %) alloy have been measured at 200 C, 250 C and 300 C using conventional transmission electron microscopy techniques. At all temperatures examined the thickening showed a linear dependence on time. At 200 C the plates remained less than 6nm in thickness after 1000h exposure. At temperatures above 200 C the thickening kinetics are greatly increased. Atomic resolution Z-contrast microscopy has been used to examine the structure and chemistry of the (001)(sub (Omega)) (parallel) (111)(sub (alpha)) interphase boundary in samples treated at each temperature. In all cases, two atomic layers of Ag and Mg segregation were found at the broad face of the plate. The risers of the growth ledges and the ends of the plates were free of segregation. No significant levels of Ag or Mg were detected inside the plate at any time. The necessary redistribution of Ag and Mg accompanying a migrating thickening ledge occurs at all temperatures and is not considered to play a decisive role in the excellent coarsening resistance exhibited by the (Omega) plates at temperatures up to 200 C. Plates transformed at 200 C rarely contained ledges and usually exhibited a strong vacancy misfit normal to the plate. A large increase in ledge density was observed on plates transformed at 300 C, concomitant with accelerated plate thickening kinetics. The high resistance to plate coarsening exhibited by (Omega) plates at temperatures up to 200 C, is due to limited ledge nucleation under these conditions. The prohibitively high barrier to coherent ledge nucleation on the broad faces of plates aged at 200 C arises from the contribution to the total free energy change attending nucleation from elastic interactions between the misfitting coherent ledges and the significant strain field that can exist normal to the broad face of the (Omega) plate.
NTIS
Nucleation ; Alloys ; Metal Plates ; Thickness

20020010163 Los Alamos National Lab. , NM USA

Use of a cobalt based metallic-glass in joining MoSi2 to stainless steel

Vaidya, R. ; Rangaswamy, P. ; Apr. 01, 2001 ; 8p ; In English

Report No.(s): DE2001-777916 ; LA-UR-01-2029 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The successful use of a cobalt-based metallic-glass in joining molybdenum disilicide (MoSi2) to stainless steel 316L was demonstrated. Such joints are being investigated for sensor tube applications in glass melting operations. The cobalt-based metallic-glass (METGLAS(trademark) 2714A) was found to wet the MoSi2 and stainless steel surfaces and provide high quality joints. Joining was completed at 1050 C for 60 minutes in two different ways; either by feeding excess braze into the braze gap upon heating or by constraining the MoSi2/stainless steel assembly with an alumina (Al2O3) fixture during the heating cycle. These steps were necessary to ensure the production of a high quality void free joint. Post-brazing metallographic evaluations coupled with quantitative elemental analysis indicated the presence of a Co-Cr-Si ternary phase with CoSi and CoSi2 precipitates within the braze. The residual stresses in these molybdenum disilicide (MoSi2)/stainless steel 316 L joints were evaluated using X-ray diffraction and instrumented indentation techniques. These measurements revealed that significant differences are induced in the residual stresses in MoSi2 and stainless steel depending on the joining technique employed. Push-out tests were carried out on these joints to evaluate the joint strength.

NTIS

Stainless Steels ; Molybdenum Compounds ; Cobalt ; Metallic Glasses

20020010200 Department of Energy , Aiken, SC USA

Reactor Material Program Fracture Toughness of Type 304 Stainless Steel

Awadalla, N. G. ; Mar. 28, 2001 ; 22p ; In English

Report No.(s): DE2001-781036 ; DPST-86-695 ; No Copyright ; Avail: Department of Energy Information Bridge

This report describes the experimental procedure for Type 304 Stainless Steel fracture toughness measurements and the application of results. Typical toughness values are given based on the completed test program for the Reactor Materials Program (RMP). Test specimen size effects and limitations of the applicability in the fracture mechanics methodology are outlined as well as a brief discussion on irradiation effects.

NTIS

Reactor Materials ; Stainless Steels

20020010222 Brookhaven National Lab. , Upton, NY USA

Cathodic reduction of passive films on iron in borate and phosphate buffer ph 8.4: different mechanisms revealed by in situ techniques

Schmuki, P. ; Virtanen, S. ; Isaacs, H. S. ; Mar. 25, 2001 ; 10p ; In English

Report No.(s): DE2001-782048 ; BNL-68341 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The electrochemical behavior of passive Fe and thin, sputter-deposited films of Fe(sub 2)O(sub 3) was studied in borate and phosphate buffer pH 8.4 solutions. Cyclic voltammograms and in situ light absorption measurements--which enable the monitoring of the oxide film thickness--indicate a similar behavior of the Fe electrode in both pH 8.4 solution, especially a presence of a oxide-free surface at low cathodic potentials. However, X-ray absorption near edge structure (XANES) studies--which allow a simultaneous monitoring of changes in the samples' average valency and thickness--reveal that the reactions taking place during reduction of the passive film on iron are completely different for the two electrolytes. In borate buffer (pH 8.4), reduction leads to a complete dissolution of the passive film and the end product of reduction is soluble Fe(2+). In phosphate buffer (pH 8.4), there is no dissolution in a direct step to low cathodic potentials, but the resulting reduction product is metallic iron. Hence, the formation of the bare oxide-free metal surface at cathodic potentials takes place by different mechanisms in the two pH 8.4 solutions, depending on the type of anion present in the solution.

NTIS

Borates ; Phosphates ; Iron Oxides

20020010371 DYNACS Engineering Co., Inc. , Cocoa Beach, FL USA

Corrosion of Stainless-Steel Tubing in a Spacecraft Launch Environment

Barile, Ronald G. , DYNACS Engineering Co., Inc. , USA ; MacDowell, Louis G. , NASA Kennedy Space Center , USA ; Curran, Joe , DYNACS Engineering Co., Inc. , USA ; Calle, Luz Maria , NASA Kennedy Space Center , USA ; Hodge, Timothy , DYNACS Engineering Co., Inc. , USA ; [2001] ; 7p ; In English ; NACE/2002 , 25-29 Mar. 2002 , Denver, CO , USA

Contract(s)/Grant(s): NAS10-98001 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

This is a report of exposure of various metal tubing to oceanfront launch environments. The objective is to examine various types of corrosion-resistant tubing for Space Shuttle launch sites. The metals were stainless steels (austenitic, low-carbon, Mo-alloy, superaustenitic, duplex, and superferritic), Ni-Cr-Mo alloy, Ni-Mo-Cr-Fe-W alloy, and austenitic Ni-base superalloy. Author

Corrosion Resistance ; Nickel Alloys ; Pipes (Tubes) ; Stainless Steels

20020010610 Sandia National Labs. , Albuquerque, NM USA

Solid Freeform Fabrication Using the Wirefeed Process

Buchheit, T. E. ; Crenshaw, T. B. ; Ensz, M. T. ; Greene, D. L. ; Griffith, M. L. ; Jul. 22, 1999 ; 10p ; In English

Report No.(s): DE2001-9609 ; SAND99-1866C ; No Copyright ; Avail: Department of Energy Information Bridge

Direct metal deposition technologies produce complex, near net shape components from CAD solid models. Most of these techniques fabricate a component by melting powder in a laser weld pool, rastering this weld bead to form a layer, and additively constructing subsequent layers. This talk describes a new direct metal deposition process, known as WireFeed, whereby a small diameter wire is used instead of powder as the feed material to fabricate components. Currently, parts are being fabricated from stainless steel. Microscopy studies show the WireFeed parts to be fully dense with fine microstructural features. Initial mechanical tests show stainless steel parts to have good strength values with retained ductility.

NTIS

Stainless Steels ; Metallizing ; Deposition

20020011165 Swedish Defence Research Establishment , Weapons and Protection Div. , Tumba, Sweden

A First Model for Calculation of the Temperature Distribution in Samples Subjected to Homogeneous Mechanical Deformation ***En Foersta Modell foer Beraekning av Temperaturfoerdelningen i Provstavar under Homogen Mekanisk Deformation***

Skoglund, P. ; November 1999 ; 18p ; In Swedish

Report No.(s): PB2001-108083 ; FOA-R-99-01336-310-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

A First model for calculation of the temperature gradients that develop during homogeneous mechanical deformation of a specimen is presented. by using the experimentally found stress-strain curve at a known strain rate it is possible to calculate the deformation power as a function of time. The model is based on using the part of the deformation power that is converted into heat as an external heat source in the time dependent heat conduction equation. This equation is then solved with the appropriate boundary conditions with a finite element method.

NTIS

Deformation ; Finite Element Method ; Stress-Strain Relationships ; Temperature Distribution ; Temperature Gradients

20020011228 Lawrence Livermore National Lab. , Livermore, CA USA

Activity plan for activity E-20-81: Development and experimental validation of crevice corrosion models

Farmer, J. C. ; Dec. 28, 1999 ; 36p ; In English

Report No.(s): DE2001-9781 ; UCRL-ID-132953 ; No Copyright ; Avail: Department of Energy Information Bridge

Alloy 22 (UNS N06022) is now being considered for construction of high level waste containers to be emplaced at the potential repository at Yucca Mountain or elsewhere. In essence, this alloy is 21% Cr, 13% Mo, 4% Fe, 3% W, 2% Co, with the balance being Ni. Variants without tungsten are also being considered. Detailed mechanistic models are being developed to account for the corrosion of Alloy 22 surfaces in crevices that will inevitably form. Such occluded areas experience substantial decreases in pH, with corresponding elevations in chloride concentration. Other relevant materials will also be investigated: nickel-based alloys such as Alloys 825, 625, C-4, C-276 and 59; titanium-based alloys such as Grades 12, 7 and 16, carbon steels such as A516 Grade 55; stainless steels such as 304, 304L, 316, 316L and 316NG; various copper-based alloys; and any materials that would serve as crevice formers (rock, thermally-sprayed ceramics, etc.). Experimental work has been undertaken to validate the crevice corrosion model, including parallel studies with 304 stainless steel. The crevice corrosion model is described in detail in scientific notebooks of the Principal Investigator, as well as other publications. Codes will be prepared in accordance with the YMP QP entitled Software Quality Assurance; (033-YMP-QP 12.0).

NTIS

Carbon Steels ; Containment ; Radioactive Wastes ; Waste Disposal ; Corrosion

20020011229 Lawrence Livermore National Lab. , Livermore, CA USA

Correlation effects on stability in Pu metal and its alloys

Cooper, B. R. ; Gonis, A. ; Kiousis, N. ; Price, D. L. ; Turchi, P. E. ; Apr. 01, 1999 ; 9p ; In English

Report No.(s): DE2001-9787 ; UCRL-JC-133574 ; No Copyright ; Avail: Department of Energy Information Bridge

The existence of six crystallographic allotropes from room temperature up to the solid-liquid transition just above 913 K at atmospheric pressure makes solid Plutonium unique among the elements in the periodic table. Among these phases (labeled (alpha), (beta), (gamma), (delta)(delta)(prime)), and (var-epsilon), the (delta) phase, stable between 593 K and 736 K, has commanded considerable interest in the metallurgical and solid state communities. In contrast to the low-temperature monoclinic (alpha) phase, which is brittle, the face-centered cubic (fcc) (delta) phase is ductile, a property that makes it convenient for engineering applications. This phase can also be stabilized through alloying with a number of other elements such as Ga, Al, Sc, and Am.

NTIS

Plutonium ; Alloying ; Solid State ; Electronic Structure

20020011613 Lawrence Livermore National Lab. , Livermore, CA USA

Effect of Laser Surface Reconstruction of Disordered Carbons on Performance

Even, ; Guidotti, ; Oct. 06, 1999 ; 12p ; In English

Report No.(s): DE2001-13072 ; SAND99-1703C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The reconstruction of the surface of disordered carbons was examined by heating carbons derived from polymethacrylonitrile (PMAN) and divinylbenzene (DVB) with a pulsed infrared laser in an argon or helium atmosphere, both fluidized and under static conditions. by graphitizing the outer surface of the carbons, it was hoped to reduce the high first-cycle losses associated with such disordered materials in Li-ion cells. The power to the sample was varied to observe the effects on surface morphology and electrochemical performance in lM LiPF/ethylene carbonate-dimethyl carbonate. The use various reactive atmosphere such as ethylene, 2-vinylpyridine, pyrrole, and furfuryl alcohol were also evaluated as an alternative means of hopefully forming a thin graphitic layer on the carbon particles to reduce first-cycle irreversibility. While some improvement was realized, these losses were still unacceptably high. The laser heating did improve the rate capabilities of the carbons, however. More work in this area is necessary to fully understand surface and bulk effects.

NTIS

Carbon ; Surface Properties ; Carbonates ; Semiconductors (Materials) ; Laser Heating

20020011720 Lawrence Livermore National Lab. , Livermore, CA USA

Integrated Quantum-Mechanical Approach to Stability, Chemical Order and Phase Evolution in Complex Alloys

Julien, J. P. ; Mayou, D. ; Turchi, P. E. ; Aug. 13, 1999 ; 6p ; In English

Report No.(s): DE2001-9645 ; UCRL-JC-133537 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors first briefly review and illustrate the application of a state-of-the-art approach to the study of phase stability properties of substitutional alloys based on periodic lattices with the prediction of the phase diagram of Ta-W. Then, they schematically present a real-space approach based on electronic structure calculations for studying stability, chemical order, and phase evolution in the case of multi-component alloys which exhibit both chemical order and topological disorder. Potential applications, and preliminary results are discussed.

NTIS

Phase Diagrams ; Phase Stability (Materials) ; Alloys

20020012273 Swedish Defence Research Establishment , Weapons and Protection Div. , Tumba, Sweden

Quasistatic Compressive Tests of Tungsten Carbide/Cobalt Alloys *Kvasistatisk Tryckprovning ave Volframkarbid/Koboltlegeringar*

Svensson, L. ; January 2000 ; 20p ; In Swedish

Report No.(s): PB2001-108199 ; FOA-R-00-0111-310-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

Quasistatic compressive tests of tungsten carbide/cobalt alloys have been done. One of the alloys contain 8w% cobalt and the other 11w%. The mechanical properties such as E-modulus, compressive strength and fracture strain are determined and compared to available literature data on similar alloys. The results show that both materials have an E-modulus of 580 GP-a. The alloy with 8% cobalt is elastic up to a pressure of 1600 MP-a and has a compressive strength of 5800 GP-a at a strain of 2.3%.

For the harder material about 50% of the total strain at fracture is plastic, while about 70% of the total strain is plastic for the alloy with 11% cobalt.
NTIS
Cobalt ; Cobalt Alloys ; Mechanical Properties ; Tungsten Carbides

20020012435 NASA Glenn Research Center , Cleveland, OH USA
Superalloy Foams for Aeroshell Applications
Gayda, John , NASA Glenn Research Center , USA ; Padula, Santo, II , NASA Glenn Research Center , USA ; November 2001 ; 12p ; In English
Contract(s)/Grant(s): RTOP 706-85-33
Report No.(s): NASA/TM-2001-211305 ; NAS 1.15:211305 ; E-13103 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Current thermal protection systems for reentry from space, such as that employed on the space shuttle, rely on ceramic tiles with ultra-low conductivity. These materials provide excellent thermal protection but are extremely fragile, easily degraded by environmental attack, and carry no structural loads. Future thermal protection systems being proposed in NASAs MITAS Program will attempt to combine thermal protection with improved durability and structural capability without significant increases in vehicle weight. This may be accomplished by combining several materials in a layered structure to obtain the desired function for aeroshell applications. One class of materials being considered for inclusion in this concept are high temperature metal foam. The objective of this paper was to fabricate low density, superalloy foams and conduct limited testing to evaluate their thermal and structural capabilities. Superalloys were chosen for evaluation as they possesses good strength and excellent environmental endurance over a wide range of temperatures. Utilizing superalloys as low density foams, with porosity contents greater than 90%, minimizes weight and thermal conductivity.
Author
Aeroshells ; Heat Resistant Alloys ; Metal Foams ; Characterization ; Thermal Protection

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20020006104 Los Alamos National Lab. , NM USA
Mean field and monte carlo modeling of multiblock copolymers
Rasmussen, K. ; Jan. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-773325 ; LA-UR-01-91 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors discuss and apply extensions needed to treat multiblock copolymers within the mean field theoretical framework for microphase separation in diblock copolymer metals, originally due to Leibler. The mean field calculations are complemented by lattice Monte Carlo realizations using the bond fluctuation model. They find that the microphase separation transition occurs at larger (sub (chi))N as the number of blocks in increased beyond two (i.e., beyond diblock), and that the characteristic length scale of the emerging morphology decreases as the number of blocks increases. The latter prediction is in qualitative agreement with published experimental results due to Sontak and co-workers for model multiblock poly(styrene-isoprene) systems and recent results due to Hjelm and co-workers for a segmented poly(ester-urethane) relevant to Los Alamos interests. Additionally, the mean field predictions and bond fluctuation realizations yield consistent results.
NTIS
Copolymers ; Monte Carlo Method ; Mathematical Models ; Multiblock Grids ; Morphology

20020006112 Federal Energy Technology Center , Morgantown, WV USA
Supported dense ceramic membranes for oxygen separation
Ward, T. L. ; Jun. 30, 2000 ; 16p ; In English
Report No.(s): DE2001-772392 ; DE-FG26-98FT40120-02 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Mixed-conducting membranes have the ability to conduct oxygen with perfect selectivity at elevated temperatures, which makes them an extremely attractive alternative for oxygen separation and membrane reactor applications. The ability to reliably fabricate these membranes in thin or thick films would enable solid-state divisional limitations to be minimized, thus providing

higher oxygen flux. Based on that motivation, the overall objective for this project is to develop and demonstrate a strategy for the fabrication of supported Wick film ceramic mixed conducting membranes, and improve the understanding of the fundamental issues associated with reliable fabrication of these membranes. The project has focused on the mixed-conducting ceramic composition SRCo(sub 0.5)FeO(sub x) because of its superior permeability and stability in reducing atmospheres. The fabrication strategy employed involves the deposition of SRCo(sub 0.5)FeO(sub x) thick films onto porous supports of the same composition. In the second year of this project, we completed characterization of the sintering and phase behavior of the porous SRCo(sub 0.5)FeO(sub x) supports, leading to a standard support fabrication methodology. Using a doctor blade method, pastes made from aerosol-derived SRCo(sub 0.5)FeO(sub x) powder dispersed with polyethylene glycol were applied to the supports, and the sintering behavior of the thick film membranes was examined in air and nitrogen atmospheres. It has been demonstrated that the desired crystalline phase content can be produced in the membranes, and that the material in the membrane layer can be highly densified without densifying the underlying support. However, considerable cracking and opening of the film occurred when films densified to a high extent. The addition of MgO into the SRCo(sub 0.5)FeO(sub x) supports was shown to inhibit support sintering so that temperatures up to 1300 C, where significant liquid formation occurs, could be used for film sintering. This successfully reduced cracking, however the films retained open porosity. The investigation of this concept will be continued in the final year of the project. Investigation of a metal organic chemical vapor deposition (MOCVD) method for defect mending in dense membranes was also initiated. An appropriate metal organic precursor (iron tetramethylheptanedionate) was identified whose deposition can be controlled by access to oxygen at temperatures in the 280-300 C range. Initial experiments have deposited iron oxide, but only on the membrane surface; thus refinement of this method will continue.
NTIS
Membranes ; Oxygen ; Separators

20020006145 Oak Ridge National Lab. , TN USA
Properties and Performance of Ceramic Composite Components
Carter, R. H. ; Jan. 04, 2001 ; 35p ; In English
Report No.(s): DE2001-773302 ; ORNL/SUB/87-SA946/08 ; No Copyright ; Avail: Department of Energy Information Bridge
The research program of the Materials Response Group at Virginia Tech addresses the need for reliable and durable ceramic composites to perform in high temperature applications. Areas of current research are characterization of oxide/oxide hot gas filter tubes and dense Nextel/SiC tubes. The focus of this report will be on the characterization of the Nextel/SiC tubes.
NTIS
Composite Materials ; Performance Prediction ; Mechanical Properties ; Ceramic Matrix Composites

20020006226 Los Alamos Scientific Lab. , NM USA
An Equation of State for Shocked Polyurethane Foam
Mader, Charles L. ; Carter, William J. ; Nov. 22, 1968 ; 52p ; In English
Contract(s)/Grant(s): W-7405-eng-36
Report No.(s): AD-A395377 ; LA-4059 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The experimentally observed behavior of systems of high explosives, low density (0.5- and 0.3 g/cc) polyurethane foam, and metals can be numerically reproduced if the foam is assumed to decompose and the decomposition products are described by a BKW equation of state.
DTIC
Equations of State ; Polyurethane Foam ; Decomposition

20020006248 Federal Energy Technology Center , Morgantown, WV USA
Investigation of waste glass pouring process over a knife edge
Ebadian, M. A. ; Jan. 01, 1999 ; 56p ; In English
Report No.(s): DE2001-772514 ; DE-FG01-95EW55094-62 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Vitrification is the process of capturing radioactive waste in glass. The Savannah River Site's (SRS) Defense Waste Processing Facility (DWPF) is one of the facilities using the vitrification technology to treat and immobilize radioactive waste. The objective of the project is to investigate the pouring behavior of molten glass over a pour spout knife edge. Experiments are run using simulant glass containing the same chemical formulation as the radioactive sludge glass, but without radioactive contaminants. The purpose of these tests is to obtain actual glass data that, when combined with previous cold data from other fluids, will provide an overall understanding of the physics of liquids flowing over a pour spout and knife edge, A specific objective is to verify computational fluid dynamics (CFD) models with a range of liquid data with particular emphasis on glass

so as to provide confidence in use of these CFD models for designing a new improved pour spout for the DWPF melter. The work to be performed at FIU-HCET includes assembling the melting and pouring system that mimics the DWPF melter and determining the key parameters that may influence wicking. Information from the FIU-HCET melter tests will lead to better operating guidelines for the DWPF melter so as to avoid wicking. During FY98, a bench-scale melter complete with pour spout and a knife edge was designed and assembled at FIU-HCET. Initially, the system was tested with glycerine. Subsequently, glass provided by SRS was used for experimentation. Flow visualization tests were performed with the melter in FY98 to investigate the pouring behavior of molten glass over a pour spout model simulating a DWPF pour spout of the original design. Simulant glass containing the same chemical formulation as sludge glass but without radioactive contaminants was used in the tests. All the tasks and milestones mentioned in the PTP for the project were accomplished. The project completed its second year, and this document reports the tasks and milestones that were accomplished during the 1998 fiscal year.
NTIS
Vitrification ; Radioactive Contaminants ; Computational Fluid Dynamics ; Radioactive Wastes

20020006314 QSS Group, Inc. , Brook Park, OH USA
Environment Conscious Ceramics (Ecoceramics): An Eco-Friendly Route to Advanced Ceramic Materials
Singh, M. , QSS Group, Inc. , USA ; December 2001 ; 15p ; In English ; 11th ; 11th International Symposium on Ultra-High Temperature Materials , 6-7 September, 2001 , Tajimi , Japan ; Sponsored by Japan Ultra-High Temperature Materials Inst. , Japan
Contract(s)/Grant(s): NAS3-00145 ; RTOP 251-30-07
Report No.(s): NASA/CR-2001-211202 ; E-13048 ; NAS 1.26:211202 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Environment conscious ceramics (Ecoceramics) are a new class of materials, which can be produced with renewable natural resources (wood) or wood wastes (wood sawdust). This technology provides an eco-friendly route to advanced ceramic materials. Ecoceramics have tailorable properties and behave like ceramic materials manufactured by conventional approaches. Silicon carbide-based ecoceramics have been fabricated by reactive infiltration of carbonaceous preforms by molten silicon or silicon-refractory metal alloys. The fabrication approach, microstructure, and mechanical properties of SiC-based ecoceramics are presented.
Author
Ceramics ; Environment Protection ; Melts (Crystal Growth) ; Wood ; Infiltration

20020006494 University of Southern California , Loker Hydrocarbon Research Inst. , Los Angeles, CA USA
Photon-Harvesting Block Copolymers ***Final Report , 15 May-1 Sep. 2000***
Harper, Aaron W. ; Oct. 19, 2001 ; 7p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0166
Report No.(s): AD-A395661 ; ARO-40121.1-CH-YIP ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Our work has led to 1) the identification of several new and facile routes to preparing polyphenylene and poly(arylene vinylene)-type polymers and copolymers, 2) the development of highly-efficient organolanthanide complexes and dendrimers for both photon and excited-state energy harvesting. 3) the demonstration of triplet excited-state harvesting and electrophosphorescence in polymers used for light-emitting diodes, and 4) the development of two-photon active dyes for chemical sensing and photonic applications. It is expected that these four accomplishments will lead to more robust and efficient polymers for solar energy harvesting and light-emitting devices, as well as optical sensors for the detection of chemicals and biological agents.
DTIC
Block Copolymers ; Excitation ; Photons ; Polyphenyls ; Photonics

20020006502 Case Western Reserve Univ. , Cleveland, OH USA
New Microlayer and Nanolayer Polymer Composites ***Interim Report , 1 Jan.-31 Dec. 1999***
Baer, Eric ; Hiltner, Anne ; Dec. 1999 ; 12p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0311
Report No.(s): AD-A395803 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The highlights of this period are centered around the development of polymer nanolayer systems by a novel continuous coextrusion method. Nanolayers ranging in thickness between 5 nm to 500 nm have been manufactured using inexpensive polymeric materials such as polystyrene, polystryene acrylonitrile copolymers, polypropylene, polyethylene, polycarbonate and polymethylmethacrylate. Two and three component systems have been made from various combinations of these polymers. In particular, the morphology of polypropylene has been drastically changed from a routine spherilitic alpha-form structure to a

discoidal meso-form structure by just decreasing the layer thickness to nano dimensions. High density polyethylene has been totally changed to a ”shish-kabab” structure due to the fact that the nano-layer thickness is less than the radius of gyration of the polymer macromolecule. When oriented, this novel crystalline morphology appeared as extended chain fibrillar crystals imbedded in polystyrene acting as the continuous phase in a nanocomposite structure. Recently, we have started to develop nano-systems with anisotropic electrical and mechanical properties. Also, gradient and vertical layer structures are being considered. In the last few weeks we have actually succeeded in creating a vertical composite with highly anisotropic mechanical properties composed of polystyrene and a styrene-butadiene block copolymer.
DTIC
Nanocomposites ; Nanostructure (Characteristics) ; Thickness ; Mechanical Properties ; Electrical Properties

20020006511 Case Western Reserve Univ. , Cleveland, OH USA
New Microlayer and Nanolayer Polymer Composites ***Interim Report , 1 Jun.-31 Dec. 1998***
Baer, E. ; Hiltner, A. ; Dec. 1998 ; 3p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0311
Report No.(s): AD-A395836 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
During the period, new types of micro- and nano-layered polymeric composite systems were created with specific property combinations. Various materials systems with two and three components were produced for the first time. These had novel characteristics due to structure control as a function of scale and inter-layer adhesion. Highlights include: (1) Development of clear nano-layered composites with improved ballistic performance characteristics; (2) Creation of conducting micro-layered composites by controlled interdiffusion; and, (3) Microlayered structures with highly anisotropic conductivity.
DTIC
Composite Materials ; Nanocomposites ; Thickness

20020006520 Kyushu Univ. , Faculty of Engineering , Fukuoka, Japan
Sulfate Ion Concentration in the Concrete Corrosive Ground
Sato, Toshiyuki , Kyushu Univ. , Japan ; Matsushita, Hiromichi , Kyushu Univ. , Japan ; Technology Reports of Kyushu University ; November 2001 ; ISSN 0023-2718 ; Volume 74 , No. 6 , pp. 635-643 ; In Japanese ; Copyright ; Avail: Issuing Activity
The concrete corrosive ground was found from a geological view point to be developed on coal waste from old coal-mining areas (Paleogene) and mudstone (Neogene) as discussed in a previous paper. In this paper, sulfate ion concentration in these grounds was evaluated from results of geological and pedological analyses. The evaluated concentration suggests the possibility that it increases by oxidation and the ensuing risk of corrosion to concrete has been established. High concentrations of sulfate ion were found not only in coal waste and Neogene mudstone but also in diluvium and alluvium of marine origin. It was revealed that positive ion supply, ground water level, earth temperature and pyrite oxidation due to the ambient temperature significantly affect on the bacteria processes.
Author
Sulfates ; Ion Concentration ; Concretes ; Corrosion

20020006538 Los Alamos National Lab. , NM USA
Comprehensive structural study of pre-and post-heat treated compression molded polyurethane samples of varying composition studies by scanning probe techniques
Hawley, M. ; Orler, E. ; Mar. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-775488 ; LA-UR-01-1234 ; No Copyright ; Avail: Department of Energy Information Bridge
Only a limited number of structural studies have been performed on polyurethanes using scanning probe techniques to determine both the microstructure and the corresponding distribution of hard and soft segments within samples. This type of information is needed to better understand the mechanical properties of these materials and to facilitate modeling. In order to address these issues, we have fabricated a series of compression molded segmented polyester urethane samples with hard (HS) to soft segment ratios from 19 to 100%. Samples were examined using scanning probe phase imaging techniques to obtain the topography and corresponding distribution of hard domains before and after heating at 100 C. A number of significant differences were observed between the pre- and post-heat treated samples. Variations in structure and heat-induced morphological changes were directly related to HS content. Fine strand- or fibril-like structures were most prominent in the 23 and 19% HS sample but first appeared at 30% HS. Harder, thicker elongated structures dominated the surface of the 100% HS sample and were seen to

a limited extent on all samples, especially after annealing and quenching. The 23% HS sample surface structure depended on quenching rate and time after treatment.
NTIS
Mechanical Properties ; Polyurethane Resins ; Imaging Techniques ; Morphology ; Heat Treatment ; Molds

20020006543 Los Alamos National Lab. , NM USA
Full-Field Deformation Measurement in Polymeric Foam Specimens
Liu, C. ; Mar. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-775576 ; LA-UR-01-1277 ; No Copyright ; Avail: Department of Energy Information Bridge
In this investigation, a simple experimental technique, dot-matrix deposition and mapping, was developed to study the full-field deformation in a polymeric foam specimen. One of the advantages of using this technique is that it can be easily applied to situations where large deformations are involved. The spatial resolution of the current technique is not as high as the digital image correlation method and some other optical techniques. Nevertheless, because the largest cell diameter of the polyurethane foam studied in this investigation is about 1 mm, the smallest length scale over which the polymeric foam material can be treated as a homogeneous solid would be at least several millimeters. For the element size used in the present study in the range of 2.5 x 2.5 mm, the dot-matrix deposition and mapping technique would provide enough detail about the behavior of polymeric foam materials under complicated deformation states and under complicated loading conditions. It will also provide useful information to compare with numerical simulations so that the constitutive models can be validated.
NTIS
Deformation ; Polyurethane Foam ; Optical Properties ; Imaging Techniques ; Mathematical Models

20020006830 Oak Ridge National Lab. , TN USA
Aging of Polyurethane Foam Insulation in Simulated Refrigerator Panels: Two-Year Results with Third-Generation Blowing Agents
Wilkes, K. E. ; Feb. 14, 2001 ; 16p ; In English
Report No.(s): DE2001-775408 ; P00-107629 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Laboratory data are presented on the effect of constant-temperature aging on the apparent thermal conductivity of polyurethane foam insulation for refrigerators and freezers. The foam specimens were blown with HCFC-141b and with three of its potential replacements--HFC-134a, HFC-245fa, and cyclopentane. Specimens were aged at constant temperatures of 90 F, 40 F, and (minus)10 F. Thermal conductivity measurements were made on two types of specimens: full-thickness simulated refrigerator panels containing foam enclosed between solid plastic sheets, and thin slices of core foam cut from similar panels. Results are presented for the first two years of a multi-year aging study. Preliminary comparisons of measured data with predictions of a mathematical aging model are presented.
NTIS
Thermal Conductivity ; Temperature Effects ; Aging (Metallurgy) ; Polyurethane Foam

20020007089 National Renewable Energy Lab. , Golden, CO USA
Glass: Industry of the Future
Jan. 23, 2001 ; 8p ; In English
Report No.(s): DE2001-775988 ; NREL/BR-810-29342 ; DOE/GO-102001-1155 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This 8-page brochure describes the Office of Industrial Technologies' Glass Industry of The Future; a partnership between the Department of Energy and the glass industry established to increase industrial energy and cost efficiency.
NTIS
Glass ; Industrial Energy ; Energy Conservation

20020007095 Kansas City Plant , Kansas City, MO USA
Ultrasonic Imaging for Poling Uniformity Measurements in PZT Ceramic Elements
Jamieson, E. E. ; Mar. 14, 2000 ; 21p ; In English
Report No.(s): DE2001-752079 ; KCP-613-6312 ; No Copyright ; Avail: Department of Energy Information Bridge
This report summarizes the results of a project sponsored by Honeywell Corporation (formerly AlliedSignal Inc.) Federal Manufacturing and Technologies/Kansas City (FM and T/KC) and conducted jointly with the University of Missouri, Rolla, titled 'Ultrasonic Imaging for Poling Uniformity Measurements in PZT Ceramic Elements.' In this three-month research project, a series of experiments was performed on soft and hard lead-zirconate-titanate (PZT) structures to determine the effectiveness of

ultrasonic measurements as a nondestructive method of evaluating poling quality and uniformity. The study revealed that acoustic velocity correlates well with the degree of poling of PZT structures, as predicted by elastic theory. Additionally, time-of-flight (TOF) imaging was shown to be an ideal tool for viewing the spatial distribution of poled material and of material affected by the electric field beyond the edge of electroded regions. Finally, the effectiveness of ultrasonic methods for flaw detection and evaluation of PZT/stainless steel bonds was also demonstrated.
NTIS
Ceramics ; Lead Zirconate Titanates ; Ultrasonic Flaw Detection ; Microstructure ; Imaging Techniques

20020008117 Oak Ridge National Lab. , TN USA
Formation and Erosion of WC Under W(+) Irradiation of Graphite
Roth, J. ; Jan. 16, 2001 ; 6p ; In English
Report No.(s): DE2001-774929 ; P01-109556 ; No Copyright ; Avail: Department of Energy Information Bridge
The bombardment of C with 100 keV and 1 MeV W at normal incidence is studied as a function of the incident W fluence experimentally and by computer simulation with the program TRIDYN. Calculated oscillations in the amount of retained W and in the target weight change are confirmed experimentally for 100 keV at room temperature. XPS investigations show W2C formation during ion implantation already at room temperature. RBS depth profiles for 1 MeV bombardment show W mobility and surface segregation even at liquid nitrogen (LN2) temperatures. At elevated temperatures W clusters to form nano-particles at the surface and the oscillations in the retained amount of W disappear.
NTIS
Fluence ; Graphite ; Irradiation

20020008119 Federal Energy Technology Center , Morgantown, WV USA
Supported Dense Ceramic Membranes for Oxygen Separation
Ward, T. L. ; Jun. 01, 2000 ; 13p ; In English
Report No.(s): DE2001-774914 ; DE-AC26-98FT40120-01 ; No Copyright ; Avail: Department of Energy Information Bridge
This report describes results from the first contract year of a research project whose overall objective is to explore the fundamental and practical issues confronting the successful development of thick-film dense ceramic membrane technology for oxygen separation applications.
NTIS
Ceramics ; Membranes ; Oxygen

20020008162 Case Western Reserve Univ. , Cleveland, OH USA
New Microlayer and Nanolayer Polymer Composites ***Final Report , 1 Jun. 1998-31 May 2001***
Baer, E. ; Hiltner, A. ; Oct. 22, 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0311
Report No.(s): AD-A395719 ; ARO-37196.11-MS ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
Created new microlayered and nanolayered polymer composites for various novel and unique applications. (1) Produced clear microlayered composites with improved ballistic performance. (2) Developed microlayered composites with highly anisotropic conductivity. (3) Polymer nanolayered systems of polypropylene were created having discoidal, meso-form morphologies. Also, high density polyethylene has been changed to a 'shish-kebab' structure due to the fact that the nano-layer thickness is less than the radius of gyration of the polymer macromolecule. (4) High barrier, injection moldable systems have been produced by microlayering a polymer with good water barrier and a polymer with good oxygen barrier. Taking advantage of differences in melting points, layer integrity was maintained during injection molding in between the two melting points. This concept, which utilizes and maintains the large interfacial surface area achieved with microlayering, is broadly applicable to highly immiscible polymeric systems. (5) One dimensional photonic materials with applications to optical limiting and optical switching have been developed in conjunction with the Naval Research Laboratory. This was accomplished by synergistically combining nanolayer coextrusion methodology with dispersion of nonlinear dyes and careful control of nanolayer refractive indices.
DTIC
Composite Materials ; Nanostructure (Characteristics) ; Polymer Blends

20020008186 Oak Ridge National Lab. , TN USA

Development of Advanced Ceramic Manufacturing Technology

Pujari, V. K. ; Apr. 05, 2001 ; 182p ; In English

Report No.(s): DE2001-786757 ; ORNL/SUB/94-SP234/1 ; No Copyright ; Avail: Department of Energy Information Bridge

Due to their high temperature capability, low density, high stiffness, and corrosion resistance, advanced structural ceramics are enabling materials for new transportation engine systems that have the potential for significantly reducing energy consumption and pollution in automobiles and heavy vehicles. Currently, ceramics are used in limited production applications for cam rollers and injector plungers, and in the form of coatings applied to cylinder head fire decks and pistons. In the early 1980's the U.S. Department of Energy (DOE) Office of Transportation Technologies (OTT) and U.S. Industry accelerated activity in the development of ceramics for advanced heat engines. DOE's Ceramic Technology Project (CTP) at Oak Ridge National Laboratory (ORNL) was a major program that demonstrated the performance and reliability of advanced ceramics for heat engines including automotive gas turbine and heavy-duty diesel engines. In a major CTP program initiative, Norton Company's Northboro R&D Center (now a division of Saint-Gobain Industrial Ceramics, Inc.) successfully completed an Advanced Process contract demonstrating reliable and high-tensile-strength ceramics. The Processing program approach was to implement in-process inspection, nondestructive evaluation, statistical process control, mechanical characterization, and proof testing in the production of tensile specimens by both injection molding and pressure slip casting. Utilizing a new closed-loop aqueous process and systematic flaw reduction methodologies, the program achieved 1 GP-a tensile strengths and high Weibull moduls in high temperature silicon nitride, thereby demonstrating that advanced ceramics can be viable propulsion system materials.

NTIS

Ceramics ; Manufacturing ; Heat Engines ; Corrosion Resistance ; Diesel Engines ; Energy Consumption ; Feedback Control

20020008205 NASA Ames Research Center , Moffett Field, CA USA

Effect of Porosity on Surface Catalytic Efficiency

Stewart, David A. , NASA Ames Research Center , USA ; Pallix, Joan , Thermoscience Inst. , USA ; [1994] ; 1p ; In English ; AIAA 29th Thermophysics Conference , 19-22 Jun. 1995 , San Diego, CA , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA

Contract(s)/Grant(s): RTOP 232-01-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This paper describes the effect of surface porosity of thermal protection materials on surface catalytic efficiency using test data taken from both arc-jet and side-arm reactor facilities. Relative surface porosity of the samples varied from 6% to 50%. Surface porosity was measured using a flow apparatus and Bernoulli equation. The surface catalytic efficiency of the materials was calculated using aerothermodynamic, and kinetic theories. The catalytic efficiency of the materials are compared at surface temperatures between room temperature and 2500 F. The data are presented in the form of graphs and tables.

Author

Porosity ; Thermal Protection ; Surface Temperature

20020008246 Technion - Israel Inst. of Tech. , Haifa Israel

Alumina/Nickel Laminate Under Thermal Shock Up to 1000 degree C ***Final Report , 26 Aug. 1999-1 Jun. 2001***

Sherman, Dov ; Jun. 2001 ; 58p ; In English

Contract(s)/Grant(s): F61775-99-WE067

Report No.(s): AD-A395738 ; EOARD-SPC-99-4067 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report results from a contract tasking Technion Israel Institute of Science and Technology as follows: The contractor will investigate a novel laminated material system consisting of thin ceramic layers alternating with thinner metallic interlayers for use as flaps in a gas exhaust afterburner. In this system, the ceramic is the high melting point constituent, possessing high stiffness, high wear and fatigue resistance at elevated temperatures. The metal interlayers provide the needed compliance, ductility, and toughness. The interface should be strong enough to prevent crack deflection and disintegration of the material system when damage occurs. Oxidation resistance of such systems is expected to be good due to the small exposed area of the metallic interlayers. Good fracture toughness of the laminated system (more than an order of magnitude better than monolithic alumina) and R-curve behavior upon mechanical loading is expected.

DTIC

Laminates ; Ceramics ; Exhaust Systems ; Afterburning

20020008635 California Univ., Lawrence Berkeley Lab. , Berkeley, CA USA

Development and testing of new biologically-based polymers as advanced biocompatible contact lenses

Bertozzi, C. R. ; Jun. 01, 2000 ; 5p ; In English

Report No.(s): DE2001-775141 ; LBNL-46168 ; No Copyright ; Avail: Department of Energy Information Bridge

Nature has evolved complex and elegant materials well suited to fulfill a myriad of functions. Lubricants, structural scaffolds and protective sheaths can all be found in nature, and these provide a rich source of inspiration for the rational design of materials for biomedical applications. Many biological materials are based in some fashion on hydrogels, the crosslinked polymers that absorb and hold water. Biological hydrogels contribute to processes as diverse as mineral nucleation during bone growth and protection and hydration of the cell surface. The carbohydrate layer that coats all living cells, often referred to as the glycocalyx, has hydrogel-like properties that keep cell surfaces well hydrated, segregated from neighboring cells, and resistant to non-specific protein deposition. With the molecular details of cell surface carbohydrates now in hand, adaptation of these structural motifs to synthetic materials is an appealing strategy for improving biocompatibility. The goal of this collaborative project between Prof. Bertozzi's research group, the Center for Advanced Materials at Lawrence Berkeley National Laboratory and Sunsoft Corporation was the design, synthesis and characterization of novel hydrogel polymers for improved soft contact lens materials. Our efforts were motivated by the urgent need for improved materials that allow extended wear, and essential feature for those whose occupation requires the use of contact lenses rather than traditional spectacles. Our strategy was to transplant the chemical features of cell surface molecules into contact lens materials so that they more closely resemble the tissue in which they reside. Specifically, we integrated carbohydrate molecules similar to those found on cell surfaces, and sulfoxide materials inspired by the properties of the carbohydrates, into hydrogels composed of biocompatible and manufacturable substrates. The new materials were characterized with respect to surface and bulk hydrophilicity, and non-specific protein adsorption, properties which are thought to correlate with comfort in the eye. The outcome of these studies was the discovery of a new material that is superior to present commercial materials. Contact lenses composed of a sulfoxide acrylate and 2-(hydroxyethyl)methacrylate are presently undergoing clinical evaluation at Sunsoft and, if successful, these novel lenses should be commercially available within the next two years.

NTIS

Biocompatibility ; Contact Lenses ; Optical Materials ; Design Analysis ; Eye (Anatomy) ; Polymers

20020008657 Swedish Defence Research Establishment , Sensor Technology , Linkoeping, Sweden

Surface Polariton Excitation in a Ceramic Surface ***Topical Report Ytpolaritonexcitation i Keramyta***

Ribbing, C. G. ; Staaf, O. ; Mar. 2001 ; 32p ; In Swedish

Report No.(s): PB2001-108094 ; FOI-R-0069-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

This final report relates to the work done within the framework of the innovation project 'Ceramic based Surface Polariton Sensor'. The activity includes literature studies, calculations of optical properties of thin films, deposition experiments with titanium oxide on different substrates, and measurements of reflectance and transmittance in the infrared wavelength range. A number of possible combinations of IR-transmitting substrates and ceramic reststrahlen band materials have been identified as possible candidates in the proposed polarition sensor. The calculations have shown that excitations can be obtained in a TiO2 film on a dielectric substrate. A number of TiO2 films with a thickness of 100 to 1760 nm have been deposited in two different magnetron sputtering units. These coatings have been analyzed with respect to IR-reflectance and transmittance. Reststrahlen bands have been observed in accordance with the thin film calculations regarding the position of the band, but not to its strength.

NTIS

Ceramics ; Polaritons ; Thin Films ; Titanium Oxides ; Magnetron Sputtering

20020008659 Swedish Defence Research Establishment , Sensor Technology , Linkoeping, Sweden

Metallic Powder for Low Emissive Paint

Georgson, M. ; Lee, H. S. ; Staaf, O. ; Dec. 1999 ; 20p ; In Swedish

Report No.(s): PB2001-108071 ; FOA-R-99-01367-615-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

A study of the use of metallic powder for use in binder in order to reduce the emittance of painted surfaces has been carried out with respect to the optical properties. Powders of silver, copper and iron had their surfaces modified by an oxidation process. The oxidized surfaces showed low metallic gloss in the visible region and a reflectance level in the infrared which indicates low emissive properties. This study indicates that it is possible to produce a low emissive paint without an increase of the metallic gloss. The work has not focused on optimization of the process parameters. Consequently, a systematic study of the influence of the

oxidation time and powder particle size on the optical properties can result in an improved wavelength selectivity with respect to the optical properties.
NTIS
Paints ; Emittance ; Metal Powder ; Optical Properties ; Additives

20020008880 Oak Ridge National Lab. , TN USA
Evaluation of Creep Property of AS800 Silicon Nitride from As-Processed Surface Regions
Lin, H. T. ; Mar. 09, 2001 ; 8p ; In English
Report No.(s): DE2001-777690 ; P01-110240 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Tensile creep studies were carried out to evaluate the creep performance of AS800 silicon nitride samples extracted from the surface and bulk regions of as-processed billets at 1350 C in air. The objective of this study was to understand the creep properties of the silicon nitride in the as-processed surface region and determine if they are comparable to those obtained from the bulk region. The results indicated that samples from the as-processed surface region exhibited higher creep rates and shorter lifetimes as compared with those obtained from the bulk region. The poor creep performance of material from the as-processed surface region was due to the higher content of glassy phase enriched with oxygen and sintering additive elements.
NTIS
Silicon Nitrides ; Creep Properties ; Oxygen

20020008881 Oak Ridge National Lab. , TN USA
Development and Characterization of Novel Adsorbent Carbons Final CRADA Report ORNL-97-0483
Burchell, T. D. ; Feb. 14, 2001 ; 22p ; In English
Report No.(s): DE2001-777688 ; C/ORNL97-0483 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Oak Ridge National Laboratory (ORNL) and the Westvaco Corporation are both engaged in the development of novel adsorbent carbons. This CRADA facilitated close cooperation between these partners in the characterization and performance of several novel adsorbent carbon materials. The research and development activities conducted under this CRADA fell into three major areas: (1) The determination of the methane storage capacities of ORNL's adsorbent carbon monoliths. (2) The determination of the thermal conductivity of ORNL's adsorbent carbon monoliths and Westvaco's powdered activated carbon product. (3) The use of X-ray diffraction analysis to characterize the structure of Westvaco's powdered activated carbon and investigate structural changes after heat-treatment to high temperatures. The results of activities in these three areas are reported and discussed here.
NTIS
Carbon Fibers ; Adsorbents ; Research and Development ; Activated Carbon

20020008891 Los Alamos National Lab. , NM USA
Hybrid Mesoscale Modeling of Dynamic Grain Fragmentation
Swift, R. ; Hagelberg, C. ; Hiltl, M. ; Apr. 01, 2001 ; 15p ; In English
Report No.(s): DE2001-777449 ; LA-UR-01-1943 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Fines created by grain fragmentation from shaped-charge, jet perforation treatment often plug up pores in the vicinity of the perforation tunnel. We analyze and model grain damage on samples recovered from impact tests of dry and water saturated sandstone at stress levels and duration similar to that of perforation loading. Analyses of Scanning Electron Microscope (SEM) images and laser particle size measurements on portions of the recovered samples characterize grain damage and changes in grain size distribution. Hybrid modeling that combines the Discrete Element Method (DEM) with Smooth Particle Hydrodynamics (SPH), and includes mesoscale representation of grain/pore structure, shows how grain damage evolves for dry and wet conditions. Modeling defines behavior in accord with recovered sample analyses as follows: (1) Increase in grain damage is obtained with an increase in stress level and pulse duration; (2) The grains in dry samples are extremely and irregularly fragmented with extensive reduced porosity; (3) Less grain damage and higher porosity is obtained in saturated samples. The influence of pore fluid mitigates the interaction between grains, thus reducing fragmentation damage; and (4) Computed particle size distributions are similar in character to measurements.
NTIS
Damage ; Drying ; Fragmentation ; Grain Size ; Size Distribution ; Models

20020009007 Army Tank-Automotive Research and Development Command , Warren, MI USA
Market Investigation for Advanced Engine and Powertrain Lubricants ***Final Report , Nov. 2000-Jul. 2001***
Comfort, Allen S. ; Aug. 2001 ; 22p ; In English
Report No.(s): AD-A395900 ; TARDEC-TR-13803 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The design of the Future Combat Systems (FCS) and Interim Force are expected to push the envelope of the capabilities of current military engine and powertrain lubricants. These vehicles are expected to have high heat soak back due to limited space constraints increased power density, and increased range requirements. Current military engine and powertrain lubricants simply cannot perform under the high temperatures, loads, and range that future combat systems will demand. In response to this need, a market investigation was conducted by the Fuels and Lubricants Technology Team (FLTT) of the Tank- automotive Research, Development and Engineering Center (TARDEC) in Warren, MI. The purpose of this market survey was to gather data on both commercially available and developmental advanced engine and powertrain lubricants. Eased 011 the submission of the market survey questionnaires and a limited literature search, there is a possibility that commercial or developmental advanced engine and powertrain lubricants may (1) provide fuel consumption savings on the order of 1-5%, (2) reduce maintenance and downtime by extending drain intervals as much as four times conventional oil drain intervals, and (3) retain adequate oxidation and thermal stability at higher sustained oil sump temperatures (> 300 F).

DTIC

Lubricants ; Engines ; Market Research ; Automobiles

20020009029 Lawrence Livermore National Lab. , Livermore, CA USA
Sum-frequency spectroscopic studies , 1 , Surface melting of ice
Wei, X. ; Dec. 21, 2000 ; 148p ; In English
Report No.(s): DE2001-776642 ; LBNL-47261 ; No Copyright ; Avail: Department of Energy Information Bridge

Surface vibrational spectroscopy via infrared-visible sum-frequency generation (SFG) has been established as a useful tool to study the structures of different kinds of surfaces and interfaces. This technique was used to study the (0001) face of hexagonal ice (Ih). SFG spectra in the O-H stretch frequency range were obtained at various sample temperatures. For the vapor(air)/ice interface, the degree of orientational order of the dangling OH bonds at the surface was measured as a function of temperature. Disordering sets in around 200 K and increases dramatically with temperature, which is strong evidence of surface melting of ice. For the other ice interfaces (silica/OTS/ice and silica/ice), a similar temperature dependence of the hydrogen bonded OH stretch peak was observed; the free OH stretch mode, however, appears to be different from that of the vapor (air)/ice interface due to interactions at the interfaces. The technique was also used to measure the orientational distributions of the polymer chains on a rubbed polyvinyl alcohol surface. Results show that the polymer chains at the surface appear to be well aligned by rubbing, and the adsorbed liquid crystal molecules are aligned, in turn, by the surface polymer chains. A strong correlation exists between the orientational distributions of the polymer chains and the liquid crystal molecules, indicating that the surface-induced bulk alignment of a liquid crystal film by rubbed polymer surfaces is via an orientational epitaxy-like mechanism. This thesis also contains studies on some related issues that are crucial to the above applications. An experiment was designed to measure SFG spectra in both reflection and transmission. The result confirms that SFG in reflection is generally dominated by the surface contribution. Another issue is the motional effect due to fast orientational motion of molecules at a surface or interface. Calculations show that the effect is significant if the molecular orientation varies over a broad range within the vibrational relaxation time. The stretch vibration of the free OH bonds at the vapor/water interface is used to illustrate the importance of the effect.

NTIS

Melting ; Ice ; Surface Properties

20020009138 Brookhaven National Lab. , Upton, NY USA
Performance of a polymer sealant coating in an arctic marine environment
Moskowitz, ; Cowgill, ; Griffith, ; Chernaenko, ; Diashev, ; Feb. 25, 2001 ; 9p ; In English
Report No.(s): DE2001-777937 ; BNL-68134 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The feasibility of using a polymer-based coating, Polibrid 705, to seal concrete and steel surfaces from permanent radioactive contamination in an Arctic marine environment has been successfully demonstrated using a combination of field and laboratory testing. A mobile, self-sufficient spraying device was developed to specifications provided by the Russian Northern Navy and deployed at the RTP Atomflot site, Murmansk, Russia. Demonstration coatings were applied to concrete surfaces exposed to conditions ranging from indoor pedestrian usage to heavy vehicle passage and container handling in a loading dock. A large steel container was also coated with the polymer, filled with solid radwaste, sealed, and left out of doors, exposed to the full annual Arctic weather cycle. The 12 months of field testing gave rise to little degradation of the sealant coating, except for a few chips

and gouge marks on the loading bay surface that were readily repaired. Contamination resulting from radwaste handling was easily removed and the surface was not degraded by contact with the decontamination agents. The field tests were accompanied by a series of laboratory qualification tests carried out at a research laboratory in St. Petersburg. The laboratory tests examined a variety of properties, including bond strength between the coating and the substrate, thermal cycling resistance, wear resistance, flammability, and ease of decontamination. The Polibrid 705 coating met all the Russian Navy qualification requirements with the exception of flammability. In this last instance, it was decided to restrict application of the coating to land-based facilities.
NTIS
Marine Environments ; Polymers ; Decontamination ; Sealers ; Coatings

20020009139 Brookhaven National Lab. , Upton, NY USA
Carbon dioxide as a feedstock
Creutz, ; Fujita, ; Dec. 09, 2000 ; 11p ; In English
Report No.(s): DE2001-777935 ; BNL-68111 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report is an overview on the subject of carbon dioxide as a starting material for organic syntheses of potential commercial interest and the utilization of carbon dioxide as a substrate for fuel production. It draws extensively on literature sources, particularly on the report of a 1999 Workshop on the subject of catalysis in carbon dioxide utilization, but with emphasis on systems of most interest to us. Atmospheric carbon dioxide is an abundant (750 billion tons in atmosphere), but dilute source of carbon (only 0.036 % by volume), so technologies for utilization at the production source are crucial for both sequestration and utilization. Sequestration--such as pumping CO(sub 2) into sea or the earth--is beyond the scope of this report, except where it overlaps utilization, for example in converting CO(sub 2) to polymers. But sequestration dominates current thinking on short term solutions to global warming, as should be clear from reports from this and other workshops. The 3500 million tons estimated to be added to the atmosphere annually at present can be compared to the 110 million tons used to produce chemicals, chiefly urea (75 million tons), salicylic acid, cyclic carbonates and polycarbonates. Increased utilization of CO(sub 2) as a starting material is, however, highly desirable, because it is an inexpensive, non-toxic starting material. There are ongoing efforts to replace phosgene as a starting material. Creation of new materials and markets for them will increase this utilization, producing an increasingly positive, albeit small impact on global CO(sub 2) levels. The other uses of interest are utilization as a solvent and for fuel production and these will be discussed in turn.
NTIS
Carbon Dioxide ; Atmospheric Composition ; Toxicity ; Carbonates ; Catalysis

20020009162 Cincinnati Univ. , Dept. of Mechanical Engineering , OH USA
Piezoelectric Materials for an Artificial Neural System
Schulz, M. J. ; Chattopadhyay, S. ; Sundaresan, M. J. ; Ghoshal, A. ; Martin, W. N. ; Jul. 16, 2001 ; 14p ; In English ; Presented at the Ceramic Materials Symposium at the Intl Mechanical Engineering Congress and Exposition Winter Annual Meeting of the ASME, Nov. 11-16, 2001, New York Hilton and Towers, NY. Prepared in cooperation North Carolina A&T State Univ
Contract(s)/Grant(s): F49620-00-1-0232
Report No.(s): AD-A395625 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Piezoelectric materials are opening the door for the design of large smart structures. to explore what possibilities there might be for building practical smart structures, a review of the characteristics and methods of processing piezoelectric active materials is given. The advantages and limitations of using the different forms of piezoelectric materials for sensors and actuators are then discussed. One area where piezoceramic sensors can have a large impact is structural condition monitoring. Structural condition monitoring refers to using in-situ sensors to monitor the internal loads and the health of a structure in real-time. This will allow a structure to be operated at its maximum performance and efficiency while minimizing the fatigue damage. To achieve this on a large structure, a new highly distributed sensor concept is discussed in which piezoceramic ribbon fibers and microelectronic components are used to replicate the biological nervous system. A simplified simulation and experiment are then presented to show how this artificial neural system can measure dynamic strains and acoustic emissions caused by damage in structures.
DTIC
Artificial Intelligence ; Piezoelectric Ceramics ; Structural Analysis ; Smart Structures ; Fatigue Testing Machines

20020009171 Nottingham Univ. , School of Mechanical Materials, Manufacturing Engineering and Management , UK

Nanostructures in Polymer Matrices

Rudd, Christopher D. , Editor ; Shaw, Robert W. , Editor ; Sep. 2001 ; 38p ; In English ; Workshop held at University of Nottingham, 10-13 Sep 2001

Contract(s)/Grant(s): N68171-01-M-5971

Report No.(s): AD-A395887 ; R/D-9212-CH-03 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

An ERO sponsored Workshop on Nano Structures in Polymer Matrices was held in order to establish the status of international science and technology and to develop recommendations for basic research. This addressed both theoretical (modelling) and experimental techniques to develop and understand these materials. The Workshop was held at Risley Hall, Derby, UK. Twenty invited participants, comprising a mix of scientists and engineers with complementary expertise met in an intensive fashion over 2.5 days with a series of timetabled presentation and discussion events. The participants were requested to address a series of specific questions intended to provoke constructive recommendations for future research strategy in this area. These responses are included within the report, along with supporting background information on the participants and their presentations. Further information on the workshop, including downloadable presentations is available at: http://www.nottingham.ac.uk/^eazwww/composite/ nanostructures2001.

DTIC

Mathematical Models ; Nanostructures (Devices) ; Polymer Matrix Composites ; Mechanical Properties

20020009593 Lawrence Livermore National Lab. , Livermore, CA USA

Fatigue of ceramics at elevated temperatures: Microstructural design for optimal performance

Ritchie, R. O. ; Chen, D. ; Zhang, X. F. ; Oct. 01, 2000 ; 10p ; In English

Report No.(s): DE2001-780588 ; LBNL-46921 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The high-temperature mechanical properties of an in-situ toughened silicon carbide have been examined at temperatures from ambient to 1300C with the objective of optimizing structural performance.

NTIS

Mechanical Properties ; Silicon Carbides ; Thermal Fatigue

20020009594 Department of Energy , Aiken, SC USA

alpha, n Neutron Emission from DWPF Glass

Pellarin, D. J. ; Mar. 23, 2001 ; 18p ; In English

Report No.(s): DE2001-780500 ; DPST-86-212 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In the Defense Waste Processing Facility (DWPF) of Savannah River Plant site waste will be immobilized in borosilicate glass. A knowledge of the neutron emission from DWPF glass is necessary to assess shielding requirements for the DWPF canister and to determine the response characteristics of the Neutron Transmission Glass Level Detection System. Excellent agreement was obtained between measured and calculated neutron emissions (yields) from Pu spiked black frit glasses using West's method of weighting components based on relative stopping power. The calculated values for the three glasses were 2-7 percent higher than measured. Calculations using a Nj Zj weighting method were 19-22 percent lower than measured. The good agreement between measurement and calculation using West's method lends confidence in its use to calculate the neutron source term for DWPF glass.

NTIS

Borosilicate Glass ; Neutron Emission ; Neutron Sources ; Neutrons ; Radioactive Wastes

20020009601 Sandia National Labs. , Albuquerque, NM USA

Uptake of Nitroaromatic Compounds by Polymeric Tubing

Bounkeua, V. ; Rodacy, P. J. ; Apr. 01, 2001 ; 20p ; In English

Report No.(s): DE2001-780320 ; SAND2001-1055 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The type of polymeric material used in the manufacturing of tubing determines its strength, elasticity, and durability. Tubing made of polymeric material is commonly used for analytical work because it is readily available, inexpensive and can be relatively inert. Polymeric tubing is used in many sampling applications for explosive compounds. A major concern is the uptake of the explosive compounds into or onto the tubing during sampling. Because of the reactive nature of explosives, it is important that as little of the detectable explosive as possible is lost by tubing uptake. It is also important that nothing leaches out of the tubing to interfere with the detection of explosives. High Performance Liquid Chromatography (HPLC) is commonly used for the analysis of trace levels of explosive compounds in the range of parts per billion (ppb) to parts per million (ppm). This study

attempts to determine which types of polymers are most conducive to sampling applications where large volumes of dilute explosive solutions are collected through a length of tubing for analysis. This was determined by analyzing the amount of explosive lost from solution per cm(sup 2) of tubing in solution. It was determined that tubing made of polyethylene, teflon, polypropylene, or KYNAR(reg-sign) is recommended for dilute trinitrotoluene (TNT) solution analyses. Tubing made of polypropylene, PHARMED(reg-sign), KYNAR(reg-sign), or polyethylene is recommended for analyses involving dilute explosive solutions of RDX. Tubing made from polyurethane, TYGON(reg-sign), nylon, vinyl, gum rubber, or reinforced PVC are not recommended because they leach contaminants into solution that may interfere with HPLC analysis of explosive peaks. NTIS

Nitro Compounds ; Liquid Chromatography ; Trace Contaminants ; Pipes (Tubes)

20020009750 NASA Ames Research Center , Moffett Field, CA USA

Diagenetic Microcrystalline Opal Varieties from the Monterey Formation, CA: HRTEM Study of Structures and Phase Transformation Mechanisms

Cady, Sherry L. , NASA Ames Research Center , USA ; Wenk, H.-R. , California Univ. , USA ; [1994] ; 1p ; In English ; GSA Annual Meeting , 24-27 Oct. 1994 , Seattle, WA , USA ; Sponsored by Geological Society of America , USA

Contract(s)/Grant(s): RTOP 185-52-32

Report No.(s): Rept-30124 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Microcrystalline opal varieties form as intermediary precipitates during the diagenetic transformation of biogenically precipitated non-crystalline opal (opal-A) to microquartz. With regard to the Monterey Formation of California, X-ray powder diffraction studies have shown that a decrease in the primary d-spacing of opal-CT toward that of cristobalite occurs with increasing diagenesis. The initial timing of opal-CT/quartz formation and the value of the primary opal-CT d-spacing, are influenced by the sediment. lithology. Transmission electron microscopy methods (CTEM/HRTEM) were used to investigate the structure of the diagenetic phases and establish transformation mechanisms between the varieties of microcrystalline opals in charts and porcelanites from the Monterey Formation. HRTEM images revealed that the most common fibrous varieties of microcrystalline opals contain varying amounts of structural disorder. Finite lamellar units of cristobalite-and tridymite-type. layer sequences were found to be randomly stacked in a direction perpendicular to the fiber axis. Disordered and ordered fibers were found to have coprecipitated within the same radial fiber bundles that formed within the matrix of the Most siliceous samples. HRTEM images, which reveal that the fibers within radial and lepispheric fiber bundles branch non-crystallographically, support an earlier proposal that microspheres in chert grow via a spherulitic growth mechanism. A less common variety of opal-CT was found to be characterized by non-parallel (low-angle) stacking sequences that often contain twinned lamellae. Tabular-shaped crystals of orthorhombic tridymite (PO-2) were also identified in the porcelanite samples. A shift in the primary d-spacing of opal-CT has been interpreted as an indication of solid-state ordering g toward a predominantly cristobalite structure, (opal-C). Domains of opal-C were identified as topotactically-oriented overgrowths on discrete Sections of opal-CT fibers and as lamellar domains within relict opal-CT fibers. These findings indicate that the type of transformation mechanism depends upon the primary structural characteristics of the authigenic opaline. varieties that are in turn influenced by the sediment lithology.
Author

Phase Transformations ; Crystallinity ; Quartz ; Crystals ; Diffraction ; Microcrystals

20020010119 Brookhaven National Lab. , Upton, NY USA

Performance of a polymer sealant coating in an arctic marine environment

Moskowitz, ; Cowgill, ; Griffith, ; Chernaenko, ; Diashev, ; Feb. 25, 2001 ; 9p ; In English

Report No.(s): DE2001-777884 ; BNL-68134 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The feasibility of using a polymer-based coating, Polibrid 705, to seal concrete and steel surfaces from permanent radioactive contamination in an Arctic marine environment has been successfully demonstrated using a combination of field and laboratory testing. A mobile, self-sufficient spraying device was developed to specifications provided by the Russian Northern Navy and deployed at the RTP Atomflot site, Murmansk, Russia. Demonstration coatings were applied to concrete surfaces exposed to conditions ranging from indoor pedestrian usage to heavy vehicle passage and container handling in a loading dock. A large steel container was also coated with the polymer, filled with solid radwaste, sealed, and left out of doors, exposed to the full annual Arctic weather cycle. The 12 months of field testing gave rise to little degradation of the sealant coating, except for a few chips and gouge marks on the loading bay surface that were readily repaired. Contamination resulting from radwaste handling was easily removed and the surface was not degraded by contact with the decontamination agents. The field tests were accompanied by a series of laboratory qualification tests carried out at a research laboratory in St. Petersburg. The laboratory tests examined a variety of properties, including bond strength between the coating and the substrate, thermal cycling resistance, wear resistance,

flammability, and ease of decontamination. The Polibrid 705 coating met all the Russian Navy qualification requirements with the exception of flammability. In this last instance, it was decided to restrict application of the coating to land-based facilities.
NTIS
Marine Environments ; Polymers ; Sealers ; Coatings ; Thermal Cycling Tests ; Performance Tests

20020010121 Brookhaven National Lab. , Upton, NY USA
Carbon dioxide as a feedstock
Creutz, ; Fujita, ; Dec. 09, 2000 ; 11p ; In English
Report No.(s): DE2001-777868 ; BNL-68111 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report is an overview on the subject of carbon dioxide as a starting material for organic syntheses of potential commercial interest and the utilization of carbon dioxide as a substrate for fuel production. It draws extensively on literature sources, particularly on the report of a 1999 Workshop on the subject of catalysis in carbon dioxide utilization, but with emphasis on systems of most interest to us. Atmospheric carbon dioxide is an abundant (750 billion tons in atmosphere), but dilute source of carbon (only 0.036 % by volume), so technologies for utilization at the production source are crucial for both sequestration and utilization. Sequestration--such as pumping CO(sub 2) into sea or the earth--is beyond the scope of this report, except where it overlaps utilization, for example in converting CO(sub 2) to polymers. But sequestration dominates current thinking on short term solutions to global warming, as should be clear from reports from this and other workshops. The 3500 million tons estimated to be added to the atmosphere annually at present can be compared to the 110 million tons used to produce chemicals, chiefly urea (75 million tons), salicylic acid, cyclic carbonates and polycarbonates. Increased utilization of CO(sub 2) as a starting material is, however, highly desirable, because it is an inexpensive, non-toxic starting material. There are ongoing efforts to replace phosgene as a starting material. Creation of new materials and markets for them will increase this utilization, producing an increasingly positive, albeit small impact on global CO(sub 2) levels. The other uses of interest are utilization as a solvent and for fuel production and these will be discussed in turn.
NTIS
Carbon Dioxide ; Carbon Dioxide Concentration ; Synthesis (Chemistry) ; Fuel Production

20020010162 Department of Energy , Aiken, SC USA
Kinetic and Thermodynamic Implications of some Commonly Used Rate Laws for Glass Dissolution
Grant, M. W. ; Mar. 28, 2001 ; 24p ; In English
Report No.(s): DE2001-781037 ; DPST-86-761 ; No Copyright ; Avail: Department of Energy Information Bridge
This report discusses the results of the examination of three rate laws for glass dissolution. These three are: SLDF, LDF/LDF and ZO/LDF. All three models can fit the results of static powder leach tests reasonably well. The existence of a fundamental relationship between the thermodynamics and the kinetics of glass dissolution/leaching has been demonstrated for the three rate models.
NTIS
Dissolving ; Glass ; Reaction Kinetics ; Waste Disposal ; Radioactive Wastes

20020010164 Pacific Northwest National Lab. , Richland, WA USA
Preparation and Characterization of Pu-238-Ceramics for Radiation Damage Experiments
Strachan, D. M. ; Scheele, R. D. ; Buchmiller, W. C. ; Vienna, J. D. ; Sell, R. L. ; Jun. 15, 2000 ; 46p ; In English
Report No.(s): DE2001-781061 ; No Copyright ; Avail: Department of Energy Information Bridge
The results from this initial characterization of the Pu-238 and Pu-239-bearing ceramics showed that the target phase assemblage was achieved in all but one material, Pu-238-zirconolite baseline. This Pu-238-zirconolite baseline material appears to have been prepared incorrectly with a 14 mass% excess of Pu (9.6 mass% actual vs. 8.4 mass% target; 4.8 mole% actual vs. 4.1 mole% target). It is not surprising that PuO2 was found to be one of the dominant phases. The densities of these materials compared well with the theoretical densities given by Stewart, Vance, and Ball. For all but three of the materials, the average density was >94% of theoretical. of the three, one was Pu-238-zirconolite baseline (108%) that contained unreacted PuO2. In our MCC leach testing, the normalized elemental mass losses from the various ceramic specimens depended on the elemental ceramic constituent, the Pu isotope, and the ceramic. of the primary constituents, Al and Ca were the most easily released. Plutonium and U were the next most susceptible to release. In general, the Hf had the lowest releases during the tests. The Gd and Ti releases varied, depending on the ceramic and the Pu isotope in the ceramic. The Mo, which was added as a trace constituent to monitor the stability of the crystalline structure, exhibited consistently high-normalized elemental releases. The amount of Pu leached depended the most on the Pu isotope in the ceramic with more Pu released from the Pu-238 specimens than from the Pu-239 specimens, independent of ceramic type. Interestingly, the Mo releases were typically higher for the Pu-239 specimens

than for the Pu-238 specimens. The higher Pu release from the Pu-238 specimens is not yet understood; the consistency between the ICP/MS- and GEA-measured Pu releases from the Pu-238 specimens eliminates analytical problems as an explanation. With respect to the effects of ceramic type, the three baseline ceramics often had the highest releases. The highest Pu releases were from the pyrochlore-rich and zirconolite-rich baselines. The highest U releases were from the pyrochlore-rich and zirconolite-rich baselines and zirconolite. Values for the pH of the leachates were deemed unreliable because of the length of time between the end of the test and the measurement. This resulted in pH values that were consistent with CO2-saturated water at ambient conditions. However, initial calculations with EQ3/6 suggest that the measured pH values are to be expected, given the solution concentrations and the assumptions that went into the calculations.
NTIS
Plutonium 238 ; Plutonium 239 ; Ceramics ; Leaching ; Radiation Damage

20020010178 Department of Energy , Savannah River Site , Aiken, SC USA
Degradation and Failure Characteristics of NPP Containment Protective Coating Systems
Sindelar, R. L. ; Apr. 10, 2001 ; 42p ; In English
Report No.(s): DE2001-777889 ; WSRC-TR-2001-00163 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Nuclear power plants (NPPs) must ensure that the emergency core cooling system (ECCS) or safety-related containment spray system (CSS) remains capable of performing its design safety function throughout the life of the plant. This requires ensuring that long-term core cooling can be maintained following a postulated loss-of-coolant accident (LOCA). Adequate safety operation can be impaired if the protective coatings which have been applied to the concrete and steel structures within the primary containment fail, producing transportable debris which could then accumulate on BWR ECCS suction strainers or PWR ECCS sump debris screens located within the containment. This document will present the data collected during the investigation of coating specimens from plants.
NTIS
Nuclear Power Plants ; Protective Coatings ; Degradation ; Failure ; Sprayers

20020010179 Department of Energy , National Petroleum Technology Office , Tulsa, OK USA
Porosity and Permeability Evolution Accompanying Hot fluid Injection into Diatomite, SUPRI TR-123
Diabira, I. ; Castanier, L. M. ; Kovscek, A. R. ; Apr. 19, 2001 ; 34p ; In English
Report No.(s): DE2001-777917 ; DOE/BC/15311-4 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An experimental study of silica dissolution was performed to probe the evolution of permeability and porosity in siliceous diatomite during hot fluid injection such as water or steam flooding. Two competing mechanisms were identified. Silica solubility in water at elevated temperature causes rock dissolution thereby increasing permeability; however, the rock is mechanically weak leading to compressing of the solid matrix during injection. Permeability and porosity can decrease at the onset of fluid flow. A laboratory flow apparatus was designed and built to examine these processes in diatomite core samples.
NTIS
Permeability ; Porosity ; Steam ; Fluid Injection

20020010270 Pennsylvania State Univ. , Materials Research Lab. , University Park, PA USA
Electroactive Polymers for Smart Skin Applications ***Final Report , 1 Jul. 2000-30 Sep. 2001***
Zhang, Qiming ; Nov. 01, 2001 ; 19p ; In English
Contract(s)/Grant(s): N00014-001-0623 ; Proj-01PR01351-01
Report No.(s): AD-A396202 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This program investigated the micro structure-properties relationship in the newly discovered high performance electroactive polymers: high energy irradiated P(VDF-TrFE) copolymers and P(VDF-TrFE) based terpolymers. The uniqueness of this class of new electroactive polymers is: (1) a high electric field induced strain with very little hysteresis; (2) the material also exhibits a very high elastic energy density (1 J/cu cm); and (3) the high frequency capability of the strain response (>100 kHz). Although many electroactive materials have been reported, this class of material is still the only one which can be applied to practical devices. The understanding of the fundamentals responsible for the large electromechanical responses in this class of polymers will provide interesting science on how defect structures affect the ferroelectric properties in polymers. Such an understanding will also lead to new directions to better control the material properties. In addition, in this program we also investigate new

approaches to significantly improve the dielectric properties of polymers so that the new electroactive polymers can be operated with low applied field and voltage.
DTIC
Copolymers ; Electroactive Polymers ; Electromechanical Devices

20020010365 Sandia National Labs. , Albuquerque, NM USA
Elements for Real Time Teady Simulation for Flat Glass Lehr Control
Bertram, L. A. ; Jan. 01, 2001 ; 69p ; In English
Report No.(s): DE2001-781973 ; REPT-2001-8001 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In partnership with Ford/Visteon, Sandia National Laboratories began work on design and implementation of improved end-to-end control for float glass production, under the Department of Energy Office of Industrial Technology sponsorship. The first task undertaken was to provide an intelligent control for the annealing lehr, both for optimum usage of sensors and for the ability to report digitally the state of the lehr to an end-to-end control system. The heat transfer simulation of the lehr enclosure for that purpose is described here. This includes a closed-form solution for the infinitely wide glass ribbon, which allow robust computations of the thermal profile and inverses of this function for controls use. This also allows useful initial temperature estimates for the case with counterflow in the lehr ducts, which should greatly simplify and speed the convergence of more detailed models in which the glass participates in the radiative exchanges. This is supplemented by software to compute radiative viewfactors of lehr elements for use in finite-width versions of the simulation. A brief discussion of how stresses could be computed from such a thermal solution is given, but not implemented in software.
NTIS
Computerized Simulation ; End-to-End Data Systems ; Glass ; Control Systems Design ; Heat Transfer

20020010367 NASA Glenn Research Center , Cleveland, OH USA
Segmented Thermal Barrier Coating
Smialek, James L. , Inventor , NASA Glenn Research Center , USA ; Nov. 13, 2001 ; 16p ; In English
Patent Info.: Filed 14 Mar. 2000 ; NASA-Case-LEW-16803-1 ; US-Patent-6,316,078 ; US-Patent-Appl-SN-525372 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The article has a macro-segmented thermal barrier coating due to the presence of a pattern of three-dimensional features. The features may be a series of raised ribs formed on the substrate surface and being spaced from 0.05 inches to 0.30 apart. The ribs have a width ranging from 0.005 inches to 0.02 inches, and a height ranging from 25% to 100% of the thickness of the barrier coating. Alternately, the features may be a similar pattern of grooves formed in the surface of the substrate. Other embodiments provide segmentation by grooves or ribs in the bond coat or alternately grooves formed in the thermal barrier layer.
Official Gazette of the U.S. Patent and Trademark Office
Protective Coatings ; Segments ; Thermal Control Coatings ; Grooves

20020010592 Lawrence Livermore National Lab. , Livermore, CA USA
Modeling of porous elastic viscoplastic material with tensile failure
Glenn, L. A. ; Rubin, M. ; Vorobiev, O. ; Nov. 01, 1998 ; 6p ; In English
Report No.(s): DE2001-9743 ; UCRL-JC-132611 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This work describes simple but comprehensive constitutive equations that model a number of physical phenomena exhibited by dry porous geological materials and metals. Moreover, formulas have been developed for robust numerical integration of the evolution equations at the element level that can be easily implemented into standard computer programs for dynamic response of materials.
NTIS
Dynamic Response ; Numerical Integration ; Measure and Integration ; Tensile Properties

20020010608 Sandia National Labs. , Albuquerque, NM USA
Strength of Polysilicon for MEMS Devices
Buchheit, T. E. ; LaVan, D. A. ; Jul. 20, 1999 ; 7p ; In English
Report No.(s): DE2001-9611 ; SAND99-1894C ; No Copyright ; Avail: Department of Energy Information Bridge

The safe, secure and reliable application of Microelectromechanical Systems (MEMS) devices requires knowledge about the distribution in material and mechanical properties of the small-scale structures. A new testing program at Sandia is quantifying the strength distribution using polysilicon samples that reflect the dimensions of critical MEMS components. The strength of

polysilicon fabricated at Sandia's Microelectronic Development Laboratory was successfully measured using samples 2.5 microns thick, 1.7 microns wide with lengths between 15 and 25 microns. These tensile specimens have a freely moving hub on one end that anchors the sample to the silicon die and allows free rotation. Each sample is loaded in uniaxial tension by pulling laterally with a flat tipped diamond in a computer-controlled Nanoindenter. The stress-strain curve is calculated using the specimen cross section and gage length dimensions verified by measuring against a standard in the SEM.
NTIS
Microelectromechanical Systems ; Miniaturization ; Silicon Polymers

20020010617 Sandia National Labs. , Albuquerque, NM USA
Polymer Aging Techniques Applied to Degradation of a Polyurethane Propellant Binder
Assink, R. A. ; Celina, M. ; Graham, A. C. ; Minier, L. M. ; Jul. 27, 1999 ; 8p ; In English
Report No.(s): DE2001-9578 ; SAND99-1473C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The oxidative thermal aging of a crosslinked hydroxy-terminated polybutadiene (HTPB)/isophorone diisocyanate (IPDI) polyurethane rubber, commonly used as the polymeric binder matrix in solid rocket propellants, was studied at temperatures of RT to 125 C. We investigate changes in tensile elongation, mechanical hardening, polymer network properties, density, O(sub 2) permeation and molecular chain dynamics using a range of techniques including solvent swelling, detailed modulus profiling and NMR relaxation measurements. Using extensive data superposition and highly sensitive oxygen consumption measurements, we critically evaluate the Arrhenius methodology, which normally assumes a linear extrapolation of high temperature aging data. Significant curvature in the Arrhenius diagram of these oxidation rates was observed similar to previous results found for other rubber materials. Preliminary gel/network properties suggest that crosslinking is the dominant process at higher temperatures. We also assess the importance of other constituents such as ammonium perchlorate or aluminum powder in the propellant formulation.
NTIS
Oxidation ; Polymers ; Nuclear Magnetic Resonance ; Ammonium Perchlorates ; Binders (Materials)

20020011145 California Univ. , Radiation Lab. , Livermore, CA USA
Shock Waves in a Plastic Compacting Medium
Kompaneets, A. S. ; Akademiia Nauk SSSR ; Oct. 1963 ; Volume 109 , pp. 49-52 ; In English
Report No.(s): AD-A395898 ; UCRL-TRANS-1003(L) ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
The problem of slow propagation of a plastic deformation was solved by S. L. Sobolev. We shall consider a shock propagation of a plastic deformation in a medium which is characterized by the following properties. In the initial state its density is rho(sub 0), at this density it exerts a negligibly small resistance to compression. When brought to a density rho(sub 1), the medium is incompressible and in the state is plastic, whereupon it is assumed that the absolute value of the most 'tangnetial' tension is linearly dependent on the average normal tension (the plasticity condition of Prandtl). This kind of plasticity, for example, can be possessed by sand.
Derived from text
Compacting ; Plastic Deformation ; Plastic Properties ; Shock Waves

20020011155 Sandia National Labs. , Albuquerque, NM USA
Determining a Method to Pressure Test a Novel Type of Glass
Rice, C. D. ; Aug. 19, 1999 ; 13p ; In English
Report No.(s): DE2001-9875 ; SAND99-2145C ; No Copyright ; Avail: Department of Energy Information Bridge
A novel type of glass made with a double ion exchange process is more reliable and fractures in a unique manner compared to glass currently available in the market. The novel glass is unique because it disintegrates into a powder instead of fracturing into shards and splinters, and it fails over a very narrow range of stresses. Potential applications for this glass include using it in removable valves because the powdered glass does not produce obstructions when it breaks, and in other applications that require safety glass. A 20,000-psi MTS pressure system was used to determine the possible techniques for pressure testing the strength of a collection of disk-shaped glass samples. Ordinary (i.e., not ion exchanged) glass samples, 0.962 inches in diameter and 0.07 inches thick, were fractured with linearly increasing pressures to determine the best methods. The best method for testing novel glass samples, with the same size and shape as the ordinary glass, will be implemented. The final results of this ongoing project will be used to ascertain if the novel glass is suitable for potential applications.
NTIS
Fractures (Materials) ; Glass ; Safety

20020011225 Sandia National Labs. , Albuquerque, NM USA

Intermediate Strain-Rate Loading Experiments: Technique and Applications to Ceramics

Chhabildas, L. C. ; Reinhart, W. D. ; Aug. 16, 1999 ; 9p ; In English

Report No.(s): DE2001-9756 ; SAND99-2116C ; No Copyright ; Avail: Department of Energy Information Bridge

A new test methodology is described which allows access to loading rates that lie between split Hopkinson bar and shock-loading techniques. Gas gun experiments combined with velocity interferometry techniques have been used to experimentally determine the intermediate strain-rate loading behavior of Coors AD995 alumina and Cercom silicon-carbide rods. Graded-density materials have been used as impactors; thereby eliminating the tension states generated by the radial stress components during the loading phase. Results of these experiments demonstrate that the time-dependent stress pulse generated during impact allows an efficient transition from the initial uniaxial strain loading to a uniaxial stress state as the stress pulse propagates through the rod. This allows access to intermediate loading rates over 5 x 10(sup 3)/s to a few times 10(sup 4)/s.

NTIS

Ceramics ; Strain Rate ; Loading Rate

20020012249 National Aerospace Lab. , Structures Div. , Amsterdam, Netherlands

Residual Stresses in As-Sprayed and Heat Treated Thermal Barrier Coatings Measurements and FEM Calculations

Koolloos, M. F. J. ; Nov. 19, 1999 ; 20p ; In English

Report No.(s): PB2001-108839 ; NLR-TP-99486 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The first part of this paper concerns measurements of through-thickness residual stresses in Thermal Barrier Coating (TBC) by the hole-drilling method. The influences of top coat thickness and different thermal histories (furnace and burner rig) were determined. Low tensile stresses prevailed in the as-sprayed state, and low compressive stresses after annealing in a furnace. In both cases the stresses tended to decrease with increasing coating thickness. The specimens tested in the burner rig showed a stress state between those of as-sprayed and annealed specimens. Moreover, the stress sign depended on top coat thickness. Finally, some experimental problems are discussed. The second part describes model predictions of residual stresses in a TBC after cooling from an initial stress-free state at high temperature. Compressive in-plane stresses were predicted, and these decreased with coating thickness. However, the calculated stresses were much higher than the measured stresses in an annealed specimen. This discrepancy between experiment and model is attributed to stress relaxation in the real TBC system. Also, calculated shear stresses along the top coat/bond coat interface at the free edge of the specimen explain the delamination often observed during furnace cycling.

NTIS

Residual Stress ; Ceramics ; Plasma Spraying ; Heat Treatment ; Finite Element Method ; Thermal Control Coatings

20020012336 Stanford Linear Accelerator Center , Menlo Park, CA USA

Conformational and Structural Properties of High Functionality Dendrimer-like Star Polymers Synthesized from Living Polymerization Techniques

Pople, J. A. ; Mar. 22, 2001 ; 17p ; In English

Report No.(s): DE2001-784885 ; SLAC-PUB-8422 ; No Copyright ; Avail: Department of Energy Information Bridge

The design, synthesis and solution properties of dendritic-linear hybrid macromolecules is described. The synthetic strategy employs living ring-opening polymerization in combination with selective and quantitative organic transformations for the preparation of new molecular architectures similar to classical star polymers and dendrimers. The polymers were constructed from high molecular weight poly(epsilon-caprolactone) initiated from the surface hydroxyl groups of dendrimers derived from bis(hydroxymethyl) propionic acid (bis-MPA) in the presence of stannous 2-ethyl hxanoate (Sn(Oct)). (2) In this way, star and hyperstar poly(epsilon-caprolactones) were elaborated depending on the generation of dendirmer employed. The ROP from these hydroxy groups was found to be a facile process leading to controlled molecular weight, low dispersity products (Mw/Mn) less than 1.15. In addition to the use of dendrimers as building blocks to star polymers, functional dendrons derived from bis-MPA were attached to chain ends of the star polymers, yielding structures that closely resemble that of the most advanced dendrimers. Measurements of the solution properties (hydrodynamic volume vs. molecular weight) on the dendritic-linear hybrids show a deviation form linearity, with a lower than expected hydrodynamic volume, analogous to the solution properties of dendrimers of high generation number. The onset of the deviation begins with the polymers initiated from the second generation dendrimer of bis-MPA and becomes more exaggerated with the higher generations. It was found that polymerization amplifies the nonlinear solution behavior of dendrimers. Small angle neutron scattering (SANS) measurements revealed that the radius of gyration scaled with arm functionality (f) as f-2/3, in accordance with the Daoud-Cotton model for many arm star polymer.

NTIS

Polymers ; Synthesis (Chemistry) ; Dendrimers ; Polymerization ; Structural Stability ; Neutron Scattering

20020012337 Stanford Linear Accelerator Center , Menlo Park, CA USA

Constitutional Isomers of Dendrimer-like Star Polymers: Design, Synthesis and Conformational and Structural Properties

Pople, J. A. ; Mar. 22, 2001 ; 25p ; In English

Report No.(s): DE2001-784884 ; SLAC-PUB-8421 ; No Copyright ; Avail: Department of Energy Information Bridge

The design, synthesis and solution properties of six constitutional isomers of dendrimer-like star polymers is described. Each of the polymers have comparable molecular weights (-80,000 g/mol), narrow polydispersities (less than 1.19) and an identical number of branching junctures (45) and surface hydroxyl functionalities (48). The only difference in the six isomers is the placement of the branching junctures. The polymers are constructed from high molecular weight poly(epsilon caprolactone) with branching junctures derived from 2,2'-bis(hydroxylmethyl) propionic acid (bis-MPA) emanating from a central core.

NTIS

Polymers ; Synthesis (Chemistry) ; Isomers ; Dendrimers ; Design Analysis

20020012338 Stanford Linear Accelerator Center , Menlo Park, CA USA

Six Isomers of Dendrimer-like Star Polymers: Design and Synthesis

Pople, J. A. ; Mar. 01, 1999 ; 3p ; In English

Report No.(s): DE2001-784882 ; SLAC-PUB-8377 ; No Copyright ; Avail: Department of Energy Information Bridge

The control of polymer properties through the synthesis of complex macromolecular architectures is central to many areas of research and advanced technological applications. Properties of novel materials are altered mainly through modification of their constitution. Examples of constitutional changes include the use of different monomers, variable molecular weights, block structures, grafted branching and so on. Living polymerization techniques have facilitated the preparation of these structures. The use of new multifunctional initiators has enhanced the availability of example star polymers, which are believed to have smaller hydrodynamic volume and lower melt viscosity than their linear counterparts. Dendrimers and hyperbranched polymers are other classes of macromolecules which have received a lot of attention due to their unique architectures.

NTIS

Isomers ; Polymers ; Synthesis (Chemistry) ; Macromolecules

20020012543 Stanford Linear Accelerator Center , Menlo Park, CA USA

Small-angle Study of the Solution Properties of Dendrimer-like Star Polymers

Pople, J. A. ; Mar. 22, 2001 ; 6p ; In English

Report No.(s): DE2001-784883 ; SLAC-PUB-8378 ; No Copyright ; Avail: Department of Energy Information Bridge

The solution properties of poly (epsilon-caprolactone) dendritic polymers are investigated by small angle neutron scattering (SANS) techniques. Comparisons of the scattering function in the intermediate region of the SANS patterns with molecular dynamic simulations indicate that the dendritic polymers are relatively extended in their conformation. We report a decay exponent, which scales as 1/v, of -1.2, which suggests a conformation more extended than star polymers, approaching the case of sea urchins.

NTIS

Chemical Analysis ; Neutron Scattering ; Dendrimers

20020012545 Stanford Linear Accelerator Center , Menlo Park, CA USA

Small Angle X-ray Scattering Studies of Poly(arylethinylene): Molecular Conformation in Solution and Orientational Ordering in Rod-coil Ionomer Blends

Pople, J. A. ; Mar. 29, 2001 ; 19p ; In English

Report No.(s): DE2001-784893 ; SLAC-PUB-8788 ; No Copyright ; Avail: Department of Energy Information Bridge

Poly(pyridyl/phenyl-ethinylene) polymers of tuned rigidity/flexibility were synthesized and their molecular conformation in solution determined by small angel x-ray scattering. These polymers were used as modecularly dispersed reinforcing components in ionomer blends with partially sulfonated polystyrene. Homogeneous ionomer blends were formed by acid-base interactions between the two blend components. Small angel x-ray scattering revealed that in the case of rod-like or semiflexible poly(pyridyl/phenyl-ethinylenes) an elongation induced orientational ordering is obtained. However blend samples prepared with flexible poly(pyridyl/phenyl-ethinylene) polymers do not show any observable orientation. The orientation parameter varied systematically with the rigidity/flexibility of the reinforcing component, as did the Young modulus determined from stress strain measurements.

NTIS

X Ray Scattering ; Strain Measurement ; Ions ; Modulus of Elasticity ; Polystyrene

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20020006091 Los Alamos National Lab. , NM USA
Compaction wave profiles in granular hmx
Menikoff, R. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783207 ; LA-UR-01-3103 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Meso-scale simulations of a compaction wave in a granular bed of HMX have been performed. The grains are fully resolved in order that the change in porosity across the wave front is determined by the elastic-plastic response of the grains rather than an empirical law for the porosity as a function of pressure. Numerical wave profiles of the pressure and velocity are compared with data from a gas gun experiment. The experiment used an initial porosity of 36%, and the wave had a pressure comparable to the yield strength of the grains. The profiles are measured at the front and back of the granular bed. The transit time for the wave to travel between the gauges together with the Hugoniot jump conditions determines the porosity behind the wave front. In the simulations the porosity is determined by the yield strength and stress concentrations at the contact between grains. The value of the yield strength needed to match the experiment is discussed. Analysis of the impedance match of the wave at the back gauge indicates that the compaction wave triggers a small amount of burn, less than 1% mass fraction, on the micro-second time scale of the experiment.
NTIS
Explosives ; Actuators ; Yield Strength ; Wave Propagation

20020006108 Federal Energy Technology Center , Morgantown, WV USA
Direct liquefaction proof-of-concept program - bench run pb-10 (hti 227-109)
Dec. 30, 1999 ; 48p ; In English
Report No.(s): DE2001-772403 ; DE-AC22-92PC92148-05 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report presents the results of the bench-scale test, PB-10, performed at HTI's facilities under DOE (Department of Energy) contract (HTI Run No. 227-109). This bench test continues the work that was started in PDU testing 260-007. Previous bench test (PB-09, HTI 227-106) was performed on different seams of Chinese coal (Shenhua Ningtiaota Coal No.2 and No.3). Since another coal, Shangwan coal was selected for the liquefaction plant, PB-10 was made as approved by DOE/COR. The objective of this test was to evaluate the liquefaction performance of Shangwan coal utilizing various backend processing and recycle schemes. Additionally, this test was to collect available process data to allow for the best scale-up process design possible from this particular unit.
NTIS
Coal Liquefaction ; Coal

20020006109 Federal Energy Technology Center , Morgantown, WV USA
Direct liquefaction proof-of-concept program
Comolli, A. G. ; Lee, T. L. K. ; Hu, J. ; Popper, G. ; Elwell, M. D. ; Dec. 30, 1999 ; 52p ; In English
Report No.(s): DE2001-772402 ; DE-AC22-92PC92148-04 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report presents the results of the bench-scale work, Bench Run PB-09, HTI (Hydrocarbon Technologies Inc.) Run Number 227-106, conducted under the DOE (Department of Energy) Proof-of-Concept Option Program indirect coal liquefaction at Hydrocarbon Technologies Inc. in Lawrenceville, New Jersey. Bench Run PB-09 was conducted using two types of Chinese coal, Shenhua No.2 and Shenhua No.3, and had several goals. One goal was to study the liquefaction performance of Shenhua No.2 and Shenhua No.3 with respect to coal conversion and distillate production. Another goal of Bench Run PB-09 was to study the effect of different GelCatw formulations and loadings. At the same time, the space velocity and the temperature of the fmt reactor, K-1, were varied to optimize the liquefaction of the two Chinese coals. The promoter-modified HTI GelCat(trademark) catalyst was very effective in the direct liquefaction of coal with nearly 92% maf coal conversion with Shenhua No.3 and 93% maf coal conversion with 9 Shenhua No.2. Distillate yields (CQ-524 C)varied from 52-68% maf for Shenhua No.3 coal to 54-63% maf for Shenhua No.2 coal. The primary conclusion from Bench Run PB-09 is that Shenhua No.3 coal is superior to Shenhua No.2 coal in direct liquefaction due to its greater distillate production, although coal conversion is slightly lower and C(sub 1)-C(sub

3) light gas production is higher for Shenhua No.3. The new promoter modified GelCat(trademark) proved successful in converting the two 9 Chinese coals and, under some conditions, producing good distillate yields for a coal-only bench run. Run PB-09 demonstrated significantly better performance of China Shenhua coal using HTIs coal direct liquefaction technology and GelCat(trademark) catalyst than that obtained at China Coal Research Institute (CCRI, coal conversion 88% and distillate yield 61%).
NTIS
Coal Liquefaction ; Coal

20020006111 Federal Energy Technology Center , Morgantown, WV USA
Syngas upgrading: a low temperature approach
Jan. 31, 2000 ; 4p ; In English
Report No.(s): DE2001-772400 ; DE-AC26-99FT40248-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Technical activities were performed during the reporting period.
NTIS
Synthesis (Chemistry) ; Synthetic Fuels ; Low Temperature

20020006115 Federal Energy Technology Center , Morgantown, WV USA
Market assessment and technical feasibility study of pressurized fluidized bed combustion ash use
Bland, A. E. ; Brown, T. H. ; Apr. 01, 1997 ; 26p ; In English
Report No.(s): DE2001-772386 ; DE-FC21-93MC30127-31 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Western Research Institute, in conjunction with the Electric Power Research Institute, Foster Wheeler International, Inc. and the US Department of Energy, has undertaken a research and demonstration program designed to examine the market potential and the technical feasibility of ash use options for PFBC (pressurized fluidized bed combustion) ashes. Ashes from the Foster Wheeler Energia Oy pilot-scale circulating PFBC tests in Karhula, Finland, combusting (1) low-sulfur subbituminous and (2) high-sulfur bituminous coal, and ash from the AEP (American Electric Power) high-sulfur bituminous coal-fired bubbling PFBC in Brilliant, Ohio, were evaluated in laboratory and pilot-scale ash use testing at WR1. The technical feasibility study examined the use of PFBC ash in construction-related applications, including its use as a cementing material in concrete and use in cement manufacturing, fill and embankment materials, soil stabilization agent, and use in synthetic aggregate production. Testing was also conducted to determine the technical feasibility of PFBC ash as a soil amendment for acidic and sodic problem soils and spoils encountered in agricultural and reclamation applications. The results of the technical feasibility testing indicated the following conclusions. PFBC ash does not meet the chemical requirements as a pozzolan for cement replacement. However, it does appear that potential may exist for its use in cement production as a pozzolan and/or as a set retardant. PFBC ash shows relatively high strength development, low expansion, and low permeability properties that make its use in fills and embankments promising. Testing has also indicated that PFBC ash, when mixed with low amounts of lime, develops high strengths, suitable for soil stabilization applications and synthetic aggregate production. Synthetic aggregate produced from PFBC ash is capable of meeting ASTM (American Society for Testing and Materials)/AASHTO (American Association of State Highway and Transportation Officials) specifications for many construction applications. The residual calcium carbonate and calcium sulfate in the PFE3C ash has been shown to be of value in making PFBC ash a suitable soil amendment for acidic and sodic problem soils and mine spoils. In conclusion, PFBC ash represents a viable material for use in currently established applications for conventional coal combustion ashes. As such, PFBC ash should be viewed as a valuable resource, and commercial opportunities for these materials should be explored for planned PFBC installations.
NTIS
Ashes ; Coal ; Combustion ; Combustion Products

20020006134 International Energy Agency
Case Studies of integrated hydrogen systems. International Energy Agency Hydrogen Implementing Agreement, Final report for Subtask A of task 11 - Integrated Systems
Dec. 31, 1999 ; 166p ; In English
Report No.(s): DE2001-775587 ; IEA/H2-TR-1999 ; No Copyright ; Avail: Department of Energy Information Bridge
Within the framework of the International Energy Agency Hydrogen Implementing Agreement, Task 11 was undertaken to develop tools to assist in the design and evaluation of existing and potential hydrogen demonstration projects. Emphasis was placed on integrated systems, from input energy to hydrogen end use. Included in the PDF document are the Executive Summary

of the final report and the various case studies. The activities of task 11 were focused on near- and mid-term applications, with consideration for the transition from fossil-based systems to sustainable hydrogen energy systems. The participating countries were Canada, Italy, Japan, the Netherlands, Spain, Switzerland and the USA. In order for hydrogen to become a competitive energy carrier, experience and operating data need to be generated and collected through demonstration projects. A framework of scientific principles, technical expertise, and analytical evaluation and assessment needed to be developed to aid in the design and optimization of hydrogen demonstration projects to promote implementation. The task participants undertook research within the framework of three highly coordinated subtasks that focused on the collection and critical evaluation of data from existing demonstration projects around the world, the development and testing of computer models of hydrogen components and integrated systems, and the evaluation and comparison of hydrogen systems. While the Executive Summary reflects work on all three subtasks, this collection of chapters refers only to the work performed under Subtask A. Ten projects were analyzed and evaluated in detail as part of Subtask A, Case Studies. The projects and the project partners were: Solar Hydrogen Demonstration Project, Solar-Wasserstoff-Bayern, Bayernwerk, BMW, Linde, Siemens (Germany); Solar Hydrogen Plant on Residential House, M. Friedli (Switzerland); A.T. Stuart Renewable Energy Test Site; Stuart Energy Systems (Canada); PHOEBUS Juelich Demonstration Plant Research Centre, Juelich (FZJ) (Germany); Schatz Solar Hydrogen Project, Schatz Energy Research Centre, Humboldt State University (USA); INTA Solar Hydrogen Facility, INTA (Spain); Solar Hydrogen Fueled Trucks, Clean Air Now, Xerox (USA), Electrolyser (Canada); SAPHYS: Stand-Alone Small Size Photovoltaic Hydrogen Energy System, ENEA (Italy), IET (Norway), FZJ (Germany); Hydrogen Generation from Stand-Alone Wind-Powered Electrolysis Systems, RAL (UK), ENEA (Italy), DLR (Germany); Palm Desert Renewable Hydrogen Transportation Project; Schatz Energy Research Centre, City of Palm Desert (USA). Other demonstration projects are summarized in chapter 11.
NTIS
Hydrogen Production ; Renewable Energy ; Energy Technology

20020006139 National Petroleum Technology Office , Tulsa, OK USA
Multiphase Flow and Cavern Abandonment in Salt
Ehgartner, B. ; Tidwell, V. ; Feb. 13, 2001 ; 17p ; In English
Report No.(s): DE2001-774489 ; DOE/FEW 8242-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report will explore the hypothesis that an underground cavity in gassy salt will eventually be gas filled as is observed on a small scale in some naturally occurring salt inclusions. First, a summary is presented on what is known about gas occurrences, flow mechanisms, and cavern behavior after abandonment. Then, background information is synthesized into theory on how gas can fill a cavern and simultaneously displace cavern fluids into the surrounding salt. Lastly, two-phase (gas and brine) flow visualization experiments are presented that demonstrate some of the associated flow mechanisms and support the theory and hypothesis that a cavity in salt can become gas filled after plugging and abandonment.
NTIS
Brines ; Cavities ; Two Phase Flow

20020006140 Federal Energy Technology Center , Morgantown, WV USA
Conceptual design assessment for the co-firing of bio-refinery supplied lignin project ***Quarterly Report , July 1-September 30, 2000***
Berglund, T. ; Ranney, J. T. ; Babb, C. L. ; Oct. 01, 2000 ; 10p ; In English
Contract(s)/Grant(s): FC26-99FT40670
Report No.(s): DE2001-774488 ; DE-FC26-99FT40670-02 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The initial design criteria of the MSW to ethanol facility have been completed along with preliminary site identification and layouts for the processing facility. These items are the first step in evaluating the feasibility of this co-located facility. Pilot facility design and modification are underway for the production and dewatering of the lignin fuel. Major process equipment identification has been completed and several key unit operations will be accomplished on rental equipment. Equipment not available for rental or at TVA has been ordered and facility modification and shakedown will begin in October. The study of the interface and resulting impacts on the TVA Colbert facility are underway. The TVA Colbert fossil plant is fully capable of providing a reliable steam supply for the proposed Masada waste processing facility. The preferred supply location in the Colbert steam cycle has been identified as have possible steam pipeline routes to the Colbert boundary. Additional analysis is underway to fully predict the impact of the steam supply on Colbert plant performance and to select a final steam pipeline route.
NTIS
Design Analysis ; Plant Design ; Waste Energy Utilization

20020006141 Federal Energy Technology Center , Morgantown, WV USA

Conceptual design assessment for the co-firing of bio-refinery supplied lignin project ***Quarterly Report , June 23 - July 1, 2000***

Berglund, T. ; Ranney, J. T. ; Babb, C. L. ; Jul. 27, 2000 ; 31p ; In English

Contract(s)/Grant(s): FC26-99FT40670

Report No.(s): DE2001-774487 ; DE-FC26-99FT40670-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Conceptual Design Assessment for the Co-Firing of Bio-Refinery Supplied Lignin Project was successfully kicked off on July 23, 2000 during a meeting at the TVA-PPI facility in Muscle Shoals, AL. An initial timeline for the study was distributed, issues of concern were identified and a priority actions list was developed. Next steps include meeting with NETL to discuss de-watering and lignin fuel testing, the development of the mass balance model and ethanol facility design criteria, providing TVA-Colbert with preliminary lignin fuel analysis and the procurement of representative feed materials for the pilot and bench scale testing of the hydrolysis process.

NTIS

Plant Design ; Industrial Plants

20020006143 National Renewable Energy Lab. , Golden, CO USA

Increased Oil Recovery from Mature Oil Fields Using Gelled Polymer Treatments

Willhite, G. P. ; Green, D. W. ; McCool, C. S. ; Jan. 22, 2001 ; 65p ; In English

Report No.(s): DE2001-773362 ; DOE/BC/15209-2 ; No Copyright ; Avail: Department of Energy Information Bridge

This report describes the progress of the first year of a three-year research program. This program is aimed at reducing barriers to the widespread use of gelled polymer treatments by (1) developing methods to predict gel behavior during placement in matrix rock and fractures, (2) determining the persistence of permeability reduction after gel placement, and (3) developing methods to design production well treatments to control water production.

NTIS

Oil Fields ; Oil Recovery ; Production Management ; Ferroelectric Materials

20020006146 Federal Energy Technology Center , Morgantown, WV USA

Attrition resistant iron-based Fischer-Tropsch catalysts

Goodwin, J. G. ; Spivey, J. J. ; Jothimurugesan, K. ; Gangwal, S. K. ; Sep. 17, 1998 ; 13p ; In English

Report No.(s): DE2001-7733 ; DE-FG22-96PC96217-04 ; No Copyright ; Avail: Department of Energy Information Bridge

The Fischer-Tropsch (F-T) reaction provides a way of converting coal-derived synthesis gas (CO+H2) to liquid fuels. Since the reaction is highly exothermic, one of the major problems in control of the reaction is heat removal. Recent work has shown that the use of slurry bubble column reactors (SBCRs) can largely solve this problem. Iron-based (Fe) catalysts are preferred catalysts for F-T when using low CO/H2 ratio synthesis gases derived from modern coal gasifiers. This is because in addition to reasonable F-T activity, the F-T catalysts also possess high water gas shift (WGS) activity. However, a serious problem with the use of Fe catalysts in a SBCR is their tendency to undergo attrition. This can cause fouling/plugging of downstream filters and equipment, making the separation of catalyst from the oil/wax product very difficult if not impossible, and results in a steady loss of catalyst from the reactor. The objectives of this research are to develop a better understanding of the parameters affecting attrition resistance of Fe F-T catalysts suitable for use in SBCRs and to incorporate this understanding into the design of novel Fe catalysts having superior attrition resistance. Catalyst preparations will be based on the use of spray drying and will be scalable using commercially available equipment. The research will employ among other measurements, attrition testing and F-T synthesis, including long duration slurry reactor runs in order to ascertain the degree of success of the various preparations. The goal is to develop an Fe catalyst which can be used in a SBCR having only an internal filter for separation of the catalyst from the liquid product, without sacrificing F-T activity and selectivity. The effect of silica addition via coprecipitation and as a binder to a doubly promoted Fischer-Tropsch synthesis iron catalyst (100 Fe/5 Cu/4.2 K) was studied. The catalysts were prepared by coprecipitation, followed by binder addition and drying in a 1 m diameter, 2 m tall spray dryer. The binder silica content was varied from 0 to 20 wt %. A catalyst with 12 wt % binder silica was found to have the highest attrition resistance. F-T reaction studies over 100 hours in a fixed-bed reactor showed that this catalyst maintained around 95 % CO conversion with a methane selectivity of less than 7 wt % and a C(5)(sup +) selectivity of greater than 73 wt %. The effect of adding precipitated silica from 0 to 20 parts by weight to this catalyst (containing 12 wt % binder silica) was also studied. Addition of precipitated silica was found to be detrimental to attrition resistance and resulted in increased methane and reduced wax formation.

NTIS

Catalysts ; Iron ; Coal Derived Gases ; Coal Gasification ; Fischer-Tropsch Process ; Liquid Fuels

20020006152 Federal Energy Technology Center , Morgantown, WV USA

Phase behavior of light gases in hydrocarbon and aqueous solvents

Gasem, K. A. M. ; Robinson, R. L. ; Aug. 31, 1998 ; 42p ; In English

Report No.(s): DE2001-7731 ; DE-FG22-96PC96209-04 ; No Copyright ; Avail: Department of Energy Information Bridge

Under previous support from the Department of Energy, an experimental facility has been established and operated to measure valuable vapor-liquid equilibrium data for systems of interest in the production and processing of coal fluids. to facilitate the development and testing of models for prediction of the phase behavior for such systems, we have acquired substantial amounts of data on the equilibrium phase compositions for binary mixtures of heavy hydrocarbon solvents with a variety of supercritical solutes, including hydrogen, methane, ethane, carbon monoxide, and carbon dioxide. The present project focuses on measuring the phase behavior of light gases and water in Fischer-Tropsch (F-T) type solvents at conditions encountered in indirect liquefaction processes and evaluating and developing theoretically-based correlating frameworks to predict the phase behavior of such systems. Specific goals of the proposed work include: (a) developing a state-of-the-art experimental facility to permit highly accurate measurements of equilibrium phase compositions (solubilities) of challenging F-T systems, (b) measuring these properties for systematically-selected binary, ternary and molten F-T wax mixtures to provide critically needed input data for correlation development, (c) developing and testing models suitable for describing the phase behavior of such mixtures, and (d) presenting the modeling results in generalized, practical formats suitable for use in process engineering calculations. During the present period, the Park-Gasem-Robinson (PGR) equation of state (EOS) has been modified to improve its volumetric and equilibrium predictions. Specifically, the attractive term of the PGR equation was modified to enhance the flexibility of the model, and a new expression was developed for the temperature dependence of the attractive term in this segment-segment interaction model. The predictive capability of the modified PGR EOS for vapor pressure, and saturated liquid and vapor densities was evaluated for selected normal paraffins, normal alkenes, cyclo-paraffins, light aromatics, argon, carbon dioxide and water. The generalized EOS constants and substance-specific characteristic parameters in the modified PGR EOS were obtained from the pure component vapor pressures, and saturated liquid and vapor molar volumes. The calculated phase properties were compared to those of the Peng-Robinson (PR), the simplified-perturbed-hard-chain theory (SPHCT) and the original PGR equations. Generally, the performance of the proposed EOS was better than the PR, SPHCT and original PGR equations in predicting the pure fluid properties (%AAD of 1.3, 2.8 and 3.7 for vapor pressure, saturated liquid and vapor densities, respectively).

NTIS

Hydrocarbons ; Aqueous Solutions ; Liquid-Vapor Equilibrium ; Data Acquisition ; Coal ; Product Development

20020006153 National Petroleum Technology Office , Tulsa, OK USA

Design and Development of Gas-Liquid Cylindrical Cyclone Compact Separators for Three-Phase Flow

Mohan, R. S. ; Shoham, O. ; Jan. 10, 2001 ; 30p ; In English

Report No.(s): DE2001-773002 ; DOE/BC/15024-2 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of this five-year project (October 1997--September 2002) was to expand the current research activities of Tulsa University Separation Technology Projects (TUSTP) to multiphase oil/water/gas separation. This project was executed in two phases. Phase I (1997--2000) focused on the investigations of the complex multiphase hydrodynamic flow behavior in a three-phase Gas-Liquid Cylindrical Cyclone (GLCC) Separator. The activities of this phase included the development of a mechanistic model, a computational fluid dynamics (CFD) simulator, and detailed experimentation on the three-phase GLCC. The experimental and CFD simulation results will be suitably integrated with the mechanistic model. In Phase II (2000--2002), the developed GLCC separator will be tested under high pressure and real crude conditions. This is crucial for validating the GLCC design for field application and facilitating easy and rapid technology deployment. Design criteria for industrial applications will be developed based on these results and will be incorporated into the mechanistic model by TUSTP.

NTIS

Design Analysis ; Fabrication ; Cylindrical Bodies ; Models ; Separators ; Cyclones

20020006158 Oak Ridge National Lab. , TN USA

Regional-Scale GIS-Based Modeling System for Evaluating the Potential Costs and Supplies of Biomass from Biomass Crops

Graham, R. L. ; English, B. C. ; Noon, C. E. ; Liu, W. ; Daly, M. J. ; Jun. 24, 1996 ; 7p ; In English

Report No.(s): DE2001-772468 ; P00-108399 ; No Copyright ; Avail: Department of Energy Information Bridge

A GIS-based modeling system was developed for analyzing the geographic variation in potential bioenergy feedstock supplies and optimal locations for siting bioenergy facilities. The modeling system is designed for analyzing individual US states but could readily be adapted to any geographic region.
NTIS
Biomass ; Evaluation ; Costs ; Farm Crops

20020006159 Oak Ridge National Lab. , TN USA
Transportation and Site Location Analysis for Regional Integrated Biomass Assessment (RIBA)
Noon, C. E. ; Daly, M. J. ; Graham, R. L. ; Zahn, F. B. ; Sep. 15, 1996 ; 8p ; In English
Report No.(s): DE2001-772467 ; P00-108398 ; No Copyright ; Avail: Department of Energy Information Bridge
The farmgate cost and available supply of biomass often exhibit considerable variation within a State. This variation, combined with the relatively high cost of transporting bulky biomass material, produces a wide range of expected delivered feedstock costs across a State. As a consequence, both production and transportation costs must be well-modeled when analyzing potential locations for conversion facilities. The Regional Integrated Biomass Assessment system consists of two phases. The descriptive phase characterizes a farmgate cost and supply surface for switch-grass production over a given State. These results are passed to the analytical phase, where a transportation model is used to compute the marginal cost of supplying an ethanol plant at a prescribed level of demand. The model generates a marginal cost surface that illustrates the most promising areas for locating an ethanol plant. Next, a sequential location model simulates the commercial development of ethanol production facilities. This model considers every road network node as a potential site and generates a sequence of likely plant locations. Results from the RIBA analysis demonstrate that the cost of switchgrass can increase dramatically from one location to another. This variation will seriously effect the economics of conversion in the proper sizing and locating of ethanol plant facilities.
NTIS
Biomass ; Ethyl Alcohol

20020006160 Oak Ridge National Lab. , TN USA
Conservation Reserve Program as a Means to Subsidize Bioenergy Crop Prices
Walsh, M. E. ; Becker, D. ; Graham, R. L. ; Sep. 15, 1996 ; 8p ; In English
Report No.(s): DE2001-772466 ; P00-108395 ; No Copyright ; Avail: Department of Energy Information Bridge
The Conservation Reserve Program (CRP), enacted in the 1985 Farm Bill, removes environmentally sensitive cropland from production in exchange for annual rental payments from the federal government. to reduce the cost of the program, economic use of CRP acres in exchange for reduced rental payments were proposed, but not implemented in the 1995 Farm Bill. This paper examines the potential impact an economic use policy would have on the market prices of bioenergy crops if they were permitted to be harvested from CRP acres. The analysis shows that at average yields of 11.25 dry Mg/ha/yr (5 dry tons/ac/yr) and total production of 9.1 million dry Mg (10 million dry tons) subsidized farmgate prices of as low as $16.5/dry Mg ($15/dry ton) for switch-grass and $24.2/dry Mg ($22/dry ton) for short-rotation woody crops can be achieved. Furthermore, the government can reduce the cost of the CRP resulting in a potential win-win situation.
NTIS
Farm Crops ; Farmlands ; Grasses

20020006251 Federal Energy Technology Center , Morgantown, WV USA
Basin-centered gas systems of the US project
Jun. 30, 1998 ; 4p ; In English
Report No.(s): DE2001-772498 ; DE-AT26-98FT40031-01 ; No Copyright ; Avail: Department of Energy Information Bridge
The principal objective of this project is to perform an analysis of basin-centered gas occurrence in the U.S. and analyze its potential significance to future natural gas exploration and development. This project shall utilize state-of-the-art procedures and knowledge of basin-centered gas systems, including, stratigraphic analysis, organic geochemistry, basin thermal dynamics and reservoir and pressure analyses. All information will be stored in database format, and products will be fully digital.
NTIS
Natural Gas Exploration ; Structural Basins

20020006253 Federal Energy Technology Center , Morgantown, WV USA
Direct Liquefaction Proof-of-Concept Facility
Comolli, A. G. ; Zhou, P. ; Jan. 01, 2000 ; 166p ; In English
Report No.(s): DE2001-772481 ; DE-AC22-92PC92148-06 ; No Copyright ; Avail: Department of Energy Information Bridge

The main objective of the U.S. DOE, Office of Fossil Energy, is to ensure the U.S. a secure energy supply at an affordable price. An integral part of this program was the demonstration of fully developed coal liquefaction processes that could be implemented if market and supply considerations so required, Demonstration of the technology, even if not commercialized, provides a security factor for the country if it is known that the coal to liquid processes are proven and readily available. Direct liquefaction breaks down and rearranges complex hydrocarbon molecules from coal, adds hydrogen, and cracks the large molecules to those in the fuel range, removes hetero-atoms and gives the liquids characteristics comparable to petroleum derived fuels. The current processes being scaled and demonstrated are based on two reactor stages that increase conversion efficiency and improve quality by providing the flexibility to adjust process conditions to accommodate favorable reactions. The first stage conditions promote hydrogenation and some oxygen, sulfur and nitrogen removal. The second stage hydrocracks and speeds the conversion to liquids while removing the remaining sulfur and nitrogen. A third hydrotreatment stage can be used to upgrade the liquids to clean specification fuels.
NTIS
Coal Liquefaction ; Hydrocracking ; Energy Conversion Efficiency

20020006522 Los Alamos National Lab. , NM USA
Finite element calculations of the mighty north event
Steedman, D. ; Swift, R. ; Dec. 01, 2000 ; 10p ; In English
Report No.(s): DE2001-772609 ; LA-UR-00-6060 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The MIGHTY NORTH event was a precision high explosive test performed in jointed Salem limestone for a modeling verification and validation program sponsored by DTRA. The test bed was subjected to a cylindrical shock front, making the response applicable for comparison to 2-D plane strain computations. While other investigators modeled the rock response with various elastic-plastic failure criteria, we demonstrate that simple elastic-perfectly brittle response with a tensile failure criterion replicates the experiment quite well. This paper provides comparisons between results of numerical simulations of the test event and the published test bed response.
NTIS
Explosives ; Finite Element Method ; Shock Fronts

20020006539 International Energy Agency , Golden, CO USA
IEA Agreement on the Production and Utilization of Hydrogen ***Annual Report , 1998***
Jan. 31, 1999 ; 53p ; In English
Report No.(s): DE2001-775567 ; IEA/H2-AR-98 ; No Copyright ; Avail: Department of Energy Information Bridge
The annual report includes an overview of the IEA Hydrogen Agreement, including its guiding principles. The Chairman's report section includes highlights of the agreement for 1998. Annex reports are given on various tasks: Task 10, Photoproduction of Hydrogen, Task 11, Integrated Systems, and Task 12, Metal Hydrides and Carbon for Hydrogen Storage. Lastly, a feature article by Karsten Wurr, E3M Material Consulting, GmbH, Hamburg Germany, is included titled 'Hydrogen in Material Science and Technology: State of the Art and New Tendencies'.
NTIS
Technology Utilization ; Hydrogen Production ; Hydrogen ; Photoproduction ; Materials Science

20020006540 International Energy Agency , Golden, CO USA
IEA agreement on the production and utilization of hydrogen ***Annual Report , 1996***
Jan. 31, 1997 ; 68p ; In English
Report No.(s): DE2001-775568 ; IEA/H2-AR-96 ; No Copyright ; Avail: Department of Energy Information Bridge
The annual report includes an overview of the IEA Hydrogen Agreement, including a brief summary of hydrogen in general. The Chairman's report provides highlights for the year. Sections are included on hydrogen energy activities in the IEA Hydrogen Agreement member countries, including Canada, European Commission, Germany, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, and the US. Lastly, Annex reports are given for the following tasks: Task 10, Photoproduction of Hydrogen, Task 11, Integrated Systems, and Task 12, Metal Hydrides and Carbon for Hydrogen Storage.
NTIS
Hydrogen Production ; Photoproduction ; Hydrogen ; Technology Utilization

20020006541 International Energy Agency , Golden, CO USA

Production of hydrogen in non oxygen-evolving systems: Co-produced hydrogen as a bonus in the photodegradation of organic pollutants and hydrogen sulfide

Sartoretti, C. J. ; Ulmann, M. ; Augustynski, J. ; Linkous, C. A. ; Jan. 01, 2000 ; 28p ; In English

Report No.(s): DE2001-775571 ; IEA/H2-TR-2000 ; No Copyright ; Avail: Department of Energy Information Bridge

This report was prepared as part of the documentation of Annex 10 (Photoproduction of Hydrogen) of the IEA Hydrogen Agreement. Subtask A of this Annex concerned photo-electrochemical hydrogen production, with an emphasis on direct water splitting. However, studies of non oxygen-evolving systems were also included in view of their interesting potential for combined hydrogen production and waste degradation. Annex 10 was operative from 1 March 1995 until 1 October 1998. One of the collaborative projects involved scientists from the Universities of Geneva and Bern, and the Federal Institute of Technology in Laussane, Switzerland. A device consisting of a photoelectrochemical cell (PEC) with a WO3 photoanode connected in series with a so-called Grazel cell (a dye sensitized liquid junction photovoltaic cell) was developed and studied in this project. Part of these studies concerned the combination of hydrogen production with degradation of organic pollutants, as described in Chapter 3 of this report. For completeness, a review of the state of the art of organic waste treatment is included in Chapter 2. Most of the work at the University of Geneva, under the supervision of Prof. J. Augustynski, was focused on the development and testing of efficient WO3 photoanodes for the photoelectrochemical degradation of organic waste solutions. Two types of WO3 anodes were developed: non transparent bulk photoanodes and non-particle-based transparent film photoanodes. Both types were tested for degradation and proved to be very efficient in dilute solutions. For instance, a solar-to-chemical energy conversion efficiency of 9% was obtained by operating the device in a 0.01M solution of methanol (as compared to about 4% obtained for direct water splitting with the same device). These organic compounds are oxidized to CO2 by the photocurrent produced by the photoanode. The advantages of this procedure over conventional electrolytic degradation are that much (an order of magnitude) less energy is required and that sunlight can be used directly. In the case of photoproduction of hydrogen, as compared to water splitting, feeding the anodic compartment of the PEC with an organic pollutant, instead of the usual supporting electrolyte, will bring about a substantial increase of the photocurrent at a given illumination. Thus, the replacement of the photo-oxidation of water by the photodegradation of organic waste will be accompanied by a gain in solar-to-chemical conversion efficiency and hence by a decrease in the cost of the photoproduced hydrogen. Taking into account the benefits and possible revenues obtainable by the waste degradation, this would seem to be a promising approach to the photoproduction of hydrogen. Hydrogen sulfide (H2S) is another waste effluent requiring extensive treatment, especially in petroleum refineries. The so-called Claus process is normally used to convert the H2S to elemental sulfur. A sulfur recovery process developed at the Florida Solar Energy Center is described briefly in Chapter 4 by Dr. C. Linkous as a typical example of the photoproduction of hydrogen in a non oxygen-evolving system. The encouraging results obtained in these investigations of photoelectrochemical hydrogen production combined with organic waste degradation, have prompted a decision to continue the work under the new IEA Hydrogen Agreement Annex 14, Photoelectrolytic Hydrogen Production.

NTIS

Degradation ; Hydrogen Production ; Hydrogen Sulfide ; Contaminants ; Oxidation ; Photochemical Reactions

20020006544 National Renewable Energy Lab. , Golden, CO USA

Benchmark the Fuel Cost of Steam Generation

Papar, R. ; Dec. 04, 2000 ; 2p ; In English

Report No.(s): DE2001-775885 ; NREL/FS-810-28881 ; DOE/GO-102000-1115 ; No Copyright ; Avail: Department of Energy Information Bridge

BestPractices Steam tip sheet regarding ways to assess steam system efficiency. to determine the effective cost of steam, use a combined heat and power simulation model that includes all the significant effects.

NTIS

System Effectiveness ; Fuel Systems ; Steam ; Simulation

20020006775 National Renewable Energy Lab. , Golden, CO USA

2000 Annual Progress Report for Fuels for Advanced CIDI Engines and Fuel Cells

Chalk, S. ; Dec. 11, 2000 ; 119p ; In English

Report No.(s): DE2001-775907 ; DOE/GO-102000-1150 ; NREL/SR-540-29189 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Department of Energys Office of Transportation Technologies Fiscal Year (FY) 2000 Annual Progress Report for the Fuels for Advanced CIDI Engines and Fuel Cells Program highlights progress achieved during FY 2000 and comprises 22 summaries of industry and National Laboratory projects that were conducted. The report provides an overview of the exciting

work being conducted to tackle the tough technical challenges associated with developing clean burning fuels that will enable meeting the performance goals of the Emission Control R and D for Advanced CIDI Engines and the Transportation Fuel Cell Power Systems Programs. The summaries cover the effects of CIDI engine emissions and fuel cell power system performance, the effects of lubricants on engine emissions, the effects of fuel and consumed lubricants on exhaust emission control devices and the health and safety, materials compatibility, and economics of advanced petroleum-based fuels.
NTIS
Fuel Cells ; Lubricants ; Combustion Products ; Exhaust Gases ; Pollution Control

20020006776 National Renewable Energy Lab. , Golden, CO USA
Proceedings of the 2000 U.S. DOE Hydrogen Program Review
Nov. 01, 2000 ; 995p ; In English
Report No.(s): DE2001-775896 ; NREL/CP-570-28890 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The 2000 US Department of Energy (DOE) Hydrogen Program Review was sponsored by the Office of Power Delivery Systems, Office of Power Technologies, US Department of Energy. The proceedings from this meeting serve as an important technology reference for the DOE Hydrogen Program. This document contains technical progress reports on research and technology validation projects funded by the DOE Hydrogen Program in Fiscal Year 2000. The growth of fuel cell technology will provide a basis for the establishment of the hydrogen option into both transportation and electricity supply markets.
NTIS
Fuel Cells ; Hydrogen

20020006839 Federal Energy Technology Center , Morgantown, WV USA
Advanced thermally stable jet fuels
Schobert, H. H. ; Jan. 31, 1999 ; 597p ; In English
Report No.(s): DE2001-775227 ; DE-FG22-92PC92104-08 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Pennsylvania State University program in advanced thermally stable coal-based jet fuels has five broad objectives: (1) Development of mechanisms of degradation and solids formation; (2) Quantitative measurement of growth of sub-micrometer and micrometer-sized particles suspended in fuels during thermal stressing; (3) Characterization of carbonaceous deposits by various instrumental and microscopic methods; (4) Elucidation of the role of additives in retarding the formation of carbonaceous solids; (5) Assessment of the potential of production of high yields of cycloalkanes by direct liquefaction of coal. Future high-Mach aircraft will place severe thermal demands on jet fuels, requiring the development of novel, hybrid fuel mixtures capable of withstanding temperatures in the range of 400-500 C. In the new aircraft, jet fuel will serve as both an energy source and a heat sink for cooling the airframe, engine, and system components. The ultimate development of such advanced fuels requires a thorough understanding of the thermal decomposition behavior of jet fuels under supercritical conditions. Considering that jet fuels consist of hundreds of compounds, this task must begin with a study of the thermal degradation behavior of select model compounds under supercritical conditions. The research performed by The Pennsylvania State University was focused on five major tasks that reflect the objectives stated above: Task 1: Investigation of the Quantitative Degradation of Fuels; Task 2: Investigation of Incipient Deposition; Task 3: Characterization of Solid Gums, Sediments, and Carbonaceous Deposits; Task 4: Coal-Based Fuel Stabilization Studies; and Task 5: Exploratory Studies on the Direct Conversion of Coal to High Quality Jet Fuels. The major findings of each of these tasks are presented in this executive summary. A description of the sub-tasks performed under each of these tasks and the findings of those studies are provided in the remainder of this volume (Sections 1 through 5).
NTIS
Jet Engine Fuels ; Coal Liquefaction ; Propellant Properties ; Propellant Chemistry

20020006840 Federal Energy Technology Center , Morgantown, WV USA
Low-quality natural gas sulfur removal/recovery
Amo, K. ; Baker, R. W. ; Helm, V. D. ; Hofmann, T. ; Lokhandwala, K. A. ; Jan. 29, 1998 ; 107p ; In English
Report No.(s): DE2001-775213 ; DE-AC21-92MC28133-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A significant fraction of U.S. natural gas reserves are subquality due to the presence of acid gases and nitrogen; 13% of existing reserves (19 trillion cubic feet) may be contaminated with hydrogen sulfide. For natural gas to be useful as fuel and feedstock, this hydrogen sulfide has to be removed to the pipeline specification of 4 ppm. The technology used to achieve these specifications has been amine, or similar chemical or physical solvent, absorption. Although mature and widely used in the gas

industry, absorption processes are capital and energy intensive and require constant supervision for proper operation. This makes these processes unsuitable for treating gas at low throughput, in remote locations, or with a high concentration of acid gases. The U.S. Department of Energy, recognizes that exploitation of smaller, more sub-quality resources will be necessary to meet demand as the large gas fields in the U.S. are depleted. In response to this need, Membrane Technology and Research, Inc. (MTR) has developed membranes and a membrane process for removing hydrogen sulfide from natural gas. During this project, high-performance polymeric thin film composite membranes were brought from the research stage to field testing. The membranes have hydrogen sulfide/methane selectivities in the range 35 to 60, depending on the feed conditions, and have been scaled up to commercial-scale production. A large number of spiral wound modules were manufactured, tested and optimized during this project, which culminated in a field test at a Shell facility in East Texas. The short field test showed that membrane module performance on an actual natural gas stream was close to that observed in the laboratory tests with cleaner streams. An extensive technical and economic analysis was performed to determine the best applications for the membrane process. Two areas were identified: the low flow rate, high hydrogen sulfide content region and the high flow rate, high hydrogen sulfide content region. In both regions the MTR membrane process will be combined with another process to provide the necessary hydrogen sulfide removal from the natural gas. In the first region the membrane process will be combined with the SulfaTreat fixed-bed absorption process, and in the second region the membrane process will be combined with a conventional absorption process. Economic analyses indicate that these hybrid processes provide 20-40% cost savings over stand-alone absorption technologies.
NTIS
Desulfurizing ; Natural Gas ; Contaminants

20020006873 National Defence Research Establishment , Dept. of Weapons and Protection , Stockholm, Sweden
Ignition of Double Base Propellant Using Exploding Foils, Experimental Study
Svensson, A. ; 2001 ; 22p ; In English
Report No.(s): PB2001-108131 ; FOA-R-99-01251-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A method to ignite double base propellant with the aid of electrically exploding aluminum foils is experimentally tested. A special propellant charge is constructed of three 0.15 mm thick sheets of the double base propellant NK1287 attached to an aluminum foil. The charge is mounted in a simple gun specially designed for the experiment. A capacitor bank is thereafter discharged through the foil which then explodes. The intent is that the heat from the exploding foil shall ignite the propellant. The resulting movement of the projectile is registered with an Imacon camera in streak mode. Voltage over and current through the foil is also measured. The analysis of the results is a comparison between electrical energy delivered to the gun and the kinetic energy of the projectile. The measurements indicate that the propellant in some cases is ignited, but not as homogeneously as was intended. A probable cause for this is a too low pressure around the charge caused by a pre-ignition motion of the projectile.
NTIS
Double Base Propellants ; Aluminum ; Metal Foils ; Exploding Wires

20020006877 Research Inst. of National Defence , Weapons and Protection Div. , Tumba, Sweden
Preparation, Testing and Performance Calculations of GAP/ADN Propellants *Framstaellning, Provning och Prestanda-Beraekninar foer GAP-ADN-krut*
Sanden, R. ; October 1999 ; 20p ; In Swedish
Report No.(s): PB2001-108067 ; FOA-R-99-01257-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Preliminary experiments have been performed with the aim to prepare and characterize propellants with ammonium dinitramide, A-D-N, as oxidizer and with the energetic polymer, glycidylazide polymer, GAP, as binder. Well-cured propellants could be prepared with the tri-functional isocyanate Desmodur N-100. The thermal stability of the propellants was good, yet the impact sensitivity was high. A propellant containing 47% A-D-N was strand burned with a burn rate of about 35 mm/s at 10 MP-a. The pressure exponent in the regions 0.9-2.4 MP-a and 5-18 MP-a was 0.99 and 0.67, respectively. Thermochemical calculations show that it is possible to make gun propellants with much higher performance than those used currently while, for rockets, the results show possibilities to make high performance propellants with low signature. Much work is still to be done. Desmodur N-100 self polymerizes on storage. Therefore it is important to find another A-D-N compatible curing system, which is more stable and better defined than Desmodur N-100.
NTIS
Propellant Binders ; Gun Propellants ; Propellant Properties ; Oxidizers

20020007091 National Renewable Energy Lab. , Golden, CO USA
Deaerators in Industrial Steam Systems
Papar, R. ; Dec. 04, 2000 ; 2p ; In English
Report No.(s): DE2001-775888 ; NREL/FS-810-28884 ; DOE/GO-102000-1118 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
BestPractices Steam tip sheet regarding the use of deaerators in industrial steam systems.
NTIS
Steam ; Manufacturing ; Aeration

20020007099 National Defence Research Establishment , Dept. of Weapons and Protection , Stockholm, Sweden
New Energetic Complexes. Progress Report, November 2000 ***Nya Explosivaemneskomplex. Laegesrapport November 2000***
Bemm, U. ; November 2000 ; 20p ; In Swedish
Report No.(s): PB2001-108153 ; FOA-R-01657-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Within the project 'New explosives and initiators' the work with synthesis and characterization of new dinitramide compounds continues. This report summarizes all activities concerning the work with dinitramide compounds, XDNs, in the period from June 1999 until 31 December 2000. The experimental work has mainly involved three parts: the investigation of the hygroscopic properties of AND, KDN, LiDN, and GuDN (FOX-12); the development of methods for the determination of phase diagrams for dinitramide containing energetic complexes; and the synthesis and characterization of Triaminoguanidine-dinitramide. The presentation of results about new energetic dinitramide compounds has resulted in three oral presentations, two scientific FOA (Swedish Defense Research Establishment) reports about the crystal structure of FOX-12 and KDN, respectively, and one scientific article about FOX-12.
NTIS
Crystal Structure ; Explosives

20020007923 Federal Energy Technology Center , Morgantown, WV USA
Alternative Fuels and Chemicals from Synthesis Gas
Oct. 01, 1999 ; 8p ; In English
Report No.(s): DE2001-774950 ; DE-FC22-95PC93052-41 ; No Copyright ; Avail: Department of Energy Information Bridge
The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at the Department of Energy (DOE) in LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Energy Policy ; Hydrocarbon Fuels ; Oxygenation

20020007924 Federal Energy Technology Center , Morgantown, WV USA
Vapor Pressures and Heats of Vaporization of Primary Coal Tars
Suuberg, E. M. ; Oja, V. ; Jul. 01, 1997 ; 323p ; In English
Report No.(s): DE2001-774960 ; DE-FG22-92PC92544-18 ; No Copyright ; Avail: Department of Energy Information Bridge
This project had as its main focus the determination of vapor pressures of coal pyrolysis tars. It involved performing measurements of these vapor pressures and from them, developing vapor pressure correlations suitable for use in advanced pyrolysis models (those models which explicitly account for mass transport limitations). This report is divided into five main chapters. Each chapter is a relatively stand-alone section. Chapter A reviews the general nature of coal tars and gives a summary of existing vapor pressure correlations for coal tars and model compounds. Chapter B summarizes the main experimental approaches for coal tar preparation and characterization which have been used throughout the project. Chapter C is concerned with the selection of the model compounds for coal pyrolysis tars and reviews the data available to us on the vapor pressures of high boiling point aromatic compounds. This chapter also deals with the question of identifying factors that govern the vapor pressures of coal tar model materials and their mixtures. Chapter D covers the vapor pressures and heats of vaporization of primary cellulose tars. Chapter E discusses the results of the main focus of this study. In summary, this work provides improved understanding of the volatility of coal and cellulose pyrolysis tars. It has resulted in new experimentally verified vapor pressure correlations for use in pyrolysis models. Further research on this topic should aim at developing general vapor pressure

correlations for all coal tars, based on their molecular weight together with certain specific chemical characteristics, i.e., hydroxyl group content.
NTIS
Coal ; Pyrolysis ; Tars ; Vapor Pressure ; Vaporizing

20020007926 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Jul. 1998***
Aug. 01, 1998 ; 4p ; In English
Report No.(s): DE2001-775514 ; DE-FC26-97FT96052-10 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through July 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008100 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Feb. 1999***
Mar. 01, 1999 ; 6p ; In English
Report No.(s): DE2001-775525 ; DE-FC26-97FT96052-23 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop, and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through February 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008101 Federal Energy Technology Center , Morgantown, WV USA
Engineering development of ceramic membrane reactor system for converting natural gas to hydrogen and synthesis gas for liquid transportation fuels ***Monthly Report , Sep. 1999***
Oct. 01, 1999 ; 5p ; In English
Report No.(s): DE2001-775524 ; DE-FC26-97FT96052-22 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through September 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008102 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Oct. 1999***
Nov. 01, 1999 ; 4p ; In English
Report No.(s): DE2001-775522 ; DE-FC26-97FT96052-21 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop, and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating

and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through October 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008103 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Nov. 1999***
Dec. 01, 1999 ; 4p ; In English
Report No.(s): DE2001-775519 ; DE-FC26-97FT96052-20 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through November 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008104 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Dec. 1999***
Jan. 01, 2000 ; 4p ; In English
Report No.(s): DE2001-775518 ; DE--FC26-97FT96052-19 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through December 1999.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008105 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Ceramic Membrane Reactor System for Converting Natural Gas to Hydrogen and Synthesis Gas for Liquid Transportation Fuels ***Monthly Report , Jan. 2000***
Feb. 01, 2000 ; 4p ; In English
Report No.(s): DE2001-775515 ; DE-FC26-97FT96052-18 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this contract is to research, develop, and demonstrate a novel ceramic membrane reactor system for the low-cost conversion of natural gas to synthesis gas and hydrogen for liquid transportation fuels: the ITM Syngas process. Through an eight-year, three-phase program, the technology will be developed and scaled up to obtain the technical, engineering, operating and economic data necessary for the final step to full commercialization of the Gas-to-Liquids (GTL) conversion technology. This report is a summary of activities through January 2000.
NTIS
Ceramics ; Hydrogen ; Liquid Fuels ; Membranes ; Natural Gas

20020008108 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Coal-Fired High-Performance Power Systems. Quarterly Technical Report, Reporting Period January 1-March 31, 1999
May 01, 1999 ; 27p ; In English
Report No.(s): DE2001-775010 ; DE-AC22-95PC95143-15 ; No Copyright ; Avail: Department of Energy Information Bridge
A High Performance Power System (HIPPS) is being developed. This system is a coal-fired, combined cycle plant with indirect heating of gas turbine air. Foster Wheeler Development Corporation and a team consisting of Foster Wheeler Energy Corporation, Bechtel Corporation, University of Tennessee Space Institute and Westinghouse Electric Corporation are developing this system. In Phase 1 of the project, a conceptual design of a commercial plant was developed. Technical and economic analyses indicated that the plant would meet the goals of the project which include a 47% efficiency (HHV) and a 10% lower cost of

electricity than an equivalent size PC plant. The concept uses a pyrolysis process to convert coal into fuel gas and char. The char is fired in a High Temperature Advanced Furnace (HITAF). The HITAF is a pulverized fuel-fired boiler/air heater where steam is generated and gas turbine air is indirectly heated. The fuel gas generated in the pyrolyzer is then used to heat the gas turbine air further before it enters the gas turbine. The project is currently in Phase 2 which includes engineering analysis, laboratory testing and pilot plant testing. Research and development is being done on the HIPPS systems that are not commercial or being developed on other projects. Pilot plant testing of the pyrolyzer subsystem and the char combustion subsystem are being done separately, and after each experimental program has been completed, a larger scale pyrolyzer will be tested at the Power Systems Development Facility (PSDF) in Wilsonville, AL. The facility is equipped with a gas turbine and a topping combustor, and as such, will provide an opportunity to evaluate integrated pyrolyzer and turbine operation. This report addresses the areas of technical progress for this quarter. The char combustion tests in the arch-fired arrangement were completed this quarter. A total of twenty-one setpoints were successfully completed, firing both synthetically-made char, and char generated from the pyrolyzer tests performed at FWDC's pilot plant in Livingston, New Jersey. Construction is to begin next quarter to retrofit the CETF for additional HIPPS char combustion studies in a wall-fired configuration. Design of the char transfer system for the PSDF also progressed during this quarter. A number of arrangements have been developed to modify the existing N-Valve configuration. As an experimental test facility, the PSDF needs to maintain operating flexibility in order to test under a wide range of conditions. Although a new char transfer design is needed to support the HIPPS testing at the facility, the Second Generation PFB program will also utilize this system.
NTIS
Charring ; Coal ; Combustion ; Gas Turbines ; Performance Tests

20020008109 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Coal-Fired High-Performance Power Systems. Technical Progress Report no. 14, October through December 1998
Feb. 01, 1999 ; 49p ; In English
Report No.(s): DE2001-775009 ; DE-AC22-95PC95143-14 ; No Copyright ; Avail: Department of Energy Information Bridge
A High Performance Power System (HIPPS) is being developed. This system is a coal-fired, combined cycle plant with indirect heating of gas turbine air. Foster Wheeler Development Corporation and a team consisting of Foster Wheeler Energy Corporation, Bechtel Corporation, University of Tennessee Space Institute and Westinghouse Electric Corporation are developing this system. In Phase 1 of the project, a conceptual design of a commercial plant was developed. Technical and economic analyses indicated that the plant would meet the goals of the project which include a 47% efficiency (HHV) and a 10% lower cost of electricity than an equivalent size PC plant. The concept uses a pyrolysis process to convert coal into fuel gas and char. The char is fired in a High Temperature Advanced Furnace (HITAF). The HITAF is a pulverized fuel-fired boiler/air heater where steam is generated and gas turbine air is indirectly heated. The fuel gas generated in the pyrolyzer is then used to heat the gas turbine air further before it enters the gas turbine. The project is currently in Phase 2 which includes engineering analysis, laboratory testing and pilot plant testing. Research and development is being done on the HIPPS systems that are not commercial or being developed on other projects. Pilot plant testing of the pyrolyzer subsystem and the char combustion subsystem are being done separately, and after each experimental program has been completed, a larger scale pyrolyzer will be tested at the Power Systems Development Facility (PSDF) in Wilsonville, AL. The facility is equipped with a gas turbine and a topping combustor, and as such, will provide an opportunity to evaluate integrated pyrolyzer and turbine operation. This report addresses the areas of technical progress for this quarter. A general arrangement drawing of the char transfer system was forwarded to SCS for their review. Structural steel drawings were used to generate a three-dimensional model of the char transfer system including all pressure vessels and major piping components. Experimental testing at the Combustion and Environmental Test Facility continued during this quarter. Performance of the char burner, as benchmarked by flame stability and low NOx, has been exceptional. The burner was operated successfully both without natural gas and supplemental pulverized coal.
NTIS
Burners ; Charring ; Coal ; Combustion ; Gas Turbines ; Performance Tests

20020008110 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Coal-Fired High-Performance Power Systems. Technical Progress Report no. 12, April through June 1998
Nov. 01, 1998 ; 32p ; In English
Report No.(s): DE2001-775008 ; DE-AC22-95PC95143-13 ; No Copyright ; Avail: Department of Energy Information Bridge
A High Performance Power System (HIPPS) is being developed. This system is a coal-fired, combined cycle plant with indirect heating of gas turbine air. Foster Wheeler Development Corporation and a team consisting of Foster Wheeler Energy

Corporation, Bechtel Corporation, University of Tennessee Space Institute, and Westinghouse Electric Corporation are developing this system. In Phase 1 of the project, a conceptual design of a commercial plant was developed. Technical and economic analyses indicated that the plant would meet the goals of the project which include a 47% efficiency (HHV) and a 10% lower cost of electricity than an equivalent size PC plant. The concept uses a pyrolyzation process to convert coal into fuel gas and char. The char is fired in a High Temperature Advanced Furnace (HITAF). The HITAF is a pulverized fuel-fired boiler/air heater where steam is generated and gas turbine air is indirectly heated. The fuel gas generated in the pyrolyzer is then used to heat the gas turbine air further before it enters the gas turbine. The project is currently in Phase 2, which includes engineering analysis, laboratory testing and pilot plant testing. Research and development is being done on the HIPPS systems that are not commercial or being developed on other projects. Pilot plant testing of the pyrolyzer subsystem and the char combustion subsystem are being done separately, and after each experimental program has been completed, a larger scale pyrolyzer will be tested at the Power Systems Development Facility (PSDF) in Wilsonville, AL. The facility is equipped with a gas turbine and a topping combustor, and as such, will provide an opportunity to evaluate integrated pyrolyzer and turbine operation. The design of the char burner was completed during this quarter. The burner is designed for arch-firing and has a maximum capacity of 30 MMBtu/hr. This size represents a half scale version of a typical commercial burner. The burner is outfitted with nozzles for separate injection of char, coal, and limestone. Burner performance will be rated according to three criteria, carbon conversion efficiency, NOx generation, and flame stability.
NTIS
Burners ; Charring ; Coal ; Combustion ; Gas Turbines ; Performance Tests

20020008111 Federal Energy Technology Center , Morgantown, WV USA
Engineering Development of Slurry Bubble Column Reactor (SBCR) Technology
Toseland, B. A. ; Mar. 01, 1999 ; 33p ; In English
Report No.(s): DE2001-775007 ; DE-FC22-95PC95051-22 ; No Copyright ; Avail: Department of Energy Information Bridge
The major technical objectives of this program are threefold: (1) to develop the design tools and a fundamental understanding of the fluid dynamics of a slurry bubble column reactor to maximize reactor productivity; (2) to develop the mathematical reactor design models and gain an understanding of the hydrodynamic fundamentals under industrially relevant process conditions; and (3) to develop an understanding of the hydrodynamics and their interaction with the chemistries occurring in the bubble column reactor. Successful completion of these objectives will permit more efficient usage of the reactor column and tighter design criteria, increase overall reactor efficiency, and ensure a design that leads to stable reactor behavior when scaling up to large diameter reactors. The past three months of research have been focused on two major areas of bubble column hydrodynamics: (1) pressure and temperature effects on gas holdup; and (2) region transition using a sparger as a gas distributor.
NTIS
Bubble Technique ; Hydrodynamics ; Mathematical Models ; Slurries

20020008116 Federal Energy Technology Center , Morgantown, WV USA
Development of Attrition Resistant Iron-Based Fischer-Tropsch Catalysts
Sep. 20, 2000 ; 11p ; In English
Report No.(s): DE2001-774947 ; DE-FG26-99FT40619-01 ; No Copyright ; Avail: Department of Energy Information Bridge
The Fischer-Tropsch (F-T) reaction provides a way of converting coal-derived synthesis gas (CO+H2) to liquid fuels. Since the reaction is highly exothermic, one of the major problems in control of the reaction is heat removal. Recent work has shown that the use of slurry bubble column reactors (SBCRs) can largely solve this problem. The use of iron-based catalysts is attractive not only due to their low cost and ready availability, but also due to their high water-gas shift activity which makes it possible to use these catalysts with low H2/CO ratios. However, a serious problem with use of Fe catalysts in a SBCR is their tendency to undergo attrition. This can cause fouling/plugging of downstream filters and equipment, makes the separation of catalyst from the oil/wax product very difficult if not impossible, and results a steady loss of catalyst from the reactor. The objective of this research is to develop robust iron-based Fischer-Tropsch catalysts that have suitable activity, selectivity and stability to be used in the slurry bubble column reactor. Specifically we aim to develop to: (1) improve the performance and preparation procedure of the high activity, high attrition resistant, high alpha iron-based catalysts synthesized at Hampton University; (2) seek improvements in the catalyst performance through variations in process conditions, pretreatment procedures and/or modifications in catalyst preparation steps; and (3) investigate the performance in a slurry reactor. The effort during the reporting period has been devoted to effects of pretreating procedures, using H2, CO and syngas (H2/CO = 0.67) as reductants, on the performance

(activity, selectivity and stability with time) of a precipitated iron catalyst (Fe-100/Cu-5/K-4.2/SiO2-10 on a mass basis) during F-T synthesis were studied in a fixed-bed reactor.
NTIS
Catalysts ; Fischer-Tropsch Process ; Iron

20020008120 Federal Energy Technology Center , Morgantown, WV USA
Commercial Potential of Natural Gas Storage in Lined Rock Caverns (LRC)
Nov. 01, 1999 ; 141p ; In English
Report No.(s): DE2001-774913 ; DE-AC26-97FT34348-02 ; No Copyright ; Avail: Department of Energy Information Bridge
In late 1997, Sofregaz US was engaged by the Federal Energy Technology Center (FETC) to investigate the commercialization potential of natural gas storage in Lined Rock Caverns (LRC). Sofregaz US teamed with Gaz de France and Sydkraft to perform the study for the Department of Energy. The geologic conditions in many regions of the USA will not permit the development of economical high-deliverability gas storage in salt caverns. These regions include the entire Eastern Seaboard; several northern states, notably Minnesota and Wisconsin; many of the Rocky Mountain states; and most of the Pacific Northwest. This study addresses the development of a design and associated cost estimate for lined rock caverns for these regions of the USA. The study addresses the development of LRC at two locations: one along the Southeastern Coast and the other in the Northeast.
NTIS
Caves ; Natural Gas

20020008129 Oak Ridge National Lab. , TN USA
Biomass Feedstock Research and Development for Multiple Products in the USA
Wright, L. L. ; Jan. 10, 2001 ; 4p ; In English
Report No.(s): DE2001-774675 ; P00-108178 ; No Copyright ; Avail: Department of Energy Information Bridge
A recent presidential Executive Order to triple current levels of bioenergy and bio-based production by 2010 has increased interest in determining whether sufficient biomass resources will be economically available to support the goal. The US has a well-structured program of research and development which is focusing on increasing potential energy crop and crop residue availability under economically and environmentally sustainable conditions. Genetic improvement programs are ongoing in three US locations for hybrid poplar and cottonwood, in one location for willow, and in four locations for switchgrass. Variety testing and cropping systems development is being conducted at wider variety of sites for all three crops. Molecular genetics is providing important information and tools for identifying and controlling desired traits. The program is also expanding to address supply logistics issues for both energy crop and residues. Equilibrium model analysis performed jointly with the US Department of Agriculture suggests that at farmgate prices of about $33 dt and $44 dt, between 7 and 17 million ha of land could convert to energy crop production without negatively affecting food supplies. Large amounts of crop residue also become profitable for farmers to collect at similar prices. This potential for supporting significant bioenergy and biobased products industries in the US will only be realized if the environmental and economic values to local communities are recognized and factored into energy and environmental policy.
NTIS
Agriculture ; Biomass ; Crop Growth ; Farm Crops ; Energy Policy

20020008147 International Atomic Energy Agency , Vienna Austria
Technology status of hydrogen road vehicles. IEA technical report from the IEA Agreement of the production and utilization of hydrogen
Doyle, T. A. ; Jan. 31, 1998 ; 71p ; In English
Report No.(s): DE2001-776256 ; IEA/H2-TR1-98 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The report was commissioned under the Hydrogen Implementing Agreement of the International Energy Agency (IEA) and examines the state of the art in the evolving field of hydrogen-fueled vehicles for road transport. The first phase surveys and analyzes developments since 1989, when a comprehensive review was last published. The report emphasizes the following: problems, especially backfiring, with internal combustion engines (ICEs); operational safety; hydrogen handling and on-board storage; and ongoing demonstration projects. Hydrogen vehicles are receiving much attention, especially at the research and development level. However, there has been a steady move during the past 5 years toward integral demonstrations of operable vehicles intended for public roads. Because they emit few, or no greenhouse gases, hydrogen vehicles are beginning to be taken seriously as a promising solution to the problems of urban air quality. Since the time the first draft of the report was prepared (mid-1996), the 11th World Hydrogen Energy Conference took place in Stuttgart, Germany. This biennial conference can be regarded as a valid updating of the state of the art; therefore, the 1996 results are included in the current version. Sections of the

report include: hydrogen production and distribution to urban users; on-board storage and refilling; vehicle power units and drives, and four appendices titled: Safety questions of hydrogen storage and use in vehicles, Performance of hydrogen fuel in internal production engines for road vehicles, Fuel cells for hydrogen vehicles, and Summaries of papers on hydrogen vehicles.
NTIS
Internal Combustion Engines ; Hydrogen Fuels ; Hydrogen ; Hydrogen Production

20020008148 Los Alamos National Lab. , NM USA
Insensitive high-nitrogen compounds
Chavez, D. ; Mar. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-776133 ; LA-UR-01-1493 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The conventional approach to developing energetic molecules is to chemically place one or more nitro groups onto a carbon skeleton, which is why the term 'nitration' is synonymous to explosives preparation. The nitro group carries the oxygen that reacts with the skeletal carbon and hydrogen fuels, which in turn produces the heat and gaseous reaction products necessary for driving an explosive shock. These nitro-containing energetic molecules typically have heats of formation near zero and therefore most of the released energy is derived from the combustion process. Our investigation of the tetrazine, furazan and tetrazole ring systems has offered a different approach to explosives development, where a significant amount of the chemical potential energyis derived from their large positive heats of formation. Because these compounds often contain a large percentage of nitrogen atoms, they are usually regarded as high-nitrogen fuels or explosives. A general artifact of these high-nitrogen compounds is that they are less sensitive to initiation (e.g. by impact) when compared to traditional nitro-containing explosives of similar performances. Using the precursor, 3,6-bis-(3,5-dimethylpyrazol- 1-yl)-s-tetrazine, several useful energetic compounds based on the s-tetrazine system have been synthesized and studied. Some of the first compounds are 3,6-diamino-s- tetrazine-1,4-dioxide (LAX-112) and 3,6-dihydrazino-s-tetrazine (DHT). LAX-112 was once extensively studied as an insensitive explosive by Los Alamos; DHT is an example of a high-nitrogen explosive that relies entirely on its heat of formation for sustaining a detonation. Recent synthesis efforts have yielded an azo-s-tetrazine, 3,3-azobis(6-amino-s-tetrazine) or DAAT, which has a very high positive heat of formation. The compounds, 4,4-diamino-3,3-azoxyfurazan (DAAF) and 4,4-diamino-3,3-azofurazan (DAAzF), may have important future roles in insensitive explosive applications. Neither DAAF nor DAAzF can be initiated by laboratory impact drop tests, yet both have in some aspects better explosive performances than 1,3,5-triamino- 2,4,6-trinitrobenzene TATB--the standard of insensitive high explosives. The thermal stability of DAAzF is equal to that of hexanitrostilbene (HNS), yet it too is a better explosive performer. The recently discovered tetrazol derivative, 3,6-bis-(1H-1, 2,3,4-tetrazol- 5-ylamino)-s-tetrazine (BTATz) was measuredto have exceptional positive heats of formation and to be insensitive toexplosive initiation. Because of its high burn rate with low sensitivityto pressure, this material is of great interest to the propellant community.
NTIS
Nitrogen Compounds ; Nitrogen Atoms ; Reaction Kinetics ; Burning Rate

20020008157 International Energy Agency , Golden, CO USA
IEA Agreement on the production and utilization of hydrogen: 1999 annual report
Jan. 31, 2000 ; 72p ; In English
Report No.(s): DE2001-774832 ; IEA/H2-AR-99 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The annual report begins with an overview of the IEA Hydrogen Agreement, including guiding principles and their strategic plan followed by the Chairman's report providing the year's highlights. Annex reports included are: the final report for Task 11, Integrated Systems; task updates for Task 12, Metal Hydrides and Carbon for Hydrogen Storage, Task 13, Design and Optimization of Integrated Systems, Task 14, Photoelectrolytic Production of Hydrogen, and Task 15, Photobiological Production of Hydrogen; and a feature article by Karsten Wurr titled 'Large-Scale Industrial Uses of Hydrogen: Final Development Report'.
NTIS
Hydrogen ; Hydrogen Production

20020008160 Los Alamos National Lab. , NM USA
Indexes of the Proceedings for the Ten International Symposia on Detonation 1951-93
Deal, W. E. ; Ramsay, J. B. ; Roach, A. M. ; Takala, B. E. ; Sep. 01, 1998 ; 120p ; In English
Report No.(s): DE2001-774552 ; LA-UR-97-1899 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Proceedings of the ten Detonation Symposia have become the major archival source of information of international research in explosive phenomenology, theory, experimental techniques, numerical modeling, and high-rate reaction chemistry. In many cases, they contain the original reference or the only reference to major progress in the field. For some papers, the information is more complete than the complementary article appearing in a formal journal; yet for others, authors elected to

publish only an abstract in the Proceedings. For the large majority of papers, the Symposia Proceedings provide the only published reference to a body of work. This report indexes the ten existing Proceedings of the Detonation Symposia by paper titles, topic phrases, authors, and first appearance of acronyms and code names.
NTIS
Detonation ; Explosives ; Conferences

20020008178 Department of Energy , National Energy Technology Lab. , Pittsburgh, PA USA
Urban wood/coal co-firing in the bellefield boilerplant
Cobb, J. T. ; Geiger, G. E. ; Elder, W. W. ; Barry, W. P. ; Wang, J. ; Aug. 21, 2001 ; 19p ; In English
Report No.(s): DE2001-786850 ; FG26-00NT40808-03 ; No Copyright ; Avail: Department of Energy Information Bridge
During the third quarter, important preparatory work was continued so that the experimental activities can begin early in the fourth quarter. Authorization was awaited in response to the letter that was submitted to the Allegheny County Health Department (ACHD) seeking an R&D variance for the air permit at the Battlefield Boiler Plant (BBP). Verbal authorizations were received from the Pennsylvania Department of Environmental Protection (PADEP) for R&D variances for solid waste permits at the J. A. Rutter Company (JARC), and Emery Tree Service (ETS). Construction wood was acquired from Thompson Properties and Seven D Corporation. Forty tons of pallet and construction wood were ground to produce BioGrind Wood Chips at JARC and delivered to Mon Valley Transportation Company (MVTC). Five tons of construction wood were milled at ETS and half of the product delivered to MVTC. Discussions were held with BBP and Energy Systems Associates (ESA) about the test program. Material and energy balances on Boiler no. 1 and a plan for data collection were prepared. Presentations describing the University of Pittsburgh Wood/Coal Co-Firing Professional Engineers, and the Upgraded Coal Interest Group and the Biomass Interest Group (BIG) of the Electric Power Research Institute (EPRI). An article was submitted for authorization for a Pennsylvania Switchgrass Energy and Conservation Program.
NTIS
Biomass ; Wood ; Coal ; Energy Conservation ; Environment Protection

20020008179 Department of Energy , National Energy Technology Lab. , Pittsburgh, PA USA
Water-Gas Shift Kinetics Over Iron Oxide Catalysts at Membrane Reactor Conditions
Lund, C. R. F. ; Aug. 10, 2001 ; 19p ; In English
Report No.(s): DE2001-786849 ; FG26-99FT40590-02 ; No Copyright ; Avail: Department of Energy Information Bridge
This report covers the second year of a project investigating water-gas shift catalysts for use in membrane reactors. It has been established that a simple iron high temperature shift catalyst becomes ineffective in a membrane reactor because the reaction rate is severely inhibited by build-up of the product CO2. During the past year, an improved microkinetic model for water-gas shift over iron oxide was developed. Its principal advantage over prior models is that it displays the correct asymptotic behavior at all temperatures and pressures as the composition approaches equilibrium. This model has been used to explore whether it might be possible to improve the performance of iron high temperature shift catalysts under conditions of high CO2 partial pressure. The model predicts that weakening the surface oxygen bond strength by less than 5% should lead to higher catalytic activity as well as resistance to rate inhibition at higher CO2 partial pressures. Two promoted iron high temperature shift catalysts were studied. Ceria and copper were each studied as promoters since there were indications in the literature that they might weaken the surface oxygen bond strength. Ceria was found to be ineffective as a promoter, but preliminary results with copper promoted FeCr high temperature shift catalyst show it to be much more resistant to rate inhibition by high levels of CO2. Finally, the performance of sulfided CoMo/Al2O3 catalysts under conditions of high CO2 partial pressure was simulated using an available microkinetic model for water-gas shift over this catalyst. The model suggests that this catalyst might be quite effective in a medium temperature water-gas shift membrane reactor, provided that the membrane was resistant to the H2S that is required in the feed.
NTIS
Catalysts ; Iron Oxides ; Aluminum Oxides ; Display Devices

20020008181 Department of Energy , National Energy Technology Lab. , Pittsburgh, PA USA
Conversion of lignocellulosic material to chemicals and fuels
Olson, E. S. ; Jun. 30, 2001 ; 16p ; In English
Report No.(s): DE2001-786842 ; FC26-98FT40320-19 ; No Copyright ; Avail: Department of Energy Information Bridge
A direct conversion of cellulosic wastes, including resin-bonded furniture and building waste, to levulinate esters is being investigated with the view to producing fuels, solvents, and chemical intermediates as well as other useful by-products in an inexpensive process. The acid-catalyzed reaction of cellulosic materials with ethanol or methanol at 200degC gives good yields

of levulinate and formate esters, as well as useful by-products, such as a solid residue (charcoal) and a resinous lignin residue. An initial plant design showed reasonable rates of return for production for purified ethyl levulinate and by-products.
NTIS
Cellulose ; Conversion ; Fuels ; Lignin ; By-Products

20020008198 Oak Ridge National Lab. , TN USA
Results of the Radiological Survey of the Iowa Army Ammunition. Plant, Middletown, Iowa
Murray, M. E. ; Jul. 17, 2001 ; 48p ; In English
Report No.(s): DE2001-786332 ; ORNL/TM-2000/305 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an indoor radiological survey of property at the Iowa Army Ammunition Plant (IAAAP), Middletown, Iowa in June 2000. The purpose of the survey was to determine if radioactive residuals resulting from previous Atomic Energy Commission (AEC) activities were present inside selected Line 1 buildings at the IAAAP and conduct sampling in those areas of previous AEC operations that utilized radioactive components at some point during the manufacturing process, in order to evaluate any possible immediate health hazards and to collect sufficient information to determine the next type of survey. The AEC occupied portions of IAAAP from 1947 to 1975 to assemble nuclear weapons. The surveyed areas were identified through interviews with current and former IAAAP employees who had worked at the plant during AEC's tenure, and from AEC records.
NTIS
Ammunition ; Nuclear Electric Power Generation ; Radioactivity ; Hazards

20020008686 National Renewable Energy Lab. , Golden, CO USA
Airport-Based Alternative Fuel Vehicle Fleets
Howards, S. ; Feb. 28, 2001 ; 6p ; In English
Report No.(s): DE2001-778809 ; NREL/FS-540-28353 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An account of alternative fuel vehicle usage and success highlighting three major airports.
NTIS
Airports ; Vehicles ; Fuels

20020008896 Atomic Energy Commission , Idaho Falls, ID USA
Demonstration of Decision Support Tools for Sustainable Development: An Application on Alternative Fuels in the Greater Yellowstone-Teton Region
Shropshire, D. E. ; Cobb, D. A. ; Worhach, P. ; Jacobson, J. J. ; Berrett, S. ; Dec. 30, 2000 ; 48p ; In English
Report No.(s): DE2001-777108 ; INEEL/EXT-2000-01441 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Demonstration of Decision Support Tools for Sustainable Development project integrated the Bechtel/Nexant Industrial Materials Exchange Planner and the Idaho National Engineering and Environmental Laboratory System Dynamic models, demonstrating their capabilities on alternative fuel applications in the Greater Yellowstone-Teton Park system. The combined model, called the Dynamic Industrial Material Exchange, was used on selected test cases in the Greater Yellow Teton Parks region to evaluate economic, environmental, and social implications of alternative fuel applications, and identifying primary and secondary industries. The test cases included looking at compressed natural gas applications in Teton National Park and Jackson, Wyoming, and studying ethanol use in Yellowstone National Park and gateway cities in Montana. With further development, the system could be used to assist decision-makers (local government, planners, vehicle purchasers, and fuel suppliers) in selecting alternative fuels, vehicles, and developing AF infrastructures. The system could become a regional AF market assessment tool that could help decision-makers understand the behavior of the AF market and conditions in which the market would grow. Based on this high level market assessment, investors and decision-makers would become more knowledgeable of the AF market opportunity before developing detailed plans and preparing financial analysis.
NTIS
Compressed Gas ; Energy Policy ; Environmental Laboratories ; Ethyl Alcohol

20020008900 National Renewable Energy Lab. , Golden, CO USA

Guidebook to the U.S. Department of Energy's Alternative Fuel Transportation Program for State and Alternative Fuel Provider Fleets

Melendez, M. ; Feb. 21, 2001 ; 46p ; In English

Report No.(s): DE2001-776937 ; DOE/GO-102001-1134 ; NREL/MK-540-29184 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The country increasing dependence on imported oil and the relative instability of the oil-producing countries prompted Congress to pass the Energy Policy Act (EPAct) of 1992. The Act called on the US Department of Energy (DOE) to expand research and development in the transportation sector, and to create programs for accelerating the introduction of alternative fueled vehicles (AFVs) to replace conventional models fueled by gasoline. DOE Alternative Fuel Transportation Program, as codified in 10 CFR Part 490, implements the provisions in Sections 501, 507(o), 508, 511, 512, and 513 of EPAct. These sections: (1) Call for DOE to promulgate rule makings requiring State government fleets and alternative fuel providers to acquire AFVs in certain gradually increasing percentages; (2) Set forth a credit program to reward those who purchase or lease AFVs either earlier than required, or in greater numbers than required; (3) Establish reporting procedures; (4) Implement exemption provisions; and (5) Set forth enforcement procedures and provisions. State government fleet managers and alternative fuel providers must determine if they are covered by these provisions, and take certain steps to be in compliance if they are covered. This booklet has been produced by DOE as a reader-friendly guide to the primary requirements of the Alternative Fuel Transportation Program for States and fuel providers. DOE has addressed the topics that fleet managers ask about most frequently.

NTIS

Fuels ; Management ; Alternatives ; Electric Automobiles

20020009208 Space and Naval Warfare Systems Center , San Diego, CA USA

Trace Element and Polycyclic Aromatic Hydrocarbon Analyses of Jet Engine Fuels: Jet A, JP5, and JP8

Shumway, L. A. ; Dec. 2000 ; 33p ; In English ; Original contains color images

Report No.(s): AD-A396143 ; SSC/SD-TR-1845 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This Technical Report analyzes four fuel samples: one sample of commercial Jet A (Jet Aviation) fuel, one sample of JP8 fuel, and two samples of JP5 fuel. The samples were analyzed for elements and Polycyclic Aromatic Hydrocarbons (PAHs). A larger database would enable definition of a range of typical element and PAH values in jet fuel. It would also help determine which elements in the fuels are present as delivered from the refinery or are introduced as storage and delivery system contaminants.

DTIC

Trace Elements ; Polycyclic Aromatic Hydrocarbons ; Jet Engine Fuels

20020009504 Federal Energy Technology Center , Morgantown, WV USA

Engineering development of ceramic membrane reactor system for converting natural gas to hydrogen and synthesis gas for liquid transportation fuels

Dyer, P. N. ; Mar. 01, 1999 ; 12p ; In English

Report No.(s): DE2001-780836 ; DE-FC26-97FT96052-15 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

At the beginning of this quarter, Air Products, Chevron, Norsk Hydro, and McDermott met to kick off the Process Design task. A process design strategy that includes scope, design basis, and plant location and scale was developed for both gas-to-liquids (GTL) and H(sub 2) applications. For GTL, the strategy is based on the initial design of an ITM Syngas plant for a Gulf Coast land-based GTL facility, carried out by Chevron and Air Products. This design will be adapted to the Alaskan North Slope GTL application by McDermott and Chevron, with input from the University of Alaska and ARCO. McDermott Technology will adapt the land-based GTL to a Gulf Coast offshore GTL application, and Norsk Hydro with McDermott will adapt the offshore GTL design to other offshore locations as needed.

NTIS

Hydrogen ; Natural Gas ; Liquid Fuels

20020009582 Brookhaven National Lab. , Upton, NY USA

Proceedings of the 2001 national oilheat research alliance technology conference

McDonald, R. J. ; Apr. 30, 2001 ; 215p ; In English , 30 Apr. - 1 May 2001 , Upton, NY , USA

Report No.(s): DE2001-780685 ; BNL-52625 ; EST072NEDA ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

BNL is proud to acknowledge all of our 2001 sponsors, with their help and support this has correctly become an oilheat industry conference. It is quite gratifying to see an industry come together to help support an activity like the technology conference, for the benefit of the industry as a whole and to celebrate the beginning of the National Oilheat Research Alliance. This meeting is the fourteenth oil heat industry technology conference to be held since 1984 and the first under a new name, NORA, the National Oilheat research Alliance, and the very first in the new century. The conference is a very important part of the effort in technology transfer, which is supported by the Oilheat Research Program. The Oilheat Research Program at BNL is under the newly assigned program management at the Office of Power Technology within the US DOE. The foremost reason for the conference is to provide a platform for the exchange of information and perspectives among international researchers, engineers, manufacturers, service technicians, and marketers of oil-fired space-conditioning equipment. The conference provides a conduit by which information and ideas can be exchanged to examine present technologies, as well as helping to develop the future course for oil heating advancement. These conferences also serve as a stage for unifying government representatives, researchers, fuel oil marketers, and other members of the oil-heat industry in addressing technology advancements in this important energy use sector. The specific objectives of the conference are to: (1) Identify and evaluate the current state-of-the-art and recommend new initiatives for higher efficiency, a cleaner environment, and to satisfy consumer needs cost-effectively, reliably, and safely; (2) Foster cooperative interactions among federal and industrial representatives for the common goal of sustained economic growth and energy security via energy conservation. Seventeen technical presentations will be made during the two-day program, all related to oil-heat technology and equipment, these will cover a range of research, developmental, and demonstration activities being conducted within the USA and Europe, including: (1) High-flow Fan Atomization Burner (HFAB) Development and Field Trials; (2) Field Test of the Flame Quality Monitor; (3) NORA/DOE/ BNL Oilheat Five-Year Research Plan; (4) US Department of Energy's Building Cooling Heating and Power for Buildings Program; (5) NORA Education Committee Report; (6) Marketing Oil Heat in Europe: A study in contrasts; (7) Diagnosing Burner Problems with Recorded Data; (8) Variable Firing Rate Oil Burner Using Pulse Fuel Flow Control; (9) Oil-Fired Hydronic Heating Appliances with Reduced Electric Power Consumption and Battery Backup; (10) Peep Into The Nozzle Using Computational Fluid Dynamics; (11) Results of a Parametric Investigation of Spray Characteristics Using a HFAB Type Atomizer; (12) Progression and Improvements in the Design of Blue-flame Oil Burners; (13) Biodiesel as a Heating Oil Blend Stock; (14) Lab Tests of Biodiesel Blends in Residential Heating Equipment; (15) Alternative Fuel Oils and the Effect of Selected Properties in Combustion; (16) New York State Premium Low-Sulfur Heating Fuel Marketplace Demonstration; and (17)The Need for a New Fuel Oil Stability Specification.
NTIS
Conferences ; Fuel Oils ; Heating ; Technology Transfer

20020009622 National Renewable Energy Lab. , Golden, CO USA
Biofuels News , Volume 4
Tuttle, J. H. ; Winter 2001 ; 4p ; In English
Report No.(s): DE2001-778923 ; DOE/GO-102001-1285 ; NREL/BR-580-29830 ; No Copyright ; Avail: Department of Energy Information Bridge

Newsletter for the DOE Biofuels Program. Articles on collaborative projects with USDA, and OIT. Contains an interview with Doug Kaempf, co-director of the National Biobased Products and Bioenergy Coordination Office.
NTIS
Biochemical Fuel Cells ; Renewable Energy

20020009642 Oak Ridge National Lab. , TN USA
Ultra-Clean Diesel Fuel: US Production and Distribution Capability
Hadder, G. R. ; Feb. 15, 2001 ; 40p ; In English
Report No.(s): DE2001-777709 ; ORNL/TM-2000/191 ; No Copyright ; Avail: Department of Energy Information Bridge

Diesel engines have potential for use in a large number of future vehicles in the US. However, to achieve this potential, proponents of diesel engine technologies must solve diesel pollution problems, including objectionable levels of emissions of particulates and oxides of nitrogen. To meet emissions reduction goals, diesel fuel quality improvements could enable diesel engines with advanced aftertreatment systems to achieve the necessary emissions performance. The diesel fuel would most likely have to be reformulated to be as clean as low sulfur gasoline. This report examines the small- and large-market extremes for introduction of ultra-clean diesel fuel in the US and concludes that petroleum refinery and distribution systems could produce adequate low sulfur blendstocks to satisfy small markets for low sulfur (30 parts per million) light duty diesel fuel, and deliver that fuel to retail consumers with only modest changes. Initially, there could be poor economic returns on under-utilized infrastructure investments. Subsequent growth in the diesel fuel market could be inconsistent with U.S. refinery configurations and economics. As diesel fuel volumes grow, the manufacturing cost may increase, depending upon how hydrodesulfurization

technologies develop, whether significantly greater volumes of the diesel pool have to be desulfurized, to what degree other properties like aromatic levels have to be changed, and whether competitive fuel production technologies become economic. Low sulfur (10 parts per million) and low aromatics (10 volume percent) diesel fuel for the total market could require desulfurization, dearomatization, and hydrogen production investments amounting to a third of current refinery market value. The refinery capital cost component alone would be 3 cents per gallon of diesel fuel. Outside of refineries, the gas-to-liquids (GTL) plant investment cost would be 3 to 6 cents per gallon. With total projected investments of $11.8 billion (6 to 9 cents per gallon) for the U.S. Gulf Coast alone, financing, engineering, and construction and material availability are major issues that must be addressed, for both refinery and GTL investments.
NTIS
Diesel Engines ; Diesel Fuels ; Economics ; Fuel Production ; Clean Fuels ; Automobiles ; Manufacturing

20020010194 Federal Energy Technology Center , Morgantown, WV USA
Exploratory research on novel coal liquefaction concept
Brandes, S. D. ; Winschel, R. A. ; Feb. 26, 1997 ; 12p ; In English
Report No.(s): DE2001-780938 ; DE-AC22-95PC95050-12 ; No Copyright ; Avail: Department of Energy Information Bridge
Task 4 experimental testing was continued. Six first-stage one-liter autoclave tests were made at reduced severity conditions. A device to reduce the in-line filter diameter proved difficult to use and resulted in little usable filtration data. Its use was discontinued. The second-stage reactor system was overhauled and used to process Wilsonville Run 263J resid. Resid conversion and yields were commensurate with expected results. The economic and engineering evaluation of the Novel Concept process, based on Task 2 and Task 3 experimental data, was begun. The design of a conceptual commercial plant was completed. The economic and engineering evaluation illuminated components of the process operating and capital cost estimates which, if appropriately altered, could significantly reduce the cost of product (gasoline) from the process. This provided direction for the Task 4 experimental program.
NTIS
Coal Liquefaction ; Autoclaves ; Economic Analysis ; Industrial Plants ; Crude Oil

20020010195 Federal Energy Technology Center , Morgantown, WV USA
Exploratory research on novel coal liquefaction concept
Brandes, S. D. ; Oct. 01, 1998 ; 7p ; In English
Report No.(s): DE2001-780939 ; DE-AC22-94PC95050-42 ; No Copyright ; Avail: Department of Energy Information Bridge
All experimental testing for the contract was completed. Economic evaluations for the conceptual process are under way.
NTIS
Coal Liquefaction ; Economics ; Fuel Production

20020010207 National Renewable Energy Lab. , Golden, CO USA
Dual Fuel Conversion System for Diesel Engines: Inventions and Innovation Project Fact Sheet
Wogsland, J. ; Jan. 25, 2001 ; 2p ; In English
Report No.(s): DE2001-781631 ; DOE/GO-102001-0862 ; NREL/FS-810-26737 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Project fact sheet written for the Inventions and Innovation Program about a new dual fuel conversion system allows diesel fuel switching with clean burning natural gas.
NTIS
Diesel Engines ; Diesel Fuels ; Fuel Systems

20020010209 National Renewable Energy Lab. , Golden, CO USA
Three-Phase Rotary Separator Turbine: NICE3 Petroleum Project Fact Sheet
Wogsland, J. ; Jan. 25, 2001 ; 2p ; In English
Report No.(s): DE2001-781670 ; DOE/GO-102001-1046 ; NREL/FS-810-28238 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Fact sheet written for the NICE3 Program on a new technology that separates gas, oil, and water from offshore oil and gas operations.
NTIS
Offshore Energy Sources ; Separators ; Crude Oil

20020010366 Federal Energy Technology Center , Morgantown, WV USA

Alternative fuels and chemicals from synthesis gas. final quarterly status report

Apr. 01, 1999 ; 19p ; In English

Report No.(s): DE2001-9316 ; DE-FC22-95PC93052-15 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.

NTIS

Coal Derived Gases ; Coal Utilization

20020010381 Federal Energy Technology Center , Morgantown, WV USA

Alternative fuels and chemicals from synthesis gas

Jan. 01, 1999 ; 58p ; In English

Report No.(s): DE2001-780890 ; DE-FC22-95PC93052-29 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's (Department of Energy) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.

NTIS

Slurries ; Clean Fuels ; Synthetic Fuels ; Energy Conversion ; Energy Technology

20020010622 National Renewable Energy Lab. , Golden, CO USA

Report on Biomass Drying Technology

Amos, W. A. ; Jan. 12, 1999 ; 35p ; In English

Report No.(s): DE2001-9548 ; NREL/TP-570-25885 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Using dry fuel provides significant benefits to combustion boilers, mainly increased boiler efficiency, lower air emissions, and improved boiler operation. The three main choices for drying biomass are rotary dryers, flash dryers, and superheated steam dryers. Which dryer is chosen for a particular application depends very much on the material characteristics of the biomass, the opportunities for integrating the process and dryer, and the environmental controls needed or already available.

NTIS

Biomass ; Boilers ; Environmental Control

20020010628 Department of Energy , Tulsa, OK USA

Experimental and Theoretical Investigation of Multiphase Flow in Fractured Porous media, SUPRI TR-116

Akin, S. ; Castanier, L. M. ; German, E. R. R. ; Aug. 09, 1999 ; 107p ; In English

Report No.(s): DE2001-9328 ; DOE/BC/14994-15 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The fluid transfer parameters between rock matrix and fracture are not well known. Consequently, simulation of fractured reservoirs uses, in general, very crude and unproven hypotheses such as zero capillary pressure in the fracture and/or relative permeability linear with saturation. In order to improve the understanding of flow in fractured media, an experimental study was conducted and numerical simulations of the experiments were made. A laboratory flow apparatus was built to obtain data on water-air imbibition and oil-water drainage displacements in horizontal single-fractured block systems. For this purpose, two configurations have been used: a two-block system with a 1 mm spacer between the blocks, and a two-block system with no spacer. During the experiments, porosity and saturation measurements along the cores have been made utilizing an X-ray Computerized Tomography (CT) scanner. Saturation images were reconstructed in 3-D to observe matrix-fracture interactions. Differences in fluid saturations and relative permeabilities caused by changes in fracture width have also been analyzed.

NTIS

Reservoirs ; Multiphase Flow

20020010904 Defence Science and Technology Organisation , Weapons Systems Div. , Fishermans Bend, Australia
Evaluation of the Thermochemical Code: CHEETAH 2.0 for Modeling Explosives Performance
Lu, Jing Ping , Defence Science and Technology Organisation , Australia ; August 2001 ; 38p ; In English
Report No.(s): DSTO-TR-1199 ; DODA-AR-011-997 ; Copyright ; Avail: Issuing Activity

The Lawrence Livermore National Laboratory CHEETAH 2.0 program has been used to analyze a number of conventional ideal explosive ingredients, ideal explosive compositions, non-ideal explosive compositions, and new and proposed explosives. It has also been used to study the effect of heats of formation and different types of binders on the predicted performance of explosive formulations. It is shown that the CHEETAH 2.0 program using the traditional Chapman-Jouget thermodynamic detonation theory can accurately model and predict performance of new explosive materials and of ideal explosives. It can also predict reasonably accurately experimental results for mildly non-ideal explosives. It is also shown that the CHEETAH 2.0 program based on the Wood-Kirkwood detonation theory can successfully model both mildly non-ideal explosives and moderate non-ideal explosives. It can replicate many of the features of non-ideal explosives such as detonation velocities and sonic reaction zone widths, and explosive properties such as detonation velocities as a function of the charge radius. In attempting to apply CHEETAH 2.0 to PBXW-115(Aust) using the estimated radius of curvature for the detonation front built into the code, difficulties were initially encountered in achieving convergence to a self-propagating detonation velocity. However, if an experimentally determined radius of curvature is used, good results are achieved from 'Kinetic' CHEETAH, reflecting non-ideal features such as detonation velocities dependent on charge radius. Finally, in view of the strengths and limitations of CHEETAH, recommendations for the future work are made.
Author
Detonation ; Explosives ; Thermochemistry ; Computerized Simulation ; Applications Programs (Computers)

20020010932 Federal Energy Technology Center , Morgantown, WV USA
Particulate Hot Gas Stream Cleanup Technical Issues
Feb. 26, 1999 ; 20p ; In English
Report No.(s): DE2001-9067 ; DE-AC21-94MC31160-30 ; No Copyright ; Avail: Department of Energy Information Bridge

This quarterly report describes technical activities performed under Contract No. DE-AC21-94MC31160. The analyses of hot gas stream cleanup (HGCU) ashes and descriptions of filter performance studied under Task 1 of this contract are designed to address problems with filter operation that are apparently linked to characteristics of the collected ash. This report includes a description of a device developed to harden a filter cake on a filter element so that the element and cake can subsequently be encapsulated in epoxy and studied in detail. This report also reviews the status of the HGCU data base of ash and char characteristics. Task 1 plans for the remainder of the project include characterization of additional samples collected during site visits to the Department of Energy/Southern Company Services Power Systems Development Facility (PSDF), encapsulation of an intact filter cake from the PSDF, and completion and delivery of the HGCU data bank. Task 2 of this project concerns the testing and failure analyses of new and used filter elements and filter materials. Task 2 work during the past quarter consisted of hoop tensile and axial compressive stress-strain responses of McDermott ceramic composite and hoop tensile testing of Techniweave candle filters as-manufactured and after exposure to the gasification environment.
NTIS
Ashes ; Charring ; Cleaning ; Data Bases ; Gas Streams ; Particulates

20020010933 Federal Energy Technology Center , Morgantown, WV USA
Alternative Fuels and Chemicals from Synthesis Gas ***Final Report***
Nov. 01, 1998 ; 20p ; In English
Report No.(s): DE2001-9060 ; DE-FC22-95PC93052-13 ; No Copyright ; Avail: Department of Energy Information Bridge

The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at Department of Energy's (DOE's) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Energy Policy ; Hydrocarbon Fuels ; Synthetic Fuels

20020010955 Los Alamos National Lab. , NM USA

Development of a thermoacoustic natural gas liquefier-update

Wollan, J. ; Swift, G. ; May 01, 2001 ; 9p ; In English

Report No.(s): DE2001-780899 ; LA-UR-01-2652 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Thermoacoustic heat engines and refrigerators are being developed for liquefaction of natural gas. This is the only technology capable of producing refrigeration power at cryogenic temperatures with no moving parts. A prototype, with a projected natural gas liquefaction capacity of 500 gallons/day, has been built and tested. The power source is a natural gas burner. Systems are developed with liquefaction capacities up to 10,000 to 20,000 gallons per day. The technology, the development project, accomplishments and applications are discussed.

NTIS

Heat Engines ; Natural Gas ; Condensers (Liquefiers) ; Thermoacoustic Refrigerators

20020010956 Federal Energy Technology Center , Morgantown, WV USA

Synthesis of methyl methacrylate from coal-derived syngas

Gogate, M. R. ; Spivey, J. J. ; Zoeller, J. R. ; Colberg, R. D. ; Choi, G. N. ; Jul. 19, 1999 ; 17p ; In English

Report No.(s): DE2001-780895 ; DE-AC22-94PC94065-19 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Research Triangle Institute (RTI), Eastman Chemical Company, and Bechtel collectively are developing a novel three-step process for the synthesis of methyl methacrylate (MMA) from coal-derived syngas that consists of the steps of synthesis of a propionate, its condensation with formaldehyde to form methacrylic acid (MAA), and esterification of MAA with methanol to produce MMA. The research team has completed the research on the three-step methanol-based route to MMA. Under an extension to the original contract, we are currently evaluating a new DME (dimethoxyethane)-based process for MMA. The key research need for DME route is to develop catalysts for DME partial oxidation reactions and DME condensation reactions. During the April-June quarter (04-06/99) the first in-situ formaldehyde generation from DME and condensation with methyl propionate is demonstrated and the results are summarized. The supported niobium catalyst shows better condensation activity, but supported tungsten catalyst has higher formaldehyde selectivity. The project team has also completed a 200-hour long term test of PA-HCHO condensation over 30% Nb(sub 2)O(sub 5)/SiO(sub 2). Three activity cycles and two regeneration cycles were carried out. 30% Nb(sub 2)O(sub 5)/SiO(sub 2) showed similar MAA yields as 10% Nb(sub 2)O(sub 5)/SiO(sub 2) at 300 C. However, the deactivation appears to be slower with 30% Nb(sub 2)O(sub 5)/SiO(sub 2) than 10% Nb(sub 2)O(sub 5)/SiO(sub 2). A detailed economic analysis of PA-HCHO condensation process for a 250 million lb/yr MMA plant is currently studied by Bechtel. Using the Amoco data-based azeotropic distillation model as the basis, an ASPEN flow sheet model was constructed to simulate the formaldehyde and propionic acid condensation processing section based on RTI's design data. The RTI MAA effluent azeotropic distillation column was found to be much more difficult to converge. The presence of non-condensible gases along with the byproduct DEK (both of which were not presented in Amoco's data) appear to be the culprits.

NTIS

Synthetic Fuels ; Coal Derived Gases ; Methyl Compounds ; Chemical Reactions

20020010957 Federal Energy Technology Center , Morgantown, WV USA

Alternative fuels and chemicals from synthesis gas

Jul. 01, 1999 ; 6p ; In English

Report No.(s): DE2001-780894 ; DE-FC22-95PC93052-40 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's (Department of Energy) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.

NTIS

Slurries ; Synthetic Fuels ; Clean Fuels ; Energy Technology ; Energy Conversion

20020010958 Federal Energy Technology Center , Morgantown, WV USA
Alternative fuels and chemicals from synthesis gas
Jan. 01, 1998 ; 12p ; In English
Report No.(s): DE2001-780893 ; DE-FC22-95PC93052-38 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's (Department of Energy) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Clean Fuels ; Synthetic Fuels ; Energy Technology ; Energy Conversion ; Slurries

20020010959 Federal Energy Technology Center , Morgantown, WV USA
Alternative fuels and chemicals from synthesis gas
Apr. 01, 1999 ; 28p ; In English
Report No.(s): DE2001-780892 ; DE-FC22-95PC93052-37 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's (Department of Energy) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Clean Fuels ; Synthetic Fuels ; Slurries ; Energy Conversion ; Energy Technology

20020010960 Federal Energy Technology Center , Morgantown, WV USA
Alternative fuels and chemicals from synthesis gas
Jan. 01, 1999 ; 23p ; In English
Report No.(s): DE2001-780891 ; DE-FC22-95PC93052-31 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's (Department of Energy) LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuels from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Clean Fuels ; Synthetic Fuels ; Energy Conversion ; Energy Technology ; Slurries

20020011013 Defence Science and Technology Organisation , Airframes and Engines Div. , Fishermans Bend, Australia
AMRL Evaluation of the JP-8+100 Jet Fuel Thermal Stability Additive
Rawson, Paul , Defence Science and Technology Organisation , Australia ; April 2001 ; 32p ; In English ; Original contains color illustrations
Report No.(s): DSTO-TR-1135 ; DODA-AR-011-841 ; Copyright ; Avail: Issuing Activity
An additive package designed to improve thermal stability of jet fuel by 100 F (approximately 38 C), known as the '+100 additive' or more commonly as the USAF (USA Air Force)-developed JP8+100 thermal stability additive, was evaluated to investigate its efficacy in reduction of thermal deposits formed in aircraft fuel systems. The additive was claimed to reduce deposits generated on fuel-wetted metal surfaces by up to 90%. An AED (Airframes and Engines Division)-designed rig capable of quantitatively evaluating jet fuel thermal stability was used to investigate jet fuels produced by different Australian refineries with various fuel finishing processes. The additive's effect on deposit formation from these fuels was investigated over a range of temperatures and fuel flow conditions giving both total deposit formation data and profiles of carbon and sulphur deposition on heat stressed, fuel wetted steel tubing. This fuel additive is to be introduced into RAAF (Royal Australian Air Force) aircraft fuel systems that may have substantial levels of existing thermal deposit. An important consideration was thus the additive's ability to clean dirty fuel wetted surfaces and the possibility of 'clumps' of deposit being washed into the fuel system. Levels of filterable

deposit washed from a predeposited test section were monitored and the deposit levels were found to fall below levels generated in nonadditized fuel. The +100 additive was found to substantially reduce the levels of carbonaceous deposit formed on hot metal fuel wetted surfaces and performed as claimed in its ability to clean pre-deposited fuel wetted metal surfaces.
Author
Additives ; Aircraft Fuel Systems ; Fuel Flow ; Deposits ; Jet Engine Fuels

20020011161 National Defence Research Establishment , Avd. foer Vapen och Skydd , Tumba, Sweden
A Reaction-rate Model for Ammoniumdinitramide ***Framtagning av Brinnmodell foer Ammoniumdinitramid***
Helte, A. ; Edvinsson, H. ; Hahma, A. ; March 2001 ; 24p ; In Swedish
Report No.(s): PB2001-107734 ; FOI-R-0071-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
Ammoniumdinitramide, A-D-N, is a high explosive with interesting properties such as an excess of oxygen. This makes it interesting for underwater applications. by mixing A-D-N with aluminium, the aluminium is combusted with the help of the excess oxygen. The composition is castable, which is also important for these applications. This report describes experimental work that has been performed in order to retrieve data for a reaction-rate model according to Lee-Tarver. This model can then be used to studying the sensitivity for mechanical impacts and designing booster charges among many things. In this first part data for pure A-D-N has been removed.
NTIS
Aluminum ; Reaction Kinetics ; Explosives

20020011177 Department of Energy , Operations Office , Richland, WA USA
Single shell tank sluicing history and failure frequency
Hertzel, J. S. ; Nov. 10, 1998 ; 152p ; In English
Report No.(s): DE2001-11238 ; HNF-3018-Rev-0 ; No Copyright ; Avail: Department of Energy Information Bridge
This document assesses the potential for failure of the single-shell tanks (SSTs) that are presumably sound and helps to establish the retrieval priorities for these and the assumed leakers. Furthermore, this report examines probabilities of SST failure as a function of age and operational history, and provides a simple statistical summary of historical leak volumes, leak rates, and corrosion factor.
NTIS
Leakage ; Storage Tanks

20020011218 Lawrence Livermore National Lab. , Livermore, CA USA
Laser impingement on bare and encased high explosives: safety limits
Roeske, F. ; Mar. 15, 1999 ; 16p ; In English
Report No.(s): DE2001-9663 ; UCRL-JC-132108 ; DP0102032 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
During the course of experiments involving high explosives, (HE), alignment lasers are often employed where the laser beam impinges upon a metal encased HE sample or on the bare HE itself during manned operations. While most alignment lasers are of low enough power so as not to be of concern, safety questions arise when considering the maximum credible power output of the laser in a failure mode, or when multiple laser spots are focused onto the experiment simultaneously. Safety questions also arise when the focused laser spot size becomes very small, on the order of 100 micrometers or less. This paper addresses these concerns by describing a methodology for determining safety margins for laser impingement on metal encased HE as well as one for bare HE. A variety of explosives encased in Al, Cu, Ta and stainless steel were tested using the first of these techniques. Additional experiments were performed using the second method where the laser beam was focused directly on eight different samples of pressed-powder HE.
NTIS
Explosives ; Impingement ; Lasers

20020011376 Bureau of Export Administration , Office of Strategic Industries and Economic Security , Washington, DC USA
National Security Assessment of the High Performance Explosive Components Industries
June 2001 ; 164p ; In English
Report No.(s): PB2001-108036 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
Manufacturers of high performance explosives (HPEs) and high performance explosive components (HPECs), whether US government-owned production operations or private companies, face a number of challenges in the years ahead. For the moment, the nation does not face a supply crisis in HPE and HPECs. But if the USA is to retain sufficient explosive production capacity

for the future, greater thought must be given in the next few years on how to maintain infrastructure in terms of manufacturing facilities, trained personnel, and research and development. The study examines these matters and other factors affecting the HPE and HPEC industry. The recent history of the industry as well as future needs are covered in the report, which looks at a range of issues, including: shipments in units and dollars; employment; investment in operations; financial performance; research and development; comparison of US and selected foreign manufacturers of HPEs/HPECs; and competitive assessment of US respondents.
NTIS
Explosives ; Government Procurement ; Industries

20020011599 National Defence Research Establishment , Avedelningen foer NBC Skydd , Umea, Sweden
Blast Guard and a 'Terrorist Bomb' with Mustard Gas ***Blast guard och en Terroristladdning med Senapsgas***
Claesson, O. ; Jansson, A. ; Lindberg, G. ; Renstroem, G. ; Nov. 2000 ; 34p ; In Swedish
Report No.(s): PB2001-108152 ; FOA-R-00-01663-862-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
Blast Guard, by Irvin Aerospace Canada Ltd., is a complete system for the destruction of unexploded ammunitions that can, but does not have to, included chemical warfare agents. The system has been purchased by the National NBC Defense Centre (SkyddC). In order to test the function of the system and its effectiveness in the destruction of CWA SkyddC in collaboration with the Defense Research Establishment, Division of NBC Defense, exploded a 'terrorist bomb' under the protection of the Blast Guard system. The 'terrorist bomb' consisted of 400 ml mustard gas in a stainless steel thermos and an elongated explosive charge of 60 grams of Semtex. The bomb was put on the ground, and a Blast Guard tent of the largest model complemented with one outer layer of shrapnel protection cloth was erected over it. The foam was mixed according to the 'Decon Blast Foam' formula that is with 1,5% emulgator and 3,0% decontaminant. For the detection of chemical warfare agents, eight CAM, one AP2C and indicator paper 104 were used. Additional samples of water, air and soil related to the tent and test, as well as from the inside wall of the tent, were taken for analysis with gas chromotography and mass spectrometry.
NTIS
Decontamination ; Mass Spectroscopy ; Stainless Steels

20020011706 Research Inst. of National Defence , Tumba, Sweden
Increasing the Tensile Strength of HTPB with Different Isocyanates and Chain Extenders. Scientific Report
Wingborg, N. , Research Inst. of National Defence , Sweden ; December 2000 ; 22p ; In English
Report No.(s): PB2001-108433 ; FOA-R-00-01730-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The influence of the diols 1,4-butanediol, BDO, and 1,4-cyclohexane dimenthanol, CHDM, on the mechanical properties of HTPB, cured with the diisocyanates, IPDI, HDI and H12MDI, was investigated. The highest tensile strength was obtained by using H12MDI and BDO. When adding the diols the tensile strength increases strongly up to two moles of diols per mole HTPB. Above that point the effect is moderate. The ultimate elongation of the materials has a maximum between one and two moles of diols per mole HTPB. If more than one mole diol per mole HTPB is added, all the examined materials begin to strain the crystallize and the initial modulus of elasticity increase linearly with increasing amounts of diol.
NTIS
Diisocyanates ; HTPB Propellants ; Mechanical Properties ; Solid Rocket Binders

20020011709 Research Inst. of National Defence , Avd. foer Vapen och Skydd , Tumba, Sweden
Chemical Conversion of FOX-7. Reduction of FOX-7 ***Kemisk Omvandling av FOX-7. 2. Reducering av FOX-7***
Bellamy, A. , Research Inst. of National Defence , Sweden ; December 2000 ; 18p ; In Swedish
Report No.(s): PB2001-108439 ; FOA-R-00-01728-310-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
To prepare 1,1,2,2-tetraaminoethane (or a derivative thereof), FOX-7 has been reduced under conditions which normally reduce double bonds and nitro groups. The reactions that took place indicate that the double bond and the nitro groups were reduced. The products that have been identified are derivatives of ammonia like acetamide and ammonium salts. This indicates that the structure is broken down during the reaction and means that a saturated carbon atom carrying two free amino groups isn't stable.
NTIS
Explosives ; Reduction (Chemistry) ; Hydrogenation

20020011740 Environmental Protection Agency , National Risk Management Research Lab. , Research Triangle Park, NC USA
Environmental Impacts of the Use of Orimulsion(Trade Name). Report to Congress on Phase 1 of the Orimulsion(Trade Name) Technology Assessment Program , Volume 1 , Executive Summary, Basic Report and Appendix A
Miller, C. A. ; Dreher, K. ; Wentsell, R. ; Nadeau, R. J. ; July 2001 ; 194p ; In English
Report No.(s): PB2001-109039 ; EPA/600/R-01/056A ; No Copyright ; Avail: National Technical Information Service (NTIS)

The report gives results of an evaluation of Orimulsioni, a bitumen-in-water emulsion produced in Venezuela, to provide a better understanding of the potential environmental impacts associated with its use as a fuel. Pilot-scale tests were conducted at EPA's Environmental Research Center in Research Triangle Park in North Carolina, to provide data on emissions of air pollutants from the combustion of Orimulsion 100 (the original formulation), Orimulsion 400 (a new formulation introduced in 1998), and No. 6 (residual) fuel oil, commonly used in the U.S. These results, and those of full-scale tests reported in the technical literature, were evaluated to determine the potential air pollutant emissions and the ability of commercially available pollution control technologies to adequately reduce those emissions. Results indicate that carbon monoxide, nitrogen oxide, and particulate matter (PM) emissions are likely to be nearly the same as those from No. 6 fuel oil.

NTIS
Bitumens ; Emulsions ; Technology Assessment ; Environmental Surveys ; Congressional Reports

20020011741 Environmental Protection Agency , National Risk Management Research Lab. , Research Triangle Park, NC USA
Environmental Impacts of the Use of Orimulsion(Trade Name). Report to Congress on Phase 1 of the Orimulsion(Trade Name) Technology Assessment Program , Volume 2 , Appendices B-H
Miller, C. A. ; Dreher, K. ; Wentsell, R. ; Nadeau, R. J. ; July 2001 ; 196p ; In English
Report No.(s): PB2001-109040 ; EPA/600/R-01/056B ; No Copyright ; Avail: National Technical Information Service (NTIS)

The report gives results of an evaluation of Orimulsioni, a bitumen-in-water emulsion produced in Venezuela, to provide a better understanding of the potential environmental impacts associated with its use as a fuel. Pilot-scale tests were conducted at EPA's Environmental Research Center in Research Triangle Park in North Carolina, to provide data on emissions of air pollutants from the combustion of Orimulsion 100 (the original formulation), Orimulsion 400 (a new formulation introduced in 1998), and No. 6 (residual) fuel oil, commonly used in the U.S. These results, and those of full-scale tests reported in the technical literature, were evaluated to determine the potential air pollutant emissions and the ability of commercially available pollution control technologies to adequately reduce those emissions. Results indicate that carbon monoxide, nitrogen oxide, and particulate matter (PM) emissions are likely to be nearly the same as those from No. 6 fuel oil.

NTIS
Congressional Reports ; Emulsions ; Technology Assessment ; Environmental Surveys ; Bitumens ; Fuel Oils

20020011744 Research Inst. of National Defence , Weapons and Protection Div. , Tumba, Sweden
Literature Survey of Intercalation in Graphite and Boron Nitride ***Litteraturstudie av Interkalering i Grafit och Bornitrid***
Bemm, E. ; December 2000 ; 20p ; In Swedish
Report No.(s): PB2002-100454 ; FOA-R-00-01642-310-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

In an article of R.D. Bardo (J. de Phys. IV (1995) C4-561), an explosive with a lower sensitivity than TATB and an energy content of 6.57 MJ/kg, is suggested to be formed when HNO3 is intercalated in hexagonal boron nitride. No description of how to prepare the compound is however included in the article but it is possible that a method for intercalation of HNO3 into graphite also is applicable on intercalation in boron nitride. Extended studies of a considerable amount of different intercalation reactions in graphite have been performed and published and there also exist a number of articles regarding intercalation of reactions in graphite have been performed and published and there also exist a number of articles regarding intercalation of HNO3. This report gives a general introduction into intercalation chemistry applied on intercalation in graphite and boron nitride plus an overview of published studies on intercalation in these compounds.

NTIS
Boron Nitrides ; Graphite ; Intercalation ; Explosives ; Surveys

20020012240 Department of Energy , Richland Operations Office , Richland, WA USA
Chromium Groundwater Plume West of the 100-D/DR Reactors: Summary and Fiscal Year 1999 Update
Rohay, V. J. ; Sep. 22, 1999 ; 66p ; In English
Report No.(s): DE2001-13415 ; BHI-01309-REV-0 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

High concentrations of chromium have been identified west of the 100-D/DR Reactors in the groundwater and in the porewater below the Columbia River. This ”hot spot” of chromium contamination contains the highest known concentrations of chromium currently in groundwater on the Hanford Site. The contaminated groundwater and porewater are discharging into the Columbia River, where they may pose a risk to aquatic receptors. The purpose of this report is to provide: (1) a summary of previous investigations describing the extent and source of the plume; (2) the analytical results of groundwater samples collected from the 12 FY 1999 wells; (3) a conceptual model of the geology, general hydrology, and chromium plume in the area west of the 100-D/DR Reactors; and (4) recommendations for future investigations, data collection, and groundwater sampling.
NTIS
Ground Water ; Plumes ; Sampling ; Chromium

20020012536 NASA Glenn Research Center , Cleveland, OH USA
Testing of Densified Liquid Hydrogen Stratification in a Scale Model Propellant Tank
Jurns, John M. , DYNACS Engineering Co., Inc. , USA ; Tomsik, Thomas M. , NASA Glenn Research Center , USA ; Greene, William D. , Lockheed Martin Michoud Space Systems , USA ; September 2001 ; 16p ; In English ; 1999 Cryogenic Engineering and International Cryogenic Materials Conference , 12-16 Jul. 1999 , Montreal, Quebec , Canada
Contract(s)/Grant(s): RTOP 721-20-00
Report No.(s): NASA/TM-2001-209391 ; NAS 1.15:209391 ; E-11820 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This paper describes a test program that was conducted at NASA to demonstrate the ability to load densified LH2 into a subscale propellant tank. This work was done through a collaborative effort between NASA Glenn Research Center and the Lockheed Martin Michoud Space Systems (LMMSS). The Multilobe tank, which was made from composite materials similar to that to be used on X-33, was formed from two lobes with a center septum. Test results are shown for data that was collected on filling the subscale tank with densified liquid hydrogen (DLH2) propellant that was produced at the NASA Plum Brook Station. Data is compared to analytical predictions. Data collected for this test series agrees well with analytical predictions of the environmental heat leak into the tank and the thermal stratification characteristics of the hydrogen propellant in the tank as it was filled with DLH2.
Author
Liquid Hydrogen ; Propellant Tanks ; Scale Models ; Stratification ; Cryogenic Fluid Storage ; Performance Tests

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20020006939 NASA Glenn Research Center , Cleveland, OH USA
Nonlinear Dynamics of a Diffusing Interface
Duval, Walter M. B. , NASA Glenn Research Center , USA ; November 2001 ; 18p ; In English ; 39th ; 39th Aerospace Sciences Meeting and Exhibit , 8-11 January 2001 , Reno, NV , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA
Contract(s)/Grant(s): RTOP 101-53-00
Report No.(s): NASA/TM-2001-210956 ; E-12810 ; AIAA Paper 2001-1134 ; NAS 1.15:210956 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Excitation of two miscible-viscous liquids inside a bounded enclosure in a microgravity environment has shown the evolution of quasi-stationary waves of various modes for a range of parameters. We examine computationally the nonlinear dynamics of the system as the interface breakup and bifurcates to resonance structures typified by the Rayleigh-Taylor instability mechanism. Results show that when the mean steady field is much smaller than the amplitude of the sinusoidal excitation, the system behaves linearly, and growth of quasi-stationary waves occurs through the Kelvin-Helmholtz instability mechanism. However, as the amplitude of excitation increases, nonlinearity occurs through subharmonic bifurcation prior to broadband chaos.
Author
Nonlinear Systems ; Dynamical Systems ; Liquid-Liquid Interfaces ; Flow Distribution ; Sine Waves

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20020005964 Federal Energy Technology Center , Morgantown, WV USA
Innovative hybrid gas/electric chiller cogeneration
Nowakowski, G. ; Apr. 01, 2000 ; 14p ; In English
Contract(s)/Grant(s): FC26-99FT40641
Report No.(s): DE2001-774502 ; DE-FC26-99FT40641-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

January Progress--A kick-off meeting was held in San Diego with Alturdyne on January 21st. The proposed hybrid gas/electric chiller/cogenerator design concept was discussed in detail. The requirements and functionality of the key component, a variable speed, constant frequency motor/generator was presented. Variations of the proposed design were also discussed based on their technical feasibility, cost and market potential. The discussion is documented in a Trip Report. February Progress--After significant GRI/Alturdyne discussion regarding alternative product design concepts, the team made a decision to continue with the proposed product design, a hybrid chiller capable of also providing emergency power. The primary benefits are: (a) the flexibility and operating cost savings associated with the product's dual fuel capability and (b) the emergency power feature. A variable speed, constant frequency motor/generator would significantly increase the cost of the product while providing marginal benefit. (The variable speed, constant frequency motor generator is estimated to cost $25,000 versus $4,000 for a constant speed version). In addition, the interconnection requirements to the electric grid would significantly limit market penetration of the product. We will proceed with a motor/generator design capable of serving as the electric prime mover for the compressor as well as the generator for emergency power needs. This component design is being discussed with two motor manufacturers. The first generation motor/generator will not be a variable speed, constant frequency design. The variable speed, constant frequency capability can be an advancement that is included at a later time. The induction motor/synchronous generator starts as a wound rotor motor with a brushless exciter and control electronics to switch between induction mode and synchronous mode. The exciter is a three-phase exciter with three phase rotating diode assembly. In the induction motor mode, the field windings are shorted out by SCRs located across the field. In the synchronous mode, a small ct on one of the exciter leads would power the rotating exciter electronics. Upon sensing exciter current, the electronics would automatically open the SCRs allowing synchronous operation. Quotes will be obtained from American Motor and Reuland, two motor/generator vendors. March Progress--A product layout was completed. The width is reduced significantly from the original hybrid design because the evaporator and condenser tube in shell heat exchangers are located below the engine/motor/compressor drive-line. Alturdyne is searching for a consultant to perform a drive-line torsional analysis. This analysis is necessary to ensure that the drive-line is not subject to undue vibrations operating through its entire speed range. Much effort was directed toward motor/generator selection. A decision was made to use Reuland Electric. A motor with double-end shafts will be purchased. The design effort which will be completed at Alturdyne will involve the modification of the wound rotor motor to also provide synchronous power. Work has been completed on developing the new controller which will be utilized for the original hybrid product as well as this advanced product. Work continues toward developing a manufacturing cost estimate. A detailed bill of material will be developed for the product. Key components include the engine, compressor and motor/generator.

NTIS
Cogeneration ; Cooling Systems ; Refrigerating Machinery

20020006106 Federal Energy Technology Center , Morgantown, WV USA
Tarzan: a remote tool deployment system for the west valley development project
Thompson, B. R. ; Veri, J. ; Sep. 30, 1999 ; 26p ; In English
Report No.(s): DE2001-772472 ; DE-AR21-98FT40410-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

RedZone Robotics, Inc. undertook a development project to build Tarzan, a Remote Tool Delivery system to work inside nuclear waste storage tanks 8D-1 and 8D-2 at the West Valley Demonstration Project (WVDP). The removal of waste deposits from large storage tanks poses significant challenges during tank operations and closure. Limited access, the presence of chemical, radiological, and/or explosive hazards, and the need to deliver retrieval equipment to all regions of the tank exceed the capabilities of most conventional methods and equipment. Remotely operated devices for mobilizing and retrieving waste materials are needed. Some recent developments have been made in this area. However, none of these developments completely and cost-effectively address tanks that are congested with internal structures (e.g., support columns, cooling coils, fixed piping, etc.).

The Tarzan system consists of the following parts: Locomotor which is deployed in the tank for inspection and cleanup; Hydraulic power unit providing system power for the locomotor and deployment unit; and control system providing the man machine interface to control, coordinate and monitor the system. This document presents the final report on the Tarzan project.
NTIS
Remote Control ; Remote Handling ; Radioactive Wastes

20020006135 Federal Energy Technology Center , Morgantown, WV USA
Innovative Hybrid Gas/Electric Chiller Cogeneration ***Quarterly Report , April - June, 2000***
Nowakowski, G. ; Jul. 01, 2000 ; 29p ; In English
Contract(s)/Grant(s): FC26-99FT40641
Report No.(s): DE2001-774503 ; DE-FC26-99FT40641-02 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A meeting was held at Alturdyne's facility in San Diego to discuss project progress. Cliff Carpenter, the NETL Program Manager, attended the meeting. As a result of the meeting, several decisions were made: (1) A General Motors engine would be specified as the prime mover; (2) A Carrier reciprocating compressor would be specified, however a Hitachi screw compressor with an integral oil sump was an interesting candidate if it was available in the right size and for the right price; (3) The motor/generator would provide two functions: as an induction motor and as a synchronous generator. The variable speed, constant frequency feature will not be included in the first generation product; and (4) The refrigerant will be R134-A.
NTIS
Cogeneration ; Cooling Systems ; Refrigerating Machinery

20020006144 Kansas City Plant , Kansas City, MO USA
Mass Sensor
Adams, B. E. ; Jan. 18, 2001 ; 6p ; In English
Report No.(s): DE2001-773361 ; KCP-613-6363 ; CRADA-98KCP1070 ; No Copyright ; Avail: Department of Energy Information Bridge

The purpose of this CRADA was to use Honeywell's experience in low temperature cofire ceramics and traditional ceramics to assemble a relatively low-cost, mass-producible miniature mass analyzer. The specific design, given to us by Mass Sensors, LLC, was used to test for helium. The direct benefit for the participant was to have a prototype unit assembled for the purpose of proof of concept and the ability to secure venture capital investors. From that, the company would begin producing their own product for sale. The consumer/taxpayer benefits come from the wide variety of industries that can utilize this technology to improve quality of life. Medical industry can use this technology to improve diagnostic ability; manufacturing industry can use it for improved air, water, and soil monitoring to minimize pollution; and the law enforcement community can use this technology for identification of substances. These are just a few examples of the benefit of this technology. The benefits to DOE were in the area of process improvement for cofire and ceramic materials. From this project we demonstrated nonlinear thick film fine lines and spaces that were 5-mil wide with 5-mil spaces; determined height-to diameter-ratios for punched and filled via holes; demonstrated the ability to punch and fill 5-mil microvias; developed and demonstrated the capability to laser cut difficult geometries in 40-mil ceramic; developed and demonstrated coupling LTCC with standard alumina and achieving hermetic seals; developed and demonstrated three-dimensional electronic packaging concepts; and demonstrated printing variable resistors within 1% of the nominal value and within a tightly defined ratio. The capability of this device makes it invaluable for many industries. The device could be used to monitor air samples around manufacturing plants. It also could be used for monitoring automobile exhaust, for doing blood gas analysis, for sampling gases being emitted by volcanoes, for studying activities of insects, and many other things. The ultimate goal was to build two iterations of the mass sensor. However, due to technical difficulties, only one iteration of the device was manufactured. Initial work to optimize the ion source and build a small ion pump was not successful. Consequently, the ion pump was not incorporated into the analyzer design. Mass Sensors, LLC, is still testing the analyzers that were assembled.
NTIS
Mass Spectrometers ; Ceramics ; Miniaturization ; Fabrication ; Low Temperature

20020006243 Federal Energy Technology Center , Morgantown, WV USA
Hemispheric center for environmental technology. Monthly Progress Report, October 1999
Ebadian, M. A. ; Oct. 31, 1999 ; 89p ; In English
Report No.(s): DE2001-772525 ; DE-FG01-95EW55094-73 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Deactivation and Decommissioning (D&D) Technology Assessment Program (TAP) was developed to provide detailed, comparable data for environmental technologies and to disseminate this data to D&D professionals in a manner that will facilitate the review and selection of technologies to perform decontamination and decommissioning. The objectives for this project include the following: Determine technology needs through review of the Site Technology Coordination Group (STCG) information and other applicable websites and needs databases; Perform a detailed review of industries that perform similar activities as those required in D&D operations to identify additional technologies; Define the technology assessment program for characterization and waste management problem sets; Define the data management program for characterization, dismantlement, and waste management problem sets; Evaluate baseline and innovative technologies under standard test conditions at Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) and other locations and collect data in the areas of performance, cost, health and safety, operations and maintenance, and primary and secondary waste generation; Continue to locate, verify, and incorporate technology performance data from other sources into the multimedia information system; and Develop the conceptual design for a dismantlement technology decision analysis tool for dismantlement technologies.

NTIS

Decommissioning ; Decontamination ; Decision Theory ; Data Management

20020007096 Kansas City Plant , Kansas City, MO USA

On-Machine Acceptance

Arnold, K. F. ; Feb. 14, 2000 ; 6p ; In English

Report No.(s): DE2001-751193 ; KCP-613-6288 ; CRADA-99KCP1079 ; No Copyright ; Avail: Department of Energy Information Bridge

Probing processes are used intermittently and not effectively as an on-line measurement device. This project was needed to evolve machine probing from merely a setup aid to an on-the-machine inspection system. Use of probing for on-machine inspection would significantly decrease cycle time by elimination of the need for first-piece inspection (at a remote location). Federal Manufacturing and Technologies (FM and T) had the manufacturing facility and the ability to integrate the system into production. The Contractor had a system that could optimize the machine tool to compensate for thermal growth and related error.

NTIS

Machine Tools ; Manufacturing ; On-Line Systems ; Efficiency

20020009000 Naval Research Lab. , Washington, DC USA

The Shock and Vibration Bulletin. Bulletin 35 , 6 of 7

Apr. 1966 ; 377p ; In English ; Presented at the Symposium on Shock, Vibration and Associated Environments (35th), New Orleans, LA, 25-28 Oct. 1968

Report No.(s): AD-A395946 ; BULL-35-PT-6 ; No Copyright ; Avail: CASI ; A17 , Hardcopy ; A03 , Microfiche

Many items of equipment in a variety of vehicles are subjected to both shock and short (nonstationary) bursts of random excitation. It is common practice to analyze these latter events as though they were stationary and measure their severity in terms of spectral density of acceleration. The errors involved and difficulties of doing this are reviewed. Actually, short bursts of random vibration are similar to random shocks, particularly when the failure, if any, is due to the single highest peak (SHP) of the response, rather than to fatigue. The importance of the SHP as a measure of damage is also discussed. When it is the correct damage criterion, we should attempt to control it and not spectral density. Since the SHP is a random variable, we cannot control it using random excitation, but we can with shock tests. For systems with a single degree of freedom, or those whose sensitivity to damage is known to be confined to a narrow frequency band, the solution is simple, once the statistical distribution of the SHP is known. Available experimental and theoretical data are reviewed. Using the prescribed percentile of the SHP distribution, the shock test as severe as the random excitation is derived. In certain cases, when both stationary random and shock tests are prescribed, the former can be eliminated by deriving a shock test whose highest response peaks at each frequency envelop those of both original tests. The Situation with multidegree of freedom systems is shown to be significantly more difficult and not amenable to one method of solution. A technique is introduced for extending the results to these situations. Preliminary results obtained on a analog computer for the two degree of freedom system are presented to illustrate certain trends.

DTIC

Random Vibration ; Shock Tests ; Aircraft Equipment ; Statistical Distributions ; Fatigue (Materials)

20020009156 Army Armament Research, Development and Engineering Center , Rock Island, IL USA

A Business Case for Modeling and Simulation

Carter, John R., III ; September 2001 ; 43p ; In English ; Original contains color images

Report No.(s): AD-A395650 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Simulation, once the rarefied domain of engineers, is increasingly subject to scrutiny and management. Once considered something of an oracle, it is now business as usual for many managers. As such, it must compete favorably for attention and funding with the very endproducts whose development it facilitates. In a world of product development increasingly dominated by business school and marketing managers, we must be able to articulate the quantifiable benefits of our efforts in both magnitude and duration. This report presents a checklist for Return On Investment (ROI) in four classes of simulation: Constructive, Virtual, Live, and Smart. Each is distinguished by its degree of simulation (versus real) of equipment (end products), people (end users), and the end-user/product environment. by establishing clear, reasonable expectations for ROI in simulation across the spectrum of modeling and simulation disciplines, and throughout the product life span we establish baseline cost estimation methods that can survive internal and external economic competition.

DTIC

Simulation ; Models ; Cost Analysis

20020009571 National Chin-Yi Inst. of Tech. , Dept. of Industrial Engineering and Management , Taichung, Taiwan, Province of China

Capability Indices for Processes with Asymmetric Tolerances

Chen, Kuen-Suan , National Chin-Yi Inst. of Tech. , Taiwan, Province of China ; Pearn, Wen-Lee , National Chin-Yi Inst. of Tech. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 559-568 ; In English

Contract(s)/Grant(s): NSC-89-2213-E-167-004 ; Copyright ; Avail: Issuing Activity

Process capability indices (PCIs) for processes with symmetric tolerances have received substantial research attention. But. PCIs for processes with asymmetric tolerances have been comparatively neglected. Recently, Boyles (1994) reviewed the existing PCI literature and proposed several new indices to handle processes with asymmetric tolerances. In this paper we analyze PCIs based on various process characteristics, then introduce a new class of capability indices to handle processes with asymmetric tolerances. The proposed new indices are compared with existing PCIs in terms of process yield, process centering, and process characteristic related to loss functions. The results indicate that the new indices are superior to the existing capability indices, and provide greater accuracy in current applications using PCIs to measure process potential and performance.

Author

Asymmetry ; Tolerances (Mechanics) ; Production Engineering

20020010166 National Renewable Energy Lab. , Golden, CO USA

Fresh Way to Cut Combustion, Crop and Air Heating Costs Avoids Million BTU Purchases: Inventions and Innovation Combustion Success Story

Wogsland, J. ; Jan. 17, 2001 ; 2p ; In English

Report No.(s): DE2001-781633 ; DOE/GO-102001-0874 ; NREL/FS-810-26748 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Success story written for the Inventions and Innovation Program about a new space heating method that uses solar energy to heat incoming combustion, crop, and ventilation air.

NTIS

Space Heating (Buildings) ; Inventions ; Solar Energy Conversion

20020010210 National Renewable Energy Lab. , Golden, CO USA

Low-Cost Synthesis and Consolidation of Titanium Carbide: Inventions and Innovation Industrial Materials for the Future Project Fact Sheet

Wogsland, J. ; Jan. 25, 2001 ; 2p ; In English

Report No.(s): DE2001-781707 ; DOE/GO-102001-1021 ; NREL/FS-810-28245 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Project fact sheet written for the Inventions and Innovation Program about a new mechanochemical process that delivers titanium-carbide powder for cutting-tool fabrication.

NTIS

Titanium Carbides ; Cutters

20020010269 Naval Aerospace Medical Research Lab. , Pensacola, FL USA

Structural Considerations of the Human Vertebral Column Under +G(z) Impact Acceleration

Ewing, Channing L. ; King, Albert I. ; Prasad, Priyaranjan ; Mar. 20, 1973 ; 13p ; In English

Contract(s)/Grant(s): N00014-69-A-0235

Report No.(s): AD-A396194 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Among the major limitations on manned aerospace vehicular-and escape system designs are the structural limits of the human body. One of the lower limits is the strength of the vertebral body under +G (eyeballs down) impact acceleration. When the vertebral column is considered as a structural member, a finite limit on nonfracturing accelerations can be specified, as has previously been the case. An hypothesis as to the mechanism of fracture, which suggests an approach capable of raising the limit, and experimental evidence in support of the hypothesis are presented. A crude device based upon the approach was designed and tested experimentally on cadaveric exposures to +G acceleration. A statistically significant increase in the level of acceleration required to cause fracture was measured.

DTIC

Human Body ; Impact Acceleration ; Spine

20020010375 Sandia National Labs. , Albuquerque, NM USA

Assessment of Solder Interconnect Integrity in Dismantled Electronic Components from N57 and B61 Tube-Type Radars

Rejent, J. A. ; Vianco, P. T. ; Woodrum, R. A. ; Jul. 01, 1999 ; 110p ; In English

Report No.(s): DE2001-9721 ; SAND99-0884 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Aging analyses were performed on solder joints from two radar units: (1) a laboratory, N57 tube-type radar unit and (2) a field-returned, B61-0, tube-type radar unit. The cumulative temperature environments experienced by the units during aging were calculated from the intermetallic compound layer thickness and the mean Pb-rich phase particle size metrics for solder joints in the units, assuming an aging time of 35 years for both radars. Baseline aging metrics were obtained from a laboratory test vehicle assembled at AS/FM and T; the aging kinetics of both metrics were calculated from isothermal aging experiments. The N57 radar unit interconnect board solder joints exhibited very little aging. The eyelet solder joints did show cracking that most likely occurred at the time of assembly. The eyelet, SA1126 connector solder joints, showed some delamination between the Cu pad and underlying laminate. The B61 field-returned radar solder joints showed a nominal degree of aging. Cracking of the eyelet solder joints was observed. The Pb-rich phase particle measurements indicated additional aging of the interconnects as a result of residual stresses. Cracking of the terminal pole connector, pin-to-pin solder joint was observed; but it was not believed to jeopardize the electrical functionality of the interconnect. Extending the stockpile lifetime of the B61 tube-type radar by an additional 20 years would not be impacted by the reliability of the solder joints with respect to further growth of the intermetallic compound layer. Additional coarsening of the Pb-rich phase will increase the joints' sensitivity to thermomechanical fatigue.

NTIS

Radar ; Soldered Joints ; Aging (Materials) ; Isothermal Processes

20020011166 National Defence Research Establishment , Avd. foer Vapen och Skydd , Tumba, Sweden

Travel Report: the DYMAT Conference in Krakow 25-29/9 2000 ***Reserapport-DYMAT-Konferensen i Krakow 25-29/9 2000***

Nilsson, M. ; December 2000 ; 24p ; In Swedish

Report No.(s): PB2001-108209 ; FOA-R-00-1803-310-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

The author has visited the DYMAT (European association for the promotion of research into the dynamic behavior of materials and its applications) conference 2000 in Krakow, Poland. The report consists of a brief description of some of the most interesting contributions to the conference. The conference had sessions about constitutive equations, forming and cutting of metals, experimental methods, material properties, numerical simulation of high strain rate phenomena. After visiting the conference it was possible to see some overall trends: the use of simple, repeatable and cheap test methods for verifying numerical simulations; advanced Hopkinson bar equipment for specialized applications; better methods for measuring Hopkinson bar experiments; the great significance of proper material models and proper input to the material models.

NTIS

Conferences ; Materials Science

20020011170 Microelectronics and Computer Technology Corp. , Austin, TX USA

Alternative Technologies for Making Holes Conductive: Cleaner Technologies for Printed Wiring Board Manufacturers

2001 ; 50p ; In English

Report No.(s): PB2001-108362 ; No Copyright ; Avail: National Technical Information Service (NTIS)

Printed wiring boards (PWBs) are an intrinsic part of many products in the electronics, defense, communication, and automotive industries. The traditional manufacture of PWBs requires materials and technologies that raise a number of environmental and human health concerns. Specifically, wet chemical processes such as those used in PWB fabrication are a significant source of hazardous waste and consume large amounts of water and energy. Alternative technologies are available to accomplish the making holes conductive (MHC) function; most of them eliminate the use of formaldehyde, reduce water and energy use, and generate less waste. The potential environmental and cost advantages of the alternatives are beginning to become apparent and have generated strong interest on the part of industry. to date, however, reliable data comparing these alternative technologies have not been available. To address this data gap, the U.S. Environmental Protection Agency (EPA) teamed up with industry experts in the Design for the Environment (DFE) PWB Project. The project team performed a comparative evaluation of seven different MHC technologies. The analysis focused on evaluating human health and environmental risk, performance, and cost. The technologies evaluated were: electroless copper, carbon, conductive polymer, graphite, non-formaldehyde electroless copper, organic-palladium, and tin-palladium.
NTIS
Pollution Control ; Public Health ; Manufacturing ; Printed Circuits ; Electrical Properties

20020011171 CAI Resources, Inc. , Oakton, VA USA
Printed Wiring Board Pollution Prevention and Control Technology: Analysis of Updated Survey Results
2001 ; 142p ; In English
Report No.(s): PB2001-108364 ; No Copyright ; Avail: National Technical Information Service (NTIS)
The report presents results of a pollution prevention (P2) and control survey for printed wiring board (PWB) manufacturers and related information from literature and other sources. The pollution prevention and control survey was performed to gather and organize information about the current state of environmental technology and practices for this industry segment. The focus of the survey was on determining the types of technologies and alternative processes used, the extent of their use, key factors with regard to implementation, including costs, and their success and failure rate. Pollution prevention and control technologies covered by the survey include substitute raw materials and manufacturing processes, reuse and recycle technologies, procedural changes, and innovative treatment/disposal methods that reduce chemical use or water use and/or prevent the production of hazardous waste material and its release to the air, water, or land. The survey results are useful to all those associated with the PWB manufacturing industry. PWB manufacturers can use the results of the survey to compare their own manufacturing operations to those of the survey respondents.
NTIS
Printed Circuits ; Environment Protection ; Surveys ; Prevention ; Manufacturing ; Pollution Control

20020011172 Environmental Protection Agency , Design for the Environment Branch , Washington, DC USA
Printed Wiring Board Cleaner Technologies Substitutes Assessment: Making Holes Conductive , Volume 1 , Design for the Environment Printed Wiring Board Project
Kincaid, L. E. ; Geibig, J. R. ; August 1998 ; 432p ; In English
Report No.(s): PB2001-108366 ; EPA/744/R-98/004A ; No Copyright ; Avail: National Technical Information Service (NTIS)
The document is a technical document that presents comparative risk, competitiveness, and resource requirements information on seven technologies for performing the 'making holes conductive' (MHC) function during printed wiring board (PWB) manufacturing. MHC technologies are used by PWB manufacturers to deposit a seed layer or coating of conductive material into the drilled through-holes of rigid, multi-layer PWBs prior to electroplating. Volume I describes the MHC technologies, methods used to assess the technologies, and cleaner technologies substitutes assessment (CTSA) results. The technologies evaluated are electroless copper, carbon, conductive polymer, graphite, nonformaldehyde electroless copper, organic-palladium, and tin-palladium. Chemical and process information is also presented for a conductive ink technology, but this technology is not evaluated fully.
NTIS
Public Health ; Printed Circuits ; Electrical Properties ; Holes (Electron Deficiencies) ; Manufacturing ; Electroless Deposition ; Substitutes ; Materials Selection

20020011173 Environmental Protection Agency , Design for the Environment Branch , Washington, DC USA
Implementing Cleaner Printed Wiring Board Technologies: Surface Finishes. Design for the Environment Printed Wiring Board Project
March 2000 ; 52p ; In English
Report No.(s): PB2001-108367 ; EPA/744/R-00/002 ; No Copyright ; Avail: National Technical Information Service (NTIS)

Surface finishes are applied to printed wiring boards (PWBs) to prevent oxidation of exposed copper on the board, thus ensuring a solderable surface when components are added at a later processing stage. The most widely used surface finishing process in PWB manufacturing is hot air solder leveling (HASL). In this process, tin-lead is fused onto exposed copper surfaces. This process may pose potential health and environmental risks due to the use of lead, and the HASL process also generates significant quantities of excess solder that must be recycled. In addition, HASL does not provide a level (planar) soldering surface for fine pitch components. Several emerging surface finishes viewed as viable alternatives to HASL have been developed in recent years. These finishes eliminate the use of lead in the surface finishing process and produce a planar surface. For these reasons, the Design for the Environment (DFE) PWB Project team selected the surface finishing process as the focus of a study to identify technologies that perform competitively, are cost-effective, and pose fewer potential environmental and health risks. This Guide presents first-hand accounts of the problems, solutions, and time and effort involved in implementing alternative surface finish technologies. The information presented summarizes telephone and e-mail interviews with PWB manufacturers and assemblers currently using these technologies, and the suppliers of the alternative technologies. With the information from these interviews, manufacturers considering a switch to an alternative technology can benefit from the lessons learned by those who already have made the change. Five technologies are discussed in this Guide: immersion silver; immersion tin; organic solderability preservative (OSP); electroless nickel/immersion gold; and electroless nickel/electroless palladium/immersion gold.
NTIS
Surface Finishing ; Pollution ; Printed Circuits ; Materials Selection ; Alternatives

20020011622 Department of Energy , Richland, WA USA
Multi-Canister overpack internal HEPA filters
Smith, K. E. ; Nov. 03, 1998 ; 8p ; In English
Report No.(s): DE2001-11253 ; HNF-3420-REV-0 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The rationale for locating a filter assembly inside each Multi-Canister Overpack (MCO) rather than include the filter in the Cold Vacuum Drying (CVD) process piping system was to eliminate the potential for contamination to the operators, processing equipment, and the MCO. The internal HEPA filters provide essential protection to facility workers from alpha contamination, both external skin contamination and potential internal depositions. Filters installed in the CVD process piping cannot mitigate potential contamination when breaking the process piping connections. Experience with K-Basin material has shown that even an extremely small release can result in personnel contamination and costly schedule disruptions to perform equipment and facility decontaminateon. Incorporating the filter function internal to the MCO rather than external is consistent with ALARA requirements of 10 CFR 835. Based on the above, the SNF Project position is to retain the internal HEPA filters in the MCO design.
NTIS
Vapor Deposition ; Protection ; Filters

20020011702 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek , Building and Construction Research , Rijswijk, Netherlands
HERON , Volume 46
van Mier, J. G. M. , Editor , Technische Univ. , Netherlands ; 2001 ; 84p ; In English
Report No.(s): PB2001-107748 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
Contents include the following: A Stoneley-Gibson Varga elastic stratum; A comparative treatise on the Vertical Vibration of Rigid Bodies on Deep Elastic Strata; and Standard Linear Solid Model for Dynamic and Time Dependent Behaviour of Building Materials.
NTIS
Construction Materials ; Structural Analysis ; Engineering ; Structural Engineering ; Soil Mechanics

20020011873 EC/R, Inc. , Durham, NC USA
Plain Language Guide to the Flexible Polyurethane Foam Production NESHAP 40 CFR 63, Subpart 3 ***Final Report***
McDonald, J. ; Ward, I. ; Dec. 31, 1998 ; 226p ; In English
Report No.(s): PB2002-100421 ; No Copyright ; Avail: National Technical Information Service (NTIS)
Contents include the following: Introduction; What this rule covers - An Overview; Complying with requirements for slabstock foam; Calculations and procedures; Notification and reporting; Other requirements and information; Getting additional help; Supplemental information for State or local agencies and Tribes.
NTIS
Polyurethane Foam ; Regulations ; Air Pollution ; Pollution Control

20020011874 General Accounting Office , Washington, DC USA
Coast Guard: Update on Marine Information for Safety and Law Enforcement System
October 2001 ; 52p ; In English
Report No.(s): PB2002-100629 ; GAO-02-11 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This report provides an update on Marine Information for Safety and Law Enforcement (MISLE) system status, plans, and technical and programmatic risks.
NTIS
Law (Jurisprudence) ; Safety ; Marine Environments ; Information Management

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COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20020006047 Mercer Engineering Research Center, Warner Robins, GA USA
Electronic Warfare (EW) Receiver and Processing Concepts Evaluation Program (RAPCEval 2) ***Final Report, 1 Apr. 2000-11 May 2001***
Bass, W. T.; May 2001; 182p; In English
Contract(s)/Grant(s): F09603-93-G-0012; Proj-7633
Report No.(s): AD-A394787; MR000511.01-RV-01; AFRL-SN-WP-TR-2001-1053; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The Electronic Warfare (EW) Receiver and Processing Concepts Evaluation Program (RAPCEval2) tasks have provided analytical support for current research for the Electronic signal Measurement (ESM) group at Air Force Research Laboratory (AFRL). Tasks initiated under Option Three of the contract of this program provided analysis for inputs and countermeasures for electronic receivers of radar, electro-optic, infrared, and ultraviolet systems. Research has been performed under the direction of the Joint Program Research Standards Committee, composed of members from Wright-Patterson AFB, Warner Robins AFB, Mercer University, and Mercer Engineering Research Center. The report includes research presentations from graduate students and a research presentation by a university faculty member. Topics included are represented by the keyword list on this page.
DTIC
Countermeasures; Electronic Warfare; Radar Receivers; Signal Measurement; Electro-Optics

20020006053 Communications Research Lab. , Japan
Radio Telescope Interference from a Ground Transmitter
Nakajima, Junichi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kurihara, Noriyuki , Communications Research Lab. , Japan ; Kondo, Tetsuo , Communications Research Lab. , Japan ; Shibata, Katsunori , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 91-97 ; In Japanese ; Copyright ; Avail: Issuing Activity
We report measurements of RFI (Radio Frequency Interference) from a mobile ground transmitter to a radio telescope system. Radio telescopes are equipped with a very sensitive LNA (low noise amplifier) in their focus. Although they are designed to have maximum sensitivity to extra- terrestrial radio sources with large aperture toward a pointing direction, the gain in undesired directions are still so high that they are apt to receive nearby terrestrial -based emissions. In this experiment the Global Star System mobile terminal with a frequency 1612.8 MHz was used as a transmitter and the Kashima 34m radio telescope received the signal from 172 remote points. The received strength are evaluated based on the definition of the ITU recommendation RA.769-1. The signals are very strong and often harmful to radio-astronomical observation. But the strength of the RFI is absorbed by the transmitting distance and its transmitted area.
Author
Radio Telescopes ; Transmitters ; Frequencies ; Radio Frequency Interference ; Amplifiers

20020006205 Technische Univ. , Munich Germany

Development of a Service Discovery Architecture for the Bluetooth Radio System

Schwingenschloegl, Christian ; Heigl, Anton ; Sep. 01, 2000 ; 8p ; In English

Report No.(s): AD-A395471 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Bluetooth 1.0 was published in 1999 as an industry standard for short-range wireless data and voice communication. Application profiles cover cordless telephony, wireless access to printers, fax machines or LANs, Personal Area Networking and more. In order to handle this variety of services and nevertheless guarantee interoperability and auto-configuration of different devices from different manufacturers, the Bluetooth specification contains the so-called Service Discovery Protocol (SDP).

DTIC

Architecture (Computers) ; Protocol (Computers) ; Radio Communication ; Wireless Communication

20020006220 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA

Exploratory Analysis of Personnel and Performance: Mobile Subscriber Equipment Follow-On Operational Test and Evaluation

Buckalew, Louis W. ; Smootz, Edwin R. ; Glaze, James D. ; Sanders, Michael G. ; Jun. 1989 ; 24p ; In English

Report No.(s): AD-A395402 ; ARI-WP-FH-89-01 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This exploratory research used data from the MSE Follow-On Operational Test and Evaluation to (a) describe the personnel characteristics of MSE operators, (b) describe operator performance on critical MSE tasks, and (c) identify personnel variables which could be used to account for variability in operator performance or predict operator performance. Ten personnel variables and 21 critical tasks were considered. Additional data included test performance data, operator errors and subjective workload ratings. Findings can be applied to the design of future tests and to design of prototype algorithms for personnel selection and prediction of operator performance.

DTIC

Communication Equipment ; Operator Performance ; Personnel Selection ; Workloads (Psychophysiology)

20020006230 Army Engineer Research and Development Center , Geotechnical and Structures Lab. , Vicksburg, MS USA

Design, Setup, and Operation of the Deployable TeleEngineering Communications System ***Final Report***

Williamson, Jeffrey L. ; Smith, Carroll J. ; Lynch, Larry N. ; Powell, Jeff ; August 2001 ; 49p ; In English ; Original contains color images

Report No.(s): AD-A395367 ; ERDC-TR-01-6 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

In FY97, the US Army Engineer Research and Development Center (ERDC) initiated a technology demonstration program to determine the feasibility of providing deployed troops direct access to subject matter experts (SME). Direct access to the SME would allow responses to engineering challenges beyond the in-theater capability to be provided without the time delays and costs associated with deploying the SME to the theater. Shortly after being established, the TeleEngineering Operations Center (TEOC) initiated an effort to develop a secure, deployable communications package and steps necessary to set up and operate the system.

DTIC

Communication Equipment ; Telecommunication

20020006231 Army Engineer Research and Development Center , Geotechnical and Structures Lab. , Vicksburg, MS USA

Design, Setup, and Operation of the Fixed-Site TeleEngineering Communications System ***Final Report***

Williamson, Jeffrey L. ; Smith, Carroll J. ; Lynch, Larry N. ; Register, Bryan ; July 2001 ; 39p ; In English ; Original contains color images

Report No.(s): AD-A395366 ; ERDC-SR-01-2 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

In FY97, the US Army Engineer Research and Development initiated a technology demonstration program to determine the feasibility of providing deployed troops with direct access to subject matter experts (SME). Direct Access to the SME allows responses to engineering challenges beyond the in-theater capability to be provided without the time delays and costs associated with deploying the SME to the theater. The purpose of this report is to describe the various components of the fixed-site TeleEngineering communications system and to provide the step-by-step procedures required to set up and operate the system. Chapter 2 presents the components that comprise the system. Chapter 3 provides details on setting up the equipment and the interconnections between the individual components. The operation of the system (i.e., conducting a VTC and transferring data) is presented in Chapter 4; methods of receiving technical support are provided in Chapter 5. Appendix A provides a wiring diagram for the fixed-site system.

DTIC

Teleconferencing ; Military Technology

20020006507 Defence Research Establishment Ottawa , Ottawa, Ontario Canada
Military Voice Services over Wireless ATM Networks: ATM Adaptation Layer Study
Villasenor-Gonzalez, Luis ; Lamont, Louise ; Mar. 2001 ; 74p ; In English
Report No.(s): AD-A395810 ; DREO-TR-2001-059 ; CRC-RP-2001-02 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

ATM technology has enjoyed great success, due in great part, for its ability to support a whole range of applications with Quality of Service (QoS) guarantees. Consequently, ATM has become of great interest for the support of services over military telecommunications networks. This report is provided as part of a study on the feasibility of military voice services over wireless ATM networks. In this study we are concerned with the support of low data rate and delay sensitive applications over wireless ATM link, where the ATM Adaptation Layer 2 has been identified as a suitable adaptation layer for the support of such type of traffic. Nevertheless, as currently specified, AAL2 does not provide any protection mechanisms to allow for its efficient implementation over the wireless medium. The work presented in this document includes performance analysis results to evaluate the implementation of Forward Error Correction (FEC) codes, diversity reception mechanisms and/or protocol enhancements to improve the performance of AAL2 over a wireless ATM network.

DTIC

Telecommunication ; Military Technology ; Asynchronous Transfer Mode

20020006802 Ohio State Univ. , Dept. of Computer and Information Science , Columbus, OH USA
Congestion Control and Traffic Management in ATM Networks: Recent Advances and a Survey
Jain, Raj ; Jan. 26, 1995 ; 30p ; In English
Report No.(s): AD-A395458 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Congestion control mechanisms for ATM networks as selected by the ATM Forum traffic management group are described. Reasons behind these solutions are explained. In particular, selection criterion for selection between rate-based and credit-based approach and the key points of the debate between these two approaches are presented. The approach that was finally selected and several other schemes that were considered are described.

DTIC

Asynchronous Transfer Mode ; Traffic ; Communication ; Protocol (Computers) ; Data Transmission

20020006804 Wuerzburg Univ. , Institute of Computer Science , Germany
Statistical Properties of MPEG Video Traffic and Their Impact on Traffic Modeling in ATM Systems
Rose, O. ; Feb. 1995 ; 27p ; In English ; Original contains color images
Report No.(s): AD-A395454 ; 101 ; X5-X5 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

MPEG video traffic is expected to cause several problems in ATM networks, both from performance and from architectural viewpoint. For the solution of these difficulties, appropriate video traffic models are needed. A detailed statistical analysis of newly generated long MPEG encoded video sequences is presented and the results are compared to those of existing data sets. Based on the results of the analysis, a layered modeling scheme for MPEG video traffic is suggested which will simplify the finding of appropriate models for many performance analysis techniques.

DTIC

Asynchronous Transfer Mode ; Reliability Analysis ; Statistical Analysis ; Communication ; Computer Networks ; Communication Networks ; Video Data

20020006806 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Unit Leaders' Evaluation of Mission Supportability by the Single Channel Ground and Airborne Radio System (SINCGARS)
Buckalew, Louis W. ; Jun. 1988 ; 9p ; In English
Report No.(s): AD-A395450 ; ARI-WP-88-11 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

No abstract.

DTIC

Airborne Equipment ; Radio Equipment ; Communication

20020006807 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Maximizing Mobile Subscriber Equipment System Effectiveness Through Personnel Selection and Performance Assessment: An Interim Report ***Interim Report***
Buckalew, Louis W. ; Jan. 30, 1990 ; 21p ; In English
Report No.(s): AD-A395449 ; ARI-WP-FH90-1 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
No abstract.
DTIC
Personnel Selection ; System Effectiveness ; Communication Equipment ; Communication

20020006862 National Defence Research Establishment , Div. of Human Sciences , Linkoeping, Sweden
Modelling a Joint Command and Control Unit. Visual Modelling, A Method for Task Analysis and Operational Definition of Complex Systems Concepts ***Modellering av Operativ Ledningsenhet. Visuell Modellering som Metod foer Problemanalys och Operationalisering av Begrepp i Komplexa System***
Modeer, B. ; December 1999 ; 52p ; In Swedish
Report No.(s): PB2001-108417 ; FOA-R-99-01372-505-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
A new method for construction of criteria for hypothesis testing, during the design of new organizations or systems, was used. The question was how could ideas of a future system be tested. In this case the system was a ROLF-unit (mobile joint command and control unit). The presumed organization and function of the staff was specified by a task analysis, which was done by means of visual simulation. For each object in the model, the function of the object and also how this function could be verified was specified. This work resulted in a model and a questionnaire to be used for the evaluation of how a ROLF-unit handle information.
NTIS
Command and Control ; Design Analysis ; Systems Engineering ; Complex Systems ; Models

20020006875 National Defence Research Establishment , Dept. of Command and Control Warfare Technology , Linkoeping, Sweden
Neural Networks for Antenna Array Signal Processing: A Literature Survey
Rantakokko, J. ; October 1999 ; 70p ; In Swedish ; In English
Report No.(s): PB2001-108074 ; FOA-R-99-01259-504-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This report is a literature survey on the use of neural networks in array signal processing applications, with special emphasis on wireless communications. First, a comprehensive introduction into the subject of supervised feedforward neural networks is given. Thereafter, feedforward neural networks that can perform both direction-of-arrival (DOA) estimation and beamforming are described. It is stated that neural network DOA estimators belong to the class of high resolution methods. Neural network approaches to other wireless communication applications are also presented, including propagation path loss prediction and adaptive equalization and interference rejection.
NTIS
Neural Nets ; Antenna Arrays ; Signal Processing ; Wireless Communication

20020006949 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
Concepts and Relations for the Analysis of Plane Periodic Antenna Arrays
Pettersson, L. ; November 2000 ; 56p ; In English
Report No.(s): PB2001-108429 ; FOA-R-00-01666-616-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
In this report a description of concepts and relations that are fundamental in antenna array theory is given. The main emphasis of the report is in chapter 3, which treats concepts and relations for plane periodic arrays with arbitrary periodicity and excitation. The approach here is somewhat different from what is generally given in text books on periodic arrays. For example, the 'standard' concepts reciprocal space, and the uv (ultraviolet)-plane (also called the cosine direction plane) will not be used here. Basic for the analysis of plane periodic arrays in this report, are the concepts spectral domain of signal sequences and visible spectral domains for Floquet modes. These concepts are defined and explained in chapter 3. The geometry of the visible spectral domains are then used in the report to analyze the efficiency of small embedded arrays and to determine grating lobe conditions for arrays with arbitrary periodicity.
NTIS
Antenna Arrays ; Periodic Variations

20020008089 Sandia National Labs. , Albuquerque, NM USA

Internet-Based Calibration of a Multifunction Calibrator

Bunting Baca, ; Duda, ; Walker, ; Oldham, ; Parker, ; Dec. 19, 2000 ; 10p ; In English

Report No.(s): DE2001-772057 ; SAND2000-3172C ; No Copyright ; Avail: Department of Energy Information Bridge

A new way of providing calibration services is evolving which employs the Internet to expand present capabilities and make the calibration process more interactive. Sandia National Laboratories and the National Institute of Standards and Technology are collaborating to set up and demonstrate a remote calibration of multijunction calibrators using this Internet-based technique that is becoming known as e-calibration. This paper describes the measurement philosophy and the Internet resources that can provide real-time audio/video/data exchange, consultation and training, as well as web-accessible test procedures, software and calibration reports. The communication system utilizes commercial hardware and software that should be easy to integrate into most calibration laboratories.

NTIS

Calibrating ; Internets ; Technology Transfer

20020008097 National Defence Research Establishment , Linkoeping, Sweden

Interoperability Analysis of 3rd Generation Mobile System in Military Applications

Wiklundh, K. ; Stenumgaard, P. ; Dec. 2000 ; 34p ; In Swedish

Report No.(s): PB2001-107299 ; FOA-R-00-01692-504-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

It is likely that WCDMA (Wideband Code Division Multiple Access), in third Generation Mobile Systems UMTS (Universal Mobile Telecommunications System) will be investigated as a possible technique for future military applications. In such applications, robustness against interference is one of several important features. For this reason, it is important to make an early judgement of the robustness of WCDMA against intersystem interference. The purpose of this report is to briefly analyze a WCDMA receiver's sensitivity to interference in military applications. The report consists of a survey of potential disturbance sources that might appear in military applications. Furthermore, estimations of the interference power in a mobile receiver from broadband interference and since signal interference are presented. A number of system functions are identified as sensitive to interference. Furthermore, the impact of different interfering signal wave forms on the actual receiver is studied. It is shown that a WCDMA receiver is much more sensitive to Gaussian noise than to sine signals. It is stated that the interference levels from colocated COTS (commercial off-the-shelf) equipment can constitute a large threat to UMTS. Furthermore, power control and initial cell search are identified as two important functions that can be highly affected by interference and should be further analyzed.

NTIS

Telecommunication ; Military Technology ; Code Division Multiple Access ; Mobile Communication Systems ; Technology Assessment ; Radio Frequency Interference

20020008164 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA

Trailblazer Initial Operational Test and Evaluation: Manprint Findings

Palmer, Richard L. ; Mar. 10, 1988 ; 296p ; In English

Report No.(s): AD-A395701 ; ARI-WP90-05 ; No Copyright ; Avail: CASI ; A13 , Hardcopy ; A03 , Microfiche

The Trailblazer (AN/TSQ-138), previously designated AN/TSQ-114, is a ground based, division-level, computer-assisted communications-intelligence electronic support system designed to intercept target signals, determine their points of origin, and report the acquired information. The primary tactical targets are very high frequency, single channel, voice transmitters. Each Trailblazer system consists of five master control sets, each mounted on a M1015A1 track vehicle. The system is designed to interface with Quick Fix (EH-60A) and the Tactical Control and Analysis Center. Prior operational testing occurred in 1978 and 1985, and an independent government test was conducted in 1988. During the 1978 test, the Fort Hood Field Unit of the Army Research institute conducted a human factors evaluation of the Trailblazer operator-system interface, including equipment shelter, generator trailers, physical system setup, interface with electronics, and safety. The resulting report (ARI RR 1307C, Sep 1978) described 165 system shortcomings of varying importance. Since 1978 the Trailblazer system has been modified extensively to correct some of the deficiencies of the AN/TSQ-114 model. The purpose of the research reported in this report was to answer three MANPRiNT-related issues in the test design plan for the Initial Operational Test and Evaluation (IOTE) of the new Trailblazer version, AN/TSQ-138. The test was conducted by the intelligence and Security Board of the U.S. Army Test and Experimentation Command at Fort Huachuca from 5 June to 28 July 1989.

DTIC

Telecommunication ; Armed Forces (USA) ; Evaluation ; Performance Tests ; Surveillance

20020008165 Army Command and General Staff Coll. , Fort Leavenworth, KS USA

A Command and Control Structure for Joint Interagency Counterterrorism Operations Involving Weapons of Mass Destruction within a Regional Commander-in-Chief's Area of Responsibility

Colyer, Kevin C. ; Jun. 01, 2001 ; 145p ; In English

Report No.(s): AD-A395691 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

The threat of state or nonstate actors conducting terrorism utilizing weapons of mass destruction (WMD) against U.S. personnel, property, or other locations of U.S. interest outside the continental U.S. or its territories represents a serious threat to U.S. vital interests. While numerous U.S. government agencies have joined the effort to prepare against this possibility, the system remains disjointed and inefficient. This study presents a command and control structure that meets the requirements of the operation to solve this dilemma. The study first examines the WMD counterterrorism environment and the agencies currently involved to determine what is required to counter the threat. From this a set of command and control criteria is established to compare against current command and control models. The results of comparing the requirements to current models revealed two gaps in the command and control of these operations. The study continues to propose an organizational structure that maintains the strengths of the current system and fills the gaps discovered during the research.

DTIC

Terrorism ; Defense Program

20020008174 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA

Single Channel Ground and Airborne Radio System (SINCGARS) Basic Operator Training Evaluation

Palmer, Richard L. ; Jun. 1988 ; 39p ; In English

Report No.(s): AD-A395370 ; ARI-FH-88-09 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The following topics are discussed: 1) Basic Operator Training; 2) Evaluation Methodology; 3) Gross Instructional Efficiency Analysis; 4) Operator Evaluation of Training; 5) Post-Training Testing: Criterion Test (Final Exam); 6) SINCGARS Learning-Retention Test (SLRT); 7) Class Size, Student-to-Radio Ratio and Student-to- Instructor Ratio; 8) Correlations among Criterion Test, SLRT and ASVAB Scores; 9) Criterion Test Scares, SLAT Scores, and Field Performance Scores; and 10) Miscellaneous Annotations. Generally, SINCGARS training could be changed in ways that would substantially increase its effectiveness and save significant amounts of time and expense. Suggestions to this end are presented.

CASI

Airborne Equipment ; Training Evaluation ; Radio Communication

20020008242 Analytic Sciences Corp. , Fairborn, OH USA

Automated Identification Technology for Logistics Control (AITLC) ***Final Report***

Hicks, Graydon K. ; Patton, Nick ; Jan. 2001 ; 123p ; In English

Contract(s)/Grant(s): F33615-99-D-6001 ; Proj-1710

Report No.(s): AD-A395748 ; AFRL-HE-WP-TR-2001-0048 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

This task was performed under the Logistics Technology Research Support (LTRS) contract for Capt. Kenneth Bizenga of the Air Force Research Laboratory (AFRL), Logistics Readiness Branch (HESR) at Wright-Patterson AFB (Air Force Base), OH. The research covered the time period 29 March 2000 through 31 January 2001. This effort examined the feasibility of developing a suite of passive data collection tools and corresponding transmission methods for use in logistics command and control. The tools identified can provide identification, location, and/or status information to a central control system. The effort consisted of a technology survey of available data capture and transmission equipment and methods, as well as a projection of future capability. The technologies investigated are known in the community as Automated Identification Technology (AIT). This survey evaluated key technical parameters relevant to the implementation of these technologies in an Air Force (AF) environment, including data resolution, transmission method, transmission range, storage capability, affordability, deployability, supportability, data security, and safety.

DTIC

Logistics ; Command and Control ; Data Processing ; Armed Forces (USA)

20020008404 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Single Channel Ground and Airborne Radio System (SINCGARS) Maintainer Training and Performance Evaluation
Nicholson, Nigel R. ; Buckalew, Louis W. ; Jun. 1988 ; 9p ; In English
Report No.(s): AD-A395369 ; ARI-FH-88-12 ; No Copyright ; Avail: Defense Technical Information Center (DTIC)
No abstract
DTIC
Radio Equipment ; Performance Tests ; Communication

20020008661 Research Inst. of National Defence , Div. of Sensor Technology , Linkoeping, Sweden
Signal Processing in Direction-of-Arrival in Multifunction Radar ***Signalbehandling i Riktning i Flerfunktionsradar***
Bjoerklund, S. ; Nelander, A. ; Rejdemyhr, D. ; Grahn, P. ; Dec. 2000 ; 42p ; In Swedish
Report No.(s): PB2001-107741 ; FOA-R-00-01808-408-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
Future military microwave radar systems will evolve into multifunction radar with simultaneous functions for surveillance, tracking and recognition. Resolution and accuracy of direction-of-arrival (DOA) estimation will be enhanced and performance against jamming and clutter will be increased. This is made possible by the development of digital array antennas and modern signal processing which utilizes DOA information. This report presents such signal processing together with its possibilities in multifunction radar. The report also covers signal processing for current radar systems which are equipped with auxiliary antennas. The contents of the report is based on the authors' own research and on literature surveys.
NTIS
Signal Processing ; Target Recognition ; Microwaves ; Radar Beams

20020008893 Florida Univ. , Gainesville, FL USA
Reliable Wireless Data Acquisition and Control Techniques within Nuclear Hot Cell Facilities
Kurtz, J. L. ; Tulenko, J. ; Sep. 20, 2000 ; 8p ; In English
Report No.(s): DE2001-777347 ; DOE/ID/13636 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
On this NEER project the University of Florida has investigated and applied advanced communications techniques to address data acquisition and control problems within the Fuel Conditioning Facility (FCF) of Argonne National Laboratory-West (ANL-W) in Idaho Falls. The goals of this project have been to investigate and apply wireless communications techniques to solve the problem of communicating with and controlling equipment and systems within a nuclear hot cell facility with its attendant high radiation levels. Different wireless techniques, including radio frequency, infrared and power line communications were reviewed. For each technique, the challenges of radiation-hardened implementation were addressed. In addition, it has been a project goal to achieve the highest level of system reliability to ensure safe nuclear operations. Achievement of these goals would allow the eventual elimination of through-the-wall, hardwired cabling that is currently employed in the hot cell, along wit h all of the attendant problems that limit measurement mobility and flexibility.
NTIS
Control Systems Design ; Data Acquisition ; Wireless Communication

20020009019 NASA Glenn Research Center , Cleveland, OH USA
Ka-Band Phased Array System Characterization
Acosta, R. , NASA Glenn Research Center , USA ; Johnson, S. , NASA Glenn Research Center , USA ; Sands, O. , NASA Glenn Research Center , USA ; Lambert, K. , Analex Corp. , USA ; November 2001 ; 14p ; In English ; 7th ; Seventh Ka-Band Utilization Conference , 26-28 Sept. 2001 , Genoa , Italy
Contract(s)/Grant(s): RTOP 322-10-2C
Report No.(s): NASA/TM-2001-211139 ; E-12994 ; NAS 1.15:211139 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Phased Array Antennas (PAAs) using patch-radiating elements are projected to transmit data at rates several orders of magnitude higher than currently offered with reflector-based systems. However, there are a number of potential sources of degradation in the Bit Error Rate (BER) performance of the communications link that are unique to PAA-based links. Short spacing of radiating elements can induce mutual coupling between radiating elements, long spacing can induce grating lobes, modulo 2 pi phase errors can add to Inter Symbol Interference (ISI), phase shifters and power divider network introduce losses into the system. This paper describes efforts underway to test and evaluate the effects of the performance degrading features of

phased-array antennas when used in a high data rate modulation link. The tests and evaluations described here uncover the interaction between the electrical characteristics of a PAA and the BER performance of a communication link.
Author
Microwave Antennas ; Phased Arrays ; Communication Networks ; Data Links ; Antenna Arrays

20020009066 Essex Corp. , Fort Hood, TX USA
Manprint Findings from the Follow-On Operational Test and Evaluation of the AN/TRC-170(V)
Bowser, Sam ; Lyons, Larry ; January 1988 ; 298p ; In English
Contract(s)/Grant(s): MDA903-86-C-0341
Report No.(s): AD-A396090 ; WP-FH-88-03 ; No Copyright ; Avail: CASI ; A13 , Hardcopy ; A03 , Microfiche
The Follow-On Operational Test and Evaluation (FOT&E) of the AN/TRC-170(V) Tropospheric Scatter Radio Terminal Set was conducted to provide data concerning reliability, availability, maintainability (RAM), logistical and training requirements, operational effectiveness, performance, transportability and interoperability. The AN/TRC-170(V) FOT&E test data and previous multi-service testing will support a fielding decision at an Army In-Process Review (IPR).
DTIC
Maintainability ; Reliability ; System Effectiveness ; Evaluation ; Radio Equipment

20020009068 Army Research Inst. Field Unit , Fort Hood, TX USA
C3I Test Instrumentation System (Data Collection Subsystem): MANPRINT findings
Palmer, Richard L. ; Mar. 1990 ; 35p ; In English
Report No.(s): AD-A396085 ; WP-FH-90-04 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This paper presents MANPRINT findings pertaining to the prototype Command, Control, Communications, and Intelligence (031) Test Instrumentation System (0312). The findings, conveyed to Test and Experimentation Command (TEXCOM) for inclusion in their test report, were obtained during the TEXCOM government acceptance test of the 0312 Data Collection Subsystem at Fort Sill Field Artillery Board during the week of 28 January 1990. Unfortunately, the DCS failed the acceptance test because of a crucial software bug and three crucial MANPRINT findings. The latter were: (1) easy accidental reinitialization of the system by the operator; (2) inadequate presentation of system alerts to the operator; and (3) a possible safety hazard associated with vehicle instability. The developer has resolved the software bug and is currently working on the MANPRINT problems. The complete, detailed results are presented in this report in the format required for inclusion in the TEXCOM test report.
DTIC
Command and Control ; Acceptability ; Data Acquisition

20020009170 Joint Publications Research Service , Arlington, VA USA
Translations on Telecommunications Policy, Research and Development , No. 35
Apr. 28, 1978 ; 22p ; In English
Report No.(s): AD-A395889 ; JPRS-71028 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This serial report contains translations from the world press and radio relating to worldwide political, economic and technical developments in telecommunications, computers, and satellite communications. Coverage will be worldwide with focus on France, Federal Republic of Germany, UK, Italy, Japan, the USSR, People's Republic of China, Sweden, and the Netherlands.
DTIC
Research and Development ; Telecommunication ; Policies ; Economic Development

20020009508 Lawrence Livermore National Lab. , Livermore, CA USA
Overview of the InterGroup protocols
Berket, K. ; Agarwal, D. A. ; Melliar-Smith, P. M. ; Moser, L. E. ; Mar. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-780591 ; LBNL-47567 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Existing reliable ordered group communication protocols have been developed for local-area networks and do not, in general, scale well to large numbers of nodes and wide-area networks. The InterGroup suite of protocols is a scalable group communication system that introduces a novel approach to handling group membership, and supports a receiver-oriented selection of service. The protocols are intended for a wide-area network, with a large number of nodes, that has highly variable delays and a high message

loss rate, such as the Internet. The levels of the message delivery service range from unreliable unordered to reliable group timestamp ordered.
NTIS
Communication Networks ; Wide Area Networks ; Computer Networks ; Local Area Networks

20020009513 Army Communications-Electronics Command , Fort Monmouth, NJ USA
Operational Planning: A Status Report on Knowledge Acquisition with the U. S. Army War College
Loberg, Gary ; Powell, Gerald M. ; October 1987 ; 50p ; In English
Report No.(s): AD-A395976 ; CECOM-TR-01-6 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
During the periods of December 1985 to March 1986 and December 1986 to March 1987, a series of knowledge-acquisition sessions were held involving scientists of the US Army Center for Command, Control and Communications of the Communications-Electronics Command (CECOM) and military planners of the US Army War College (AWC). The goal of the joint effort between these organizations was to identify the knowledge and methods experienced planners bring to bear when planning for military operations at the corps command level. This technical report summarizes the results, as concurred upon by the CECOM scientists and AWC planners, of this joint collaboration thus far. The content of this document should be considered as information requiring further analysis. It does not recreate the flow of the sessions, nor summarize the discussions that led to the development of the ideas presented. It does attempt to provide a coherent description of the ideas developed.
DTIC
Command and Control ; Communication Equipment ; Organizations ; Planning

20020009549 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Single Channel Ground and Airborne Radio System (SINCGARS) AN/ARC-201 (ABN) Manprint Evaluation
Buckalew, Louis W. , Army Research Inst. for the Behavioral and Social Sciences , USA ; Dec. 1988 ; 13p ; In English
Report No.(s): AD-A395528 ; ARI-WP-88-13 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report presents results of a preliminary MANPRINT evaluation of the Single Channel Ground and Airborne Radio System (SINCGARS), with primary concern for pilot workload, conducted by the Army Research Inst., Fort Hood Field Unit.
CASI
Radio Equipment ; Workloads (Psychophysiology) ; Performance Tests ; Voice Communication

20020009550 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Single Channel Ground and Airborne Radio System: MANPRINT Evaluation of Ease of Operation
Buckalew, Louis W. ; June 1988 ; 25p ; In English
Report No.(s): AD-A395407 ; ARI-WP-FH-88-10 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report presents the results of an ARI evaluation of MANPRINT aspects of the Single Channel Ground and Airborne Radio System (SINCGARS) during the Follow-on Test and Evaluation (FOTE). The FOTE was conducted during April and May of 1988 at Fort Sill, Oklahoma. The material in this report was incorporated in the TEXCOM Test report on SINCGARS submitted on the U.S. Army Operational Test and Evaluation Agency (OTEA), Falls Church, Virginia.
Author
Radio Equipment ; Performance Tests ; Technology Assessment

20020009592 Lawrence Livermore National Lab. , Livermore, CA USA
Integrated solution for secure group communication in wide-area networks
Agarwal, D. A. ; Chevassut, O. ; Thompson, M. ; Tsudik, G. ; Apr. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-780589 ; LBNL-47158 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Many distributed applications require a secure reliable group communication system to provide coordination among the application components. This paper describes a secure group layer (SGL) which bundles a reliable group communication system, a group authorization and access control mechanism, and a group key agreement protocol to provide a comprehensive and practical secure group communication platform. SGL also encapsulates the standard message security services (i.e, confidentiality, authenticity and integrity). A number of challenging issues encountered in the design of SGL are brought to light and experimental results obtained with a prototype implementation are discussed.
NTIS
Wide Area Networks ; Computer Networks ; Protocol (Computers) ; Access Control

20020009600 Sandia National Labs. , Albuquerque, NM USA

Final Report for the 10 to 100 Gigabit/Second Networking Laboratory Directed Research and Development Project

Witzke, E. L. ; Pierson, L. G. ; Tarman, T. D. ; Dean, L. B. ; Robertson, P. J. ; Apr. 01, 2001 ; 84p ; In English

Report No.(s): DE2001-780321 ; SAND2001-1062 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The next major performance plateau for high speed, long haul networks is at 10 Gbps. Data visualization, high performance network storage, and Massively Parallel Processing (MPP) demand these (and higher) communication rates. MPP-to-MPP distributed processing applications and MPP-to-Network File Store applications already require single conversation communication rates in the range of 10 to 100 Gbps. MPP-to-Visualization Station applications can already utilize communication rates in the 1 to 10 Gbps range. This LDRD (Laboratory Directed Research and Development) project examined some of the building blocks necessary for developing a 10 to 100 Gbps computer network architecture. These included technology areas such as, OS (operating system) Bypass, Dense Wavelength Division Multiplexing (DWDM), IP (Internet Protocol) switching and routing, Optical Amplifiers, Inverse Multiplexing of ATM (Asynchronous Transfer Mode), data encryption, and data compression; standards bodies activities in the ATM Forum and the Optical Internetworking Forum (OIF); and proof-of-principle laboratory prototypes. This work has not only advanced the body of knowledge in the aforementioned areas, but has generally facilitated the rapid maturation of high speed networking and communication technology by: (1) participating in the development of pertinent standards, and (2) by promoting informal (and formal) collaboration with industrial developers of high speed communication equipment.

NTIS

Computer Networks ; Data Transmission ; Transmission Rate (Communications) ; Massively Parallel Processors

20020009607 Sandia National Labs. , Albuquerque, NM USA

Final Report and Documentation for the Optical Backplane/Interconnect for High Speed Communication LDRD

Robertson, P. J. ; Chen, H. Y. ; Brandt, J. M. ; Sullivan, C. T. ; Pierson, L. G. ; Mar. 01, 2001 ; 72p ; In English

Report No.(s): DE2001-780305 ; SAND2001-0684 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Current copper backplane technology has reached the technical limits of clock speed and width for systems requiring multiple boards. Currently, bus technology such as VME and PCI (types of buses) will face severe limitations are the bus speed approaches 100 MHz. At this speed, the physical length limit of an unterminated bus is barely three inches. Terminating the bus enables much higher clock rates but at drastically higher power cost. Sandia has developed high bandwidth parallel optical interconnects that can provide over 40 Gbps throughput between circuit boards in a system. Based on Sandia's unique VCSEL (Vertical Cavity Surface Emitting Laser) technology, these devices are compatible with CMOS (Complementary Metal Oxide Semiconductor) chips and have single channel bandwidth in excess of 20 GHz. In this project, we are researching the use of this interconnect scheme as the physical layer of a greater ATM (Asynchronous Transfer Mode) based backplane. There are several advantages to this technology including small board space, lower power and non-contact communication. This technology is also easily expandable to meet future bandwidth requirements in excess of 160 Gbps sometimes referred to as UTOPIA 6. ATM over optical backplane will enable automatic switching of wide high-speed circuits between boards in a system. In the first year we developed integrated VCSELs and receivers, identified fiber ribbon based interconnect scheme and a high level architecture. In the second year, we implemented the physical layer in the form of a PCI computer peripheral card. A description of future work including super computer networking deployment and protocol processing is included.

NTIS

High Speed ; Protocol (Computers) ; Superhigh Frequencies ; CMOS ; Optical Interconnects ; Architecture (Computers) ; Communication Networks

20020009657 Army Research Lab. , Human Research and Engineering Directorate , Aberdeen Proving Ground, MD USA

Situational Awareness and Communication Experiment for Military Operations in Urban Terrain: Experiment 1 ***Final Report***

Redden, Elizabeth S. ; Blackwell, Cynthia L. ; Oct. 2001 ; 117p ; In English

Report No.(s): AD-A396178 ; ARL/HRED-TR-2583 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

The U.S. Army Research Laboratory and the Soldier and Biological Chemical Command-Natick Soldier Center, Natick, Massachusetts, developed a situational awareness (SA) assessment center (AC) for squad members, fire team leaders, and squad leaders at the McKenna military operations in urban terrain site, Fort Benning, Georgia. The AC was used to conduct a two-phase SA experiment. In Phase I, tactics, techniques, and procedures (TTPs) for the intra-squad radio were evaluated with the goal of selecting the most effective TTP for the intra-squad radio in urban conditions such as those evaluated. Five Army Ranger squads

conducted three mini-vignettes five times using different TTFs and a different script each time (a total of 75 trials). The vignettes were scripted (i.e., OpFor activity, platoon leader communication, etc.) and were of short duration to minimize the number of uncontrolled variables. In Phase II, the contribution of the intra-squad radio to the SA of the individual squad members was evaluated. The TTP selected from Phase I was incorporated into Phase II procedures for communications. Each squad conducted each of six different vignettes twice (once with and once without the intra- squad radios) and used a different script each time. The AC methodology content validity index was 0.99, had high face validity, and allowed successful discrimination among a variety of conditions (e.g., day and night, five different TTPs, radio and no radio, etc.). Critical informational requirements were identified by echelon for each of the vignettes. The use of the intra-squad radios significantly increased the SA of the squad.
DTIC
Military Operations ; Radio Communication ; Cities ; Situational Awareness

20020009758 Communications Research Lab. , Tokyo, Japan
Radio Telescope Interference from a Ground Transmitter
Nakajima, Junichi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kurihara, Noriyuki , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Shibata, Katsunori M. , National Astronomical Observatory , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 91-95 ; In English ; Copyright ; Avail: Issuing Activity

We report measurements of RFI (Radio Frequency Interference) from a mobile ground transmitter to a radio telescope system. Radio telescopes are equipped with a very sensitive LNA (low noise amplifier) in their focus. Although they are designed to have maximum sensitivity to extra-terrestrial radio sources with large aperture toward a pointing direction, the gain in undesired directions are still so high that they are apt to receive nearby terrestrial-based emissions. In this experiment the Global Star System mobile terminal with a frequency 1612.8 MHz was used as a transmitter and the Kashima 34-m radio telescope received the signal from 172 remote points. The received strength are evaluated based on the definition of the ITU recommendation RA.769-1. The signals are very strong and often harmful to radio-astronomical observation, But the strength of the RFI is absorbed by the transmitting distance and its transmitted area.
Author
Radio Telescopes ; Radio Frequency Interference ; Transmitters ; Radio Observation

20020009765 Communications Research Lab. , Tokyo, Japan
Antenna System Improvements. 34-m Antenna System Improvement
Kawai, Eiji , Communications Research Lab. , Japan ; Kurihara, Noriyuki , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Takaba, Hiroshi , Gifu Univ. , Japan ; Osaki, Hiro , Communications Research Lab. , Japan ; Okubo, Hiroshi , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 59-72 ; In English ; Copyright ; Avail: Issuing Activity

The Kashima 34-m antenna was manufactured by TIW Systems (now VertexRSI) in the USA and constructed in 1987 as the main station of the Western Pacific VLBI Network. For more than thirteen years, the radio telescope has been used for both geodetic VLBI and radio astronomy. Its control system is continuously being improved to provide better performance. This paper reports on past improvements and technical enhancements to the 34-m antenna system with a focus on hardware.
Author
Very Long Base Interferometry ; Receivers ; Optical Fibers ; Augmentation ; Antenna Design

20020010156 Science Applications International Corp. , San Diego, CA USA
Duplex Direct Data Distribution System ***Final Report***
October 2001 ; 52p ; In English
Contract(s)/Grant(s): NASA Order C-72300-K ; RTOP 322-10-0H
Report No.(s): NASA/CR-2001-211198 ; E-13038 ; NAS 1.26:211198 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The NASA Glenn Research Center (GRC) is developing and demonstrating communications and network technologies that are helping to enable the near-Earth space Internet. GRC envisions several service categories. The first of these categories is direct data distribution or D3 (pronounced ”D-cubed”). Commercially provided D3 will make it possible to download a data set from a spacecraft, like the International Space Station. as easily as one can extract a file from a remote server today, using a file transfer

protocol. In a second category, NASA spacecraft will make use of commercial satellite communication (SATCOM) systems. Some of those services will come from purchasing time on unused transponders that cover landmasses. While it is likely there will be gaps in service coverage, Internet services should be available using these systems. This report addresses alternative methods of implementing a full duplex enhancement of the GRC developed experimental Ka-Band Direct Data Distribution (D3) space-to-ground communication link. The resulting duplex version is called the Duplex Direct Data Distribution (D4) system. The D4 system is intended to provide high-data-rate commercial direct or internet-based communications service between the NASA spacecraft in low earth orbit (LEO) and the respective principal investigators associated with these spacecraft. Candidate commercial services were assessed regarding their near-term potential to meet NASA requirements. Candidates included Ka-band and V-band geostationary orbit and non-geostationary orbit satellite relay services and direct downlink (”LEO teleport”) services. End-to-end systems concepts were examined and characterized in terms of alternative link layer architectures. Alternatives included a Direct Link, a Relay Link, a Hybrid Link, and a Dual Mode Link. The direct link assessment examined sample ground terminal placements and antenna angle issues. The SATCOM-based alternatives examined existing or proposed commercial SATCOM services that could be available in the 2005 time frame. The alternatives were evaluated and compared in terms of average daily system throughput and cost per bit. Throughput was estimated based on hypothetical scenarios supporting the International Space Station and polar orbiting missions. The feasibility of using standard TCP and a modified TCP was evaluated and risks were identified. An estimate of the TCP acknowledgment data rate required to support a return channel rate of 622 Mbps was developed using OPNET.
Author
Data Systems ; Communication Networks ; Communication Satellites ; Space Communication ; Internets

20020010584 NASA Ames Research Center , Moffett Field, CA USA
An Experimental Evaluation of Data Link Textual Formats
McGann, Alison , San Jose State Univ. , USA ; Lozito, Sandy , San Jose State Univ. , USA ; Corker, Kevin , NASA Ames Research Center , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 505-64-13 ; DTFA01-93-Z-02087 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Problems resulting from the use of verbal communications in the National Airspace System have lead to an increasing necessity for digitized air-ground communications or data link. This report describes an investigation of digitized communications through the evaluation of message length and different textual formats of clearance data. Current line pilots flew in a part-task simulation where the message length (one message with four commands vs. two messages with two commands each) and the textual format of ATC clearances were varied. Pilots also monitored a secondary task while flying. Secondary task measures and data link response times revealed no significant differences between the two formats under investigation. Message length did impact communication timing with only the first of a pair of two short messages resulting in significantly faster response times than either the second short or long message types.
Author
National Airspace System ; Ground-Air-Ground Communication ; Data Links ; Communication Networks ; Pulse Communication

20020010891 National Inst. of Standards and Technology , Electronics and Electrical Engineering Lab. , Boulder, CO USA
Measurement Comparison of a Low-Intermodulation Termination for the US Wireless Industry
Jargon, J. A. ; Jul. 2001 ; 26p ; In English
Report No.(s): PB2001-107073 ; NIST/TN-1521 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
After the recent, successful completion of a passive intermodulation measurement comparison for nonlinear two-port devices, the National Institute of Standards and Technology was requested to perform a second comparison for a one-part termination. Whereas the first comparison allowed participants to determine the level of agreement in measurements of varying levels of passive intermodulation, this comparison allows companies to check their systems at or near the noise floor level. Since March 2000, five U.S. companies have participated in this intercomparison and have contributed 10 data sets for 4 different commercial communications bands. This report preserves company anonymity, and allows participants to determine how well their measurement compare to ensemble averages. The study shows that the majority of the participants report PIM levels within two standard deviations of the mean values.
NTIS
Standard Deviation ; Intermodulation ; Wireless Communication

20020010908 San Jose State Univ. , Aerospace Human Factors Research Div. , Moffett Field, CA USA

Virtual Acoustic Displays for Teleconferencing: Intelligibility Advantage for "Telephone Grade" Audio

Begault, Durand R. , San Jose State Univ. , USA ; [1994] ; 1p ; In English ; PRECIS for Audio Engineering Society 98th Convention , 25-28 Feb. 1995 , Paris , France ; Sponsored by Audio Engineering Society , Unknown

Contract(s)/Grant(s): NCC2-327 ; RTOP 505-67-01 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Speech intelligibility was evaluated using a virtual acoustic ("3-D audio") display using the method specified by ANSI. Ten subjects were evaluated with stimuli either unfiltered or low-pass filtered at 4 kHz. Results show virtual acoustic techniques are advantageous for both full-bandwidth (44.1 kHz srate) and low (8 kHz srate) bandwidth "telephone-grade" teleconferencing systems.

Author

Teleconferencing ; Acoustic Properties ; Intelligibility

20020010963 Research Inst. of National Defence , Linkoeping, Sweden

Analysis of Hot Clutter in Radar Using Spatial Data

Bjoerklund, S. , Research Inst. of National Defence , Sweden ; Dec. 2000 ; 74p ; In English

Report No.(s): PB2001-107742 ; FOA-R-00-01807-408-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Hot clutter consists of jammer signals which have been reflected in the ground or sea before they are received by a radar. This is a significant problem in current military airborne radar systems. There are several proposed ways to suppress hot clutter. Low sidelobes, adaptive beamforming and sidelobe cancellation (SLC) are proposed against hot clutter in the sidelobes. Fast-time space-time adaptive processing (fast-time STAP) is proposed against hot clutter in the mainbeam. This report is directed to the scientists working in the field of radar. In the report we analyze hot clutter, particularly the required suppression performance in terms of degrees-of-freedom (DOF) for adaptive beamforming. Our results should also partly give a description of required DOFs for STAP. The results are applicable both to present radars which can be enhanced by addition of SLC or to future radars with fully adaptive array antennas. In the report we also describe a theoretical connection between our analysis methods and common hot clutter suppression methods.

NTIS

Beamforming ; Clutter ; Spatial Filtering ; Radar Reception

20020011162 Swedish Defence Research Establishment , Div. of Command and Control Warfare Technology , Linkoeping, Sweden

Simulation for SAR Jamming ***Soersimulering mot SAR***

Brage, M. ; March 2001 ; 84p ; In Swedish

Report No.(s): PB2001-107751 ; FOI-R-0049-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

The Defense Forces as well as the industry consider simulating different systems as a well-established method of saving both time and money. Fast computers of today make it possible to simulate those experiments and situations that previously needed to be performed with real equipment. The live experiment can be performed with higher precision when valuable knowledge is obtained by simulating a certain situation in advance. The institution of Electronical Warfare at the Swedish Defense Research Agency is developing technologies for jamming SAR-systems. SAR stands for Synthetic Aperture Radar and describes a radar system that, with an artificial radar antenna, generates photo like pictures of the ground clutter that usually is a problem for ordinary radar systems. Since a SAR-system can operate independently of light and weather conditions, such a system would in a war situation be an indirect threat for our air bases, harbors, etc. Protection against SAR systems is obtained by strategic positioning of a set of jammers that will generate and transmit noise in order to prevent information collection. As a part of the SAR-jammer development there is a need for a program in which relevant jam situations can be simulated. A description is given in this report of the mast thesis work whose aim was to develop such a simulation program.

NTIS

Jammers ; Jamming ; Synthetic Aperture Radar

20020011603 National Defence Research Establishment , Dept. of Command and Control Warfare Technology , Linkoeping, Sweden

A Visible Surface Ray Tracing Algorithm for Radio Channel Multipath Predictions ***Stralgangsalgoritm foer Prediktering av Flervaegsutbredning pa Radiokanalen***

Rundgren, M. ; Nov. 1999 ; 48p ; In Swedish

Report No.(s): PB2001-108099 ; FOA-R-99-01277-504-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

The planning of radio communication systems usually involves some terrain data based wave propagation calculations. For digitally broadband systems, simply using the terrain height profile, between the transmitter and receiver, is not enough. Terrain obstacles beside the direct propagation path generates multipath components that can cause serious problems, and therefore it is by interest to find these terrain obstacles. When the matrices with terrain data elements that one search through becomes large, effective algorithms are important to quickly find the most important propagation paths. This report investigates an adaptive algorithm that finds propagation paths with the help of ray tracing. A polygon model of the terrain is used in the simulations. That model consists of rectangles that have been constructed from a terrain height data base. The algorithm is compared with a simple method that explicitly checks every terrain polygon to determine if it makes a contribution or not. The algorithm is faster only when most of the terrain surface is in shadow.
NTIS
Algorithms ; Ray Tracing ; Radio Communication

20020011737 National Inst. of Standards and Technology , Electronics and Electrical Engineering Lab. , Boulder, CO USA
Dielectric and Conductor-Loss Characterization and Measurements on Electronic Packaging Materials
Baker-Jarvis, J. ; Janezic, M. D. ; Riddle, B. ; Holloway, C. L. ; Paulter, N. G. ; July 2001 ; 164p ; In English
Report No.(s): PB2001-107072 ; NIST/TN-1520 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
This is an overview of dielectric measurement methods and metrology on substrate materials used in electronic packaging. These substrates include low-temperature co-fired ceramic, high-temperature co-fired ceramic substrates, printed wiring board, and other packaging materials. The most commonly used methods are presented. We place particular emphasis on methods that can be used nondestructively either in the laboratory or on the assembly line. We begin with an overview of pertinent electrical properties of substrate materials and conductors. We then describe frequency-dependent metal losses on conductors. We also overview cavity and dielectric resonators, full-sheet resonance, coaxial probe, stripline, and capacitive methods. The frequency range of applicability and typical uncertainties associated with the methods are summarized. We also present measurement results of many substrate materials.
NTIS
Conductors ; Electrical Properties ; Electronic Packaging ; Metrology ; Substrates ; Dielectric Loss

20020011869 Helsinki Univ. of Technology , Dept. of Electrical and Communications Engineering , Espoo, Finland
Helsinki University of Technology, Networking Laboratory *Annual Report , 2000*
Haenninen, A. ; 2001 ; 36p ; In English
Report No.(s): PB2002-100326 ; Copyright ; Avail: National Technical Information Service (NTIS)
The Laboratory of Telecommunications Technology is active in Research in the areas of networking technology and teletraffic theory. Currently the focus of our research is on enhancing the Internet technology with capabilities that are needed for it becomes the all services technology. These capabilities include Quality of Service mechanisms, a set of new protocols, improved security and interoperability solutions with legacy networks. We give graduate and post-graduate courses in data communications including the Internet technology, in circuit switched networking, in switching, in teletraffic theory and in protocol and service development. In year 2000, Laboratory staff published three journal papers and 27 papers in conferences. In 2000, two Licentiate degrees and 33 M.Sc degrees were awarded to the students of our Laboratory.
NTIS
Telecommunication ; Universities ; Research Projects ; Communication Networks ; Data Transmission ; Interoperability

20020012271 National Defence Research Establishment , Linkoeping, Sweden
Determination of Surface Curvature with Radar Polarimetry. Study of Spheroids *Bestaemning av Ytors Kroekning med Radarpolarimetric. Studie av Sfaeroider*
Berlin, H. ; Loethegaerd, J. ; Sume, A. ; Sep. 2000 ; 106p ; In Swedish
Report No.(s): PB2001-108443 ; FOA-R-00-01602-408-SE ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
The report describes work on the possibility of using radar polarimetry for form determination of objects with doubly curved, smooth, convex contours. The work has been done within a former Target Recognition project in 1996-1999, and a Multifunction Radar and Target Recognition project in 2000 at the Defense Research Establishment (FOA). Spheroids have been chosen to represent the object class; one prolate and two oblate aluminium objects have been manufactured. The electromagnetic properties have been investigated both theoretically and experimentally. For theory development, a cooperation has been established with the Department of Electromagnetic Theory at Lund Institute of Technology, that carried out this part, while measurements and their evaluation were made at the FOA. The principal part of the work has consisted of the investigation of a previously known relation in the literature, which expresses the difference between the two principal curvatures in the specular reflection point of

an object, in the phase difference between two orthogonally polarized specular returns. Together with an amplitude measurement (cross section) it is possible to determine, individually, the two principal radii of curvature in the reflection point.
NTIS
Polarimetry ; Target Recognition ; Spheroids ; Electromagnetic Properties ; Electromagnetism

20020012272 National Defence Research Establishment , Linkoeping, Sweden
Detection and Direction Finding of Spread Spectrum Signals Using Correlation
Elbornsson, U. ; Feb. 2001 ; 76p ; In Swedish
Report No.(s): PB2001-108442 ; FOI-R-0030-SE ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche

In this report a method for detection and direction finding of spread spectrum signals is discussed. The method is based on correlation between two signals which are received by two synchronous spatially separated antennas. The method has been evaluated for direct sequence spread spectrum signals in the high frequency band. Spread spectrum signals have been simulated and added to background noise received in the high frequency band. The spread spectrum has been achieved by BPSK-, QPSK- and MSK-modulation. Calculations in MATLAB have shown that the method works satisfactorily for the BPSK- and QPSK-modulated spread spectrum signals when the Signal-to-Interference Ratio exceeds -20 dB.
NTIS
Signal Detection ; Spread Spectrum Transmission ; Direction Finding ; Frequency Shift Keying

20020012275 National Defence Research Establishment , Div. of Command and Control Warfare , Linkoeping, Sweden
Analysis of Intersystem Interference during Co-Location of Frequency-Hopping Systems ***Telekonfliktanalys vid taet Samgruppering av Frekvenshoppande Radiosystem***
Linder, S. ; October 1999 ; 16p ; In Swedish
Report No.(s): PB2001-108128 ; FOA-R-99-01211-504-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

In this report, four different models, with different degrees of accuracy of the frequency spectrum, are compared. The comparison is made with respect to the bit error probability on a receiver co-located to one, or several, frequency-hopping transmitters. The results are derived for a frequency-hopping system working with minimum shift keying (MSK) in the frequency region 30-88 MHz. It is shown that for short co-location distances, disregarding other emissions than the desired output, the bit error probability (BEP) on the co-located radio receiver will be seriously underestimated. If the BEP is underestimated it can lead to severe communication problems, such as a decreased operating range of the radio system. Furthermore, underestimating the interference problem can considerably increase the cost for the system as it is in generally very expensive to handle interference problems afterwards. Thus, careful interference analysis is necessary to avoid communication as well as economic problems for complex systems containing co-located radio systems.
NTIS
Error Analysis ; Frequency Distribution ; Frequency Hopping ; Bit Error Rate

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20020006045 System Design Evaluation Ltd. , Arlington, VA USA
Aircartridge Technology
Pepper, Dick ; Holsboer, Hank ; Aug. 13, 2001 ; 21p ; In English ; Original contains color images ; Sponsored by NDIA. The original document contains color images. Contains viewgraphs only
Report No.(s): AD-A394832 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The presentation of viewgraphs describes AirCartridge technology, including the air munition concept, product range and benefits, energy comparison, the AirCartridge technology and kinematics model, methodology, trials, results and validation, and system monitoring.
DTIC
Weapons ; Cartridges

20020006069 Brookhaven National Lab. , Upton, NY USA

Study of rapid cavity tuning

Zhao, ; Jul. 12, 2001 ; 25p ; In English

Report No.(s): DE2001-785368 ; BNL-68561 ; No Copyright ; Avail: Department of Energy Information Bridge

An FFAG moot likely requires cavity tuning. The cavity must also have a very high gradient. to satisfy both the high power and rapid tuning requirements is a big challenge. Detailed investigation of the possibility is addressed. Included are general thoughts, dual-loop and simple loop analyses, and a study of using ferrite or PIN diodes. Also proposed is a phase control scheme, which may be a better solution if the needed components can be developed. Finally, an energy analysis reveals the difficulty of high power tuning. tuning. The cavity must also have a very high gradient. to satisfy both the high power and rapid tuning requirements is a big challenge. Detailed investigation of the possibility is addressed. Included are general thoughts, dual-loop and simple loop analyses, and a study of using ferrite or PIN diodes. Also proposed is a phase control scheme, which may be a better solution if the needed components can be developed. Finally, an energy analysis reveals the difficult of high power tuning. NTIS

Cavity Resonators ; Tuning ; Phase Control

20020006123 Sandia National Labs. , Albuquerque, NM USA

Kovar Micro Heat Pipe Substrates for Microelectronic Cooling

Benson, D. A. ; Burchett, S. N. ; Kravitz, S. H. ; Robino, C. V. ; Schmidt, C. ; Apr. 01, 1999 ; 55p ; In English

Report No.(s): DE2001-7792 ; SAND99-0714 ; No Copyright ; Avail: Department of Energy Information Bridge

We describe the development of a new technology for cooling microelectronics. This report documents the design, fabrication, and prototype testing of micro scale heat pipes embedded in a flat plate substrate or heat spreader. A thermal model tuned to the test results enables us to describe heat transfer in the prototype, as well as evaluate the use of this technology in other applications. The substrate walls are Kovar alloy, which has a coefficient of thermal expansion close to that of microelectronic die. The prototype designs integrating micro heat pipes with Kovar enhance thermal conductivity by more than a factor of two over that of Kovar alone, thus improving the cooling of micro-electronic die. NTIS

Cooling ; Fabrication ; Heat Pipes ; Microelectronics ; Substrates ; Cooling Systems

20020006164 National Renewable Energy Lab. , Golden, CO USA

Market-Driven EFG Modules ***Annual Report , 14 Dec. 1996 - 13 Feb. 1998***

Dec. 15, 1998 ; 38p ; In English

Report No.(s): DE2001-6903 ; NREL/SR-520-25817 ; No Copyright ; Avail: Department of Energy Information Bridge

This report summarizes the progress made at ASE Americas Inc. during Phase II of this subcontract. Accomplishments under Task 4: Wafers include optimization of edge-defined film-fed growth (EFG) crystal growth variables, leading to reduced crystal stresses and improved wafer flatness; increased die run length due to improvements in the design of furnace components; construction and testing of EFG growth furnace enclosure; reduction of EFG wafer thickness from 300 (micro)m for 50% of all standard production material; implementation of new equipment to reduce costs of silicon feedstock sorting prior to EFG crystal growth with a 3% increase in silicon feedstock utilization; and development work demonstrating the laser cutting of EFG wafers at higher speeds and with reduced silicon damage. Accomplishments under Task 5: Cells include characterization of cells after diffusion as preliminary work toward improving diffusion conditions and improving cell efficiency; demonstration of a continuous process to remove phosphorous glass from diffused wafers, reducing chemical consumption and hazardous waste by 98%; development of statistical process control methods to improve cell production process control; the use of design of experiments to study interactions between processing at various steps in cell manufacturing, and to develop strategies for productivity improvements; improvements in EFG cell efficiency due to the reduction in average wafer thickness; design and construction of equipment for producing cells with an improved grid design; and demonstration of average efficiencies over 14.1% on production lots of EFG cells. Accomplishments under Task 6: Modules include production and successful testing of prototypes of a lower-cost module diode housing; successful demonstration of a module design that greatly improves collection of light from space between cells in modules; testing of new encapsulants and lamination processes to demonstrate reduced lamination time, improved yield and enhanced durability; and completion of options study for lower-cost module frames, and development of a frameless module design using mounting clamps. NTIS

Crystal Growth ; Solar Cells ; Production Engineering

20020006214 Army Research Lab. , Sensors Directorate , Adelphi, MD USA

Design Procedures for a Frequency-Scanned Traveling Wave Antenna, Part 1: Air-Filled Waveguide ***Final Report , Jun.-Sep. 2000***

Coburn, William ; Wasylkiwskyj, Wasyl ; Sep. 2001 ; 73p ; In English

Contract(s)/Grant(s): Proj-A140

Report No.(s): AD-A395430 ; ARL-TR-791 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

A leaky waveguide antenna is investigated through a combination of theoretical analysis and numerical simulation. We developed a design procedure based on the analysis of Goldstone and Oliner for an aperture in the narrow wall of a rectangular waveguide. We can phase scan the antenna by adjusting the propagation constant of the guiding structure, and we can frequency scan it by taking advantage of frequency dispersive behavior. A combination of frequency and phase scanning can be used to steer the beam. We describe how the aperture illumination function is synthesized for a constant width aperture and we present the design equations. We use a numerical simulation of the leaky waveguide section to obtain the radiation efficiency. We then calculate the realized gain to evaluate the frequency scan range and radiation pattern characteristics. The results demonstrate that the main beam position can be scanned in the range of 100 to 300 from broadside over a narrow frequency range without corrupting the radiation pattern.

DTIC

Waveguide Antennas ; Frequency Scanning ; Beams (Radiation)

20020006228 National Univ. of Singapore , Singapore

11th IEEE Workshop on Statistical Signal Processing Proceedings

Aug. 17, 2001 ; 640p ; In English , 6-8 Aug. 2001 , Singapore

Contract(s)/Grant(s): F62562-01-M-9118

Report No.(s): AD-A395373 ; AOARD-CSP-011024 ; No Copyright ; Avail: CASI ; A99 , Hardcopy ; A06 , Microfiche

This is an interdisciplinary conference. Topics include: (1) Detection, Estimation, and Classification Theory, Time-Frequency signal analysis; (2) Non-stationary signal processing, Multirate processing and wavelets; (3) Signal and system modeling; (4) Non-Gaussian and non-linear signal processing; (5) Sensor array processing; (6) Signal processing for communications; (7) Space-time coding and modulation; (8) Computer-based statistical methods for signal processing; and (9) Applications in areas including communications, GPS, radar, sonar, biomedicine, machine diagnostics, etc.

DTIC

Signal Processing ; Mathematical Models ; Data Processing ; Conferences

20020006233 Space and Naval Warfare Systems Command , San Diego, CA USA

COMWIN Antenna Project: Fiscal Year 2001 ***Final Report***

Adams, R. C. ; Abramo, R. S. ; Von Mueller, D. W. ; Aug. 2001 ; 79p ; In English ; Original contains color images

Report No.(s): AD-A395361 ; TR-1866 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

The Combat Wear Integration (COMWIN) project seeks to develop a man-carried antenna that transmits or receives a signal at any frequency from 2 MHz to 2 GHz while disguising the radio operator's identity. The first goal is to make the antenna compatible with the hand-held radio that will be manufactured in accordance with the Operational Requirements Document of the Joint Tactical Radio (JTR). The second goal is to make it harder for snipers to target the radio operators and disrupt command, control, and communications at the squad level. Integrating the antenna into the uniform of the soldier or marine achieves both goals. During FY 2001, the models of a vest antenna, a helmet antenna, and a whole-body antenna were fabricated and tested. The three antennas have now been integrated into a system that demonstrates the potential for ultra-wideband communication while disguising the radio operator. The basic design seems effective. Problems such as asymmetry between transmit and receive for some frequencies and radiation hazard can probably be solved by minor variations of the basic design.

DTIC

Antennas ; Wideband Communication ; Tactics ; Fabrication ; Radio Equipment

20020006235 California Inst. of Tech. , Pasadena, CA USA

A Conducting Polymer-Based Electronic Nose for Landmine Detection ***Final Report , Apr. 1997-Sep. 2000***

Lewis, Nathan S. ; Goodman, Rodney M. ; Grubbs, Robert H. ; Oct. 10, 2001 ; 163p ; In English

Contract(s)/Grant(s): DAAK60-97-K-9503

Report No.(s): AD-A395352 ; NATICK-TR-02/002 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

This program was part of DARPA's 'Dog Nose' initiative to develop landmine detection technology based upon the chemical signature of the mine explosive charge. The focus of this DARPA-sponsored project was to exploit the exciting breakthrough

technology developed recently at Caltech that forms the basis for a low power, simple, manufacturable 'electronic nose'. This nose-on-a-chip involves chemically sensitive resistors, whose signals reveal the identification and concentration of vapors in a fashion analogous to that of the mammalian olfactory system. This technology has been developed into a landmine detection system, based on the characteristic chemical signature of mines, that operates in real-time through a VLSI-compatible Si process. DTIC

Electronic Equipment ; Mine Detectors ; Mines (Ordnance)

20020006300 NASA Ames Research Center , Moffett Field, CA USA

Quantum Mechanical Study of Nanoscale MOSFET

Svizhenko, Alexei , NASA Ames Research Center , USA ; Anantram, M. P. , NASA Ames Research Center , USA ; Govindan, T. R. , NASA Ames Research Center , USA ; Biegel, Bryan , NASA Ames Research Center , USA ; [2001] ; 8p ; In English ; Quantum Transport in Semiconductors , 17-22 Jun. 2001 , Maratea , Italy

Contract(s)/Grant(s): NAS2-14303 ; RTOP 519-40-12 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The steady state characteristics of MOSFETS that are of practical Interest are the drive current, off-current, dope of drain current versus drain voltage, and threshold voltage. In this section, we show that quantum mechanical simulations yield significantly different results from drift-diffusion based methods. These differences arise because of the following quantum mechanical features: (I) polysilicon gate depletion in a manner opposite to the classical case (II) dependence of the resonant levels in the channel on the gate voltage, (III) tunneling of charge across the gate oxide and from source to drain, (IV) quasi-ballistic flow of electrons. Conclusions dI/dV versus V does not increase in a manner commensurate with the increase in number of subbands. - The increase in dI/dV with bias is much smaller then the increase in the number of subbands - a consequence of bragg reflection. Our calculations show an increase in transmission with length of contact, as seen in experiments. It is desirable for molecular electronics applications to have a small contact area, yet large coupling. In this case, the circumferential dependence of the nanotube wave function dictates: - Transmission in armchair tubes saturates around unity - Transmission in zigzag tubes saturates at two.

Author (revised)

Drainage ; Diffusion ; Oxides ; Electrons

20020006306 NASA Glenn Research Center , Cleveland, OH USA

Stator and Rotor Flux Based Deadbeat Direct Torque Control of Induction Machines

Kenny, Barbara H. , NASA Glenn Research Center , USA ; Lorenz, Robert D. , Wisconsin Univ. , USA ; September 2001 ; 12p ; In English ; 2001 Industry Applications Society Annual Meeting , 30 Sep. - 5 Oct. 2001 , Chicago, IL , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA

Contract(s)/Grant(s): RTOP 755-1A-11

Report No.(s): NASA/TM-2001-211100 ; E-12945 ; NAS 1.15:211100 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A new, deadbeat type of direct torque control is proposed, analyzed, and experimentally verified in this paper. The control is based on stator and rotor flux as state variables. This choice of state variables allows a graphical representation which is transparent and insightful. The graphical solution shows the effects of realistic considerations such as voltage and current limits. A position and speed sensorless implementation of the control, based on the self-sensing signal injection technique, is also demonstrated experimentally for low speed operation. The paper first develops the new, deadbeat DTC methodology and graphical representation of the new algorithm. It then evaluates feasibility via simulation and experimentally demonstrates performance of the new method with a laboratory prototype including the sensorless methods.

Author

Algorithms ; Detection ; Feasibility Analysis ; Rotors ; Stators ; Torque ; Automatic Control

20020006325 Communications Research Lab. , Japan

Antenna System Improvements: 34-m Antenna System Improvement

Kawai, Eiji , Communications Research Lab. , Japan ; Kurihara, Noriyuki , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Takaba, Hiroshi , Communications Research Lab. , Japan ; Osaki, Hiro , Communications Research Lab. , Japan ; Okubo, Hiroshi , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 59-71 ; In Japanese ; Copyright ; Avail: Issuing Activity

The 34-m antenna at Kashima in Japan was constructed in 1988 as the main station of the Western Pacific VLBI network. The antenna was manufactured by TIW (existing VertexRSI) of the U.S.A. About thirteen years have passed since it was constructed. Since then, the radio telescope has been used for both geodetic VLBI and radio astronomy studies. The control system was continuously improved to provide better performance. This paper describes these improvements and other technical enhancements, focusing mainly on the hardware.
Author
Antenna Design ; Very Long Base Interferometry ; Radio Telescopes ; Optical Fibers ; Augmentation

20020006783 Puerto Rico Univ. , Dept. of Physics , Mayaguez, Puerto Rico
Organic Crystal Films for Electro-Optic Modulator ***Final Report , 1 Aug. 1999-31 Jul. 2001***
Leyderman, Alexander ; Sarkisov, Sergey S. ; Sep. 10, 2001 ; 17p ; In English ; Original contains color images
Contract(s)/Grant(s): F49620-99-1-0308
Report No.(s): AD-A395551 ; AFRL-SR-BL-TR-01-0528 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
During the period of performance from August 1st, 1999 to July 31st, 2001 the following was done: KD(*)P and N-(4-nitrophenyl)-(L)-prolinol (NPP) single crystals in longitudinal E-O modulator configuration have been studied. The E-O coefficient for KD(*)P, which is in good agreement with literature data, and electro-optical parameters for NPP were obtained. The latter are much higher that received by other authors, which is explained by a substantial stress in the crystal due to the conversed piezoelectric effect. An E-O thin film modulator integrated with input and output coupling prisms was designed. Successful injection, propagation and decoupling light from the experimental prototype of the modulator were demonstrated. Applicability of different shape prisms for light coupling was explored. An opportunity to grow a thin organic film in a cell comprising a cell itself and a prism used as a lid, similar to the plate-guided method was studied. Mr. Javier Wu defended his thesis 'Nonlinear Optical Properties of Organic Thin Film Materials'. Javier continues his studies in the Ph. D. program of the University of PR. Mr. Zhifu Liu defended his Ph.D. thesis 'Electro-optical effect in single crystal films', and got a position with industry.
DTIC
Modulators ; Optical Properties ; Electro-Optics

20020006789 Kent State Univ. , OH USA
Support of Scientific Symposium "Organic Thin Films for Photonic Applications" ***Final Report***
Twieg, Robert J. ; Jul. 16, 2001 ; 10p ; In English
Contract(s)/Grant(s): F49620-00-1-0276 ; Proj-1651-05
Report No.(s): AD-A395539 ; AFRL-SR-BL-TR-01-0532 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The proposal to the AFOSR 'Support of Scientific Symposium: Organic Thin Films for Photonic Applications' was prepared by Robert Twieg. The symposium transpired during the American Chemical Society National meeting in Washington, DC the week of August 20-25, 2000. Symposium events were held in the JW Marriott Motel from Sunday August 20 to Wednesday August 23. Robert Twieg was the principle organizer of this symposium. There were three co-organizers for the symposium but none of them were immediately involved in the preparation of this proposal or its execution. These individuals were: Dr. Robert Norwood (Photon-X, Inc., co-General Chair), Prof. Alex Jen (University of Washington, Program Chair), Prof. Randy Heflin (Virginia Tech, co-Program Chair). AFOSR support was used for the partial reimbursement of travel and registration expenses for participants who completed a form at the meeting requesting compensation and explaining their role in the symposium. Such support to participants is critical to draw accomplished participants from overseas, to support new faculty careers and also to support student participation in the meeting.
DTIC
Thin Films ; Photons ; Organic Materials

20020006824 Oak Ridge National Lab. , TN USA
Fault Current Tests of a 5-m HTS Cable
Lue, J. W. ; Feb. 19, 2001 ; 4p ; In English
Report No.(s): DE2001-775423 ; P01-109909 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The first industrial demonstration of a three-phase high-temperature superconducting transmission power cable at the Southwire manufacturing complex is in progress. One crucial issue during operation of the 30-m HTS cables is whether they could survive the fault current (which can be over an order of magnitude higher than the operating current) in the event of a short-circuit fault and how HTS cables and the cryogenic system would respond. Simulated fault-current tests were performed at ORNL on a 5-m cable. This single-phase cable was constructed in the same way as the 30-m cables and is also rated for 1250 A at 7.2 kV ac line-to-ground voltage. Tests were performed with fault-current pulses of up to 15 kA (for 0.5 s) with pulse lengths of up to

5 s (at 6.8 kA). Although a large voltage drop was produced across the HTS cable during the fault-current pulse, no significant changes in the coolant temperature, pressure, or joint resistance were observed. The cable survived 15 simulated fault-current shots without any degradation in its V-I characteristics.
NTIS
Electrical Faults ; High Temperature Superconductors ; Electric Potential ; Cryogenics ; Short Circuits

20020006851 Kansas City Plant , Kansas City, MO USA
Resistor Printing on Dielectric
Barner, G. E. ; Jan. 19, 2000 ; 100p ; In English
Report No.(s): DE2001-750299 ; KCP-613-6251 ; No Copyright ; Avail: Department of Energy Information Bridge
Design and processing parameters were developed for a new thick film resistor system for use in the fabrication of thick film hybrid microcircuits at Honeywell Federal Manufacturing & Technologies. This characterization was performed in two phases. First, resistor application processes (screen printing, drying, and firing) were characterized. Second, the characterization of the laser trimming process used to adjust resistor values to the final acceptable values was performed.
NTIS
Dielectrics ; Manufacturing ; Microelectronics ; Printing ; Resistors

20020006853 Lawrence Livermore National Lab. , Livermore, CA USA
Improvements on the accuracy of beam bugs
Chen, Y. J. ; Fessenden, T. ; Aug. 17, 1998 ; 6p ; In English
Report No.(s): DE2001-7495 ; UCRL-JC-130426 ; No Copyright ; Avail: Department of Energy Information Bridge
At LLNL resistive wall monitors are used to measure the current and position used on ETA-II show a droop in signal due to a fast redistribution time constant of the signals. This paper presents the analysis and experimental test of the beam bugs used for beam current and position measurements in and after the fast kicker. It concludes with an outline of present and future changes that can be made to improve the accuracy of these beam bugs. of intense electron beams in electron induction linacs and beam transport lines. These, known locally as 'beam bugs', have been used throughout linear induction accelerators as essential diagnostics of beam current and location. Recently, the development of a fast beam kicker has required improvement in the accuracy of measuring the position of beams. by picking off signals at more than the usual four positions around the monitor, beam position measurement error can be greatly reduced. A second significant source of error is the mechanical variation of the resistor around the bug.
NTIS
Electron Beams ; Linear Accelerators ; Beam Currents ; Diagnosis

20020006874 Helsinki Univ. of Technology , Lab. of Electromechanics , Espoo, Finland
Helsinki University of Technology, Laboratory of Electromechanics Annual Report, 1999
Lestinen, M. ; Jokinen, T. ; 2000 ; 30p ; In English
Report No.(s): PB2001-108109 ; Copyright ; Avail: National Technical Information Service (NTIS)
The Laboratory of Electromechanics was founded in 1980. At that time, the laboratory staff taught the basics of electrical engineering, including electrical machines. Nowadays the research and teaching area of the laboratory is concentrated on rotating electrical machines, transformers, and other equipment converting energy by means of magnetic fields. The laboratory staff also gives lectures in the field of product development. In 1999, the main research projects were High-speed Electrical Machines, Active Magnetic Bearings, Large Ship Motors, Losses in Electrical Machines, Noise and Vibration of AC (alternating current) Machines, and Modeling of Magnetic Components. Most of the research projects are carried out with external funding from the National Technology Agency of Finland (TEKES) and Finnish Industry. The laboratory is involved in several Socrates and Tempus projects. In total 17 foreign students worked in the laboratory during 1999.
NTIS
Electrical Engineering ; Electromechanics ; Universities

20020006891 Army Armament Research, Development and Engineering Center , Fire Support Armament Center , Picatinny Arsenal, NJ USA
High G MEMS IMUs and Common Guidance Smart Ideas for Overwhelming Firepower
Gray, Nigel ; Jun. 18, 2001 ; 22p ; In English ; Proceedings from Armaments for the Army Transformation Conference, 18-20 June 2001 sponsored by NDIA. Contains viewgraphs only
Report No.(s): AD-A394849 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Affordable, high-g, accurate MEMS (MicroElectroMechanicalSystems) IMUs (Inertial Measurement Units) are required for next generation munitions, missiles and other G&N applications. The program has a significant return for the investment across DOD. The program will develop 2 contractors capable of producing low cost MEMs IMU systems at less than $1200/unit in production and DI-GNU systems at less than $1500/unit in production.
Derived from text
Microelectromechanical Systems ; Missiles ; Low Cost ; Inertial Platforms

20020006893 Army Tank-Automotive and Armaments Command , Warren, MI USA
Fuzing and the MEMS Dilemma ***Annual Report***
Fleming, Gary ; Rempfer, Ed ; Apr. 11, 2001 ; 27p ; In English ; Proceedings from the Annual Gun and Ammunition Symposium and Exhibition (36th) 9-12 April 2001 Sponsored by NDIA. Contains viewgraphs only
Report No.(s): AD-A394825 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
MEMS (MicroElectroMechanicalSystems) will integrate with micro and nano electronics to provide today's complicated electromechanical systems on a single chip. MEMS could greatly affect the DOD systems by providing sensor and activator systems with little effect on the parent system. MEMS will continue to grow probably similar to IC's.
Derived from text
Microelectromechanical Systems ; Fuses (Ordnance) ; Systems-On-A-Chip ; Electromechanics

20020008088 Argonne National Lab. , IL USA
Structural and Electrical Properties of Biaxially Textured YBa2Cu3O(7-x) Thin Films on Buffered Ni-Based Alloy Substrates
Li, M. ; Ma, B. ; Jee, Y. A. ; Fisher, B. L. ; Balachandran, U. ; Dec. 07, 2000 ; 17p ; In English
Report No.(s): DE2001-772102 ; ANL/ET/CP-102247 ; No Copyright ; Avail: Department of Energy Information Bridge
Oxide high-T(sub c) superconducting wires and tapes with high critical current density (J(sub c)) are essential in future electrical power applications. Recently, YBa2Cu3O(7-x) (YBCO) thin films grown on Ni-based alloy tapes have attracted intense interest because of their promise for these applications. In order to achieve high J(sub c), buffer layers are necessary for fabricating biaxially aligned YBCO thin films. In our studies, yttria-stabilized zirconia (YSZ) layers were deposited on Ni-based alloy substrate by ion-beam assisted deposition, and CeO2 buffer layers were subsequently deposited on the YSZ layer by pulsed laser deposition (PLD) or electron beam evaporation. In addition, MgO layers were deposited on Ni-based alloy substrates by inclined substrate deposition. Finally, biaxially textured YBCO thin films were deposited on these buffered metallic substrates by PLD under optimized conditions. The orientation and in-plane textures of YBCO and the buffer layers were characterized by X-ray diffraction Theta/2(Theta) scan, phi-scan, and pole figure analysis. The superconductive transition features were examined by measuring inductive T(sub c) and transport J(sub c).
NTIS
Electrical Properties ; Substrates ; Superconducting Films ; YBCO Superconductors ; Dynamic Structural Analysis

20020008107 Oak Ridge National Lab. , TN USA
Development and Test of World's First Industrial High-Temperature Superconducting (HTS) Power Cable
Sinha, U. K. ; Feb. 15, 2001 ; 6p ; In English
Report No.(s): DE2001-775424 ; P01-109911 ; No Copyright ; Avail: Department of Energy Information Bridge
Southwire Company has installed the world's first industrial high-temperature superconducting cable system to power three of its main manufacturing plants. The cable consists of three single-phase, 30-m long cables designed to carry 1250 A at 12.4 kV. The cable is cooled by a liquid nitrogen (LN) system that can supply LN at sub-cooled temperatures down to 72 K and at pressures up to 15 atmospheres. The design of the 30-m cables is based upon two 5-m cable prototypes, which were tested at a specially developed facility at ORNL. In addition to critical current and ac loss measurements, simulated fault-current tests were performed at ORNL on the 5-m cables. Cable terminations were designed to allow smooth transition from the cryogenic temperature and pressure environment of the HTS cable to ambient temperature and pressure for copper cables. A dielectric tape material, Cryoflex(trademark), was also developed for use at cryogenic temperatures.
NTIS
High Temperature Superconductors ; Power Lines ; Cryogenic Temperature

20020008184 Oak Ridge National Lab. , TN USA

Micromechanical Structures Fabrication

Rajic, S. ; May 08, 2001 ; 11p ; In English

Report No.(s): DE2001-786761 ; ORNL/TM-2001/77 ; No Copyright ; Avail: Department of Energy Information Bridge

Work in materials other than silicon for MEMS applications has typically been restricted to metals and metal oxides instead of more ”exotic” semiconductors. However, group III-V and II-VI semiconductors form a very important and versatile collection of material and electronic parameters available to the MEMS and MOEMS designer. With these materials, not only are the traditional mechanical material variables (thermal conductivity, thermal expansion, Young’s modulus, etc.) available, but also chemical constituents can be varied in ternary and quaternary materials. This flexibility can be extremely important for both friction and chemical compatibility issues for MEMS. In addition, the ability to continually vary the bandgap energy can be particularly useful for many electronics and infrared detection applications. However, there are two major obstacles associated with alternate semiconductor material MEMS. The first issue is the actual fabrication of non-silicon micro-devices and the second impediment is communicating with these novel devices. We have implemented an essentially material independent fabrication method that is amenable to most group III-V and II-VI semiconductors. This technique uses a combination of non-traditional direct write precision fabrication processes such as diamond turning, ion milling, laser ablation, etc. This type of deterministic fabrication approach lends itself to an almost trivial assembly process. We also implemented a mechanical, electrical, and optical self-aligning hybridization technique for these alternate-material MEMS substrates.

NTIS

Semiconductors (Materials) ; Fabrication ; Ion Beams ; Microelectromechanical Systems ; Chemical Composition

20020008192 Fermi National Accelerator Lab. , Batavia, IL USA

Single Event Burnout in DC-DC Converters for the LHC Experiments

Rivetta, C. H. ; Sep. 24, 2001 ; 6p ; In English

Report No.(s): DE2001-786645 ; FERMILAB-CONF-01/250-E ; No Copyright ; Avail: Department of Energy Information Bridge

High voltage transistors in DC-DC converters are prone to catastrophic Single Event Burnout in the LHC radiation environment. This paper presents a systematic methodology to analyze single event effects sensitivity in converters and proposes solutions based on de-rating input voltage and output current or voltage.

NTIS

Voltage Converters (DC to DC) ; Electric Potential ; Burnout ; High Voltages

20020008193 Sandia National Labs. , Albuquerque, NM USA

Stereoscopic Height Estimation from Multiple Aspect Synthetic Aperture Radar Images

Delaurentis, ; Doerry, ; Aug. 01, 2001 ; 14p ; In English

Report No.(s): DE2001-786639 ; SAND2001-2585 ; No Copyright ; Avail: Department of Energy Information Bridge

A Synthetic Aperture Radar (SAR) image is a two-dimensional projection of the radar reflectivity from a 3-dimensional object or scene. Stereoscopic SAR employs two SAR images from distinct flight paths that can be processed together to extract information of the third collapsed dimension (typically height) with some degree of accuracy. However, more than two SAR images of the same scene can similarly be processed to further improve height accuracy, and hence 3-dimensional position accuracy. This report shows how.

NTIS

Synthetic Aperture Radar ; Computerized Simulation ; Radar Imagery ; Extraction

20020008200 Oak Ridge National Lab. , TN USA

Crada final report for crada number ORNL98-0521: development of. An electric bus inverter based on ORNL auxiliary resonant tank (ART) soft-switching technology

Ayers, C. W. ; May 08, 2001 ; 18p ; In English

Report No.(s): DE2001-786322 ; C/ORNL98-0521 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Power Electronics and Electric Machinery Research Center (PEEMRC) of Oak Ridge National laboratory (ORNL) has for many years been developing technologies for power converters for motor drives and may other applications. Some of the research goals are to improve efficiency and reduce audible and electromagnetic interference noise generation for inverters and the driven loads. The converters are being required to produce more power with reduced weight and volume, which requires improvements in heat removal from the electronics, as well as improved circuit designs that have fewer electrical losses. PEEMRC

has recently developed and patented a soft-switching inverter topology called an Auxiliary Resonant Tank (ART), and this design has been tested and proven at ORNL using a 10-kW laboratory prototype.
NTIS
Inverters ; Electromechanical Devices ; Electromagnetic Interference ; Power Converters

20020008203 Fermi National Accelerator Lab. , Batavia, IL USA
Development of a high density pixel multichip module at Fermilab
Zimmermann, S. ; Sep. 11, 2001 ; 5p ; In English
Report No.(s): DE2001-786173 ; FERMILAB-CONF-01/247-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

At Fermilab, a pixel detector multichip module is being developed for the Bte-V experiment. The module is composed of three layers. The lowest layer is formed by the readout integrated circuits (IC's). the back of the IC's is in thermal contact with the supporting structure, while the top is flip-chip bump-bonded to the pixel sensor. A low mass flex-circuit interconnect is glued on the top of this assembly, and the readout IC pads are wire-bounded to the circuit. This paper presents recent results on the development of a multichip module prototype and summarizes its performance characteristics.
NTIS
Chips (Electronics) ; Pixels ; Modules ; Integrated Circuits

20020008244 Virginia Polytechnic Inst. and State Univ. , Dept. of Aerospace and Ocean Engineering , Blacksburg, VA USA
Development and Testing of the Virginia Tech Doppler Global Velocimeter
Jones, Troy B. ; Simpson, Roger L. ; Feb. 2001 ; 112p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0425
Report No.(s): AD-A395744 ; VPI-AOE-271 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

A new laser based flow interrogation system, capable of simultaneous measurement of planar three-component velocity data, was constructed and tested. The Virginia Tech Doppler Global Velocimeter (DGV) system was designed for use in the Virginia Tech Stability Wind Tunnel as a tool for investigating complex three-dimensional separated flow regions. The systems was designed for robustness, ease of use, and for acquisition of low uncertainty velocity data. A series of tests in the Stability Tunnel were conducted to determine how well the new DGV system met these goals. Extensive calibration tests proved the system is capable of measuring the frequency shifts of scattered laser light, and therefore velocity. However, equipment failures and inadequate flow seed density prevented accurate velocity measurements in the separated wake region behind a 6:1 prolate spheroid. Detailed uncertainty analysis techniques demonstrated that, under the proper conditions, the system is capable of making velocity measurements with approximately +/- 2 m/s uncertainty.
DTIC
Doppler Effect ; Velocity Measurement ; Charge Coupled Devices ; Frequency Shift ; Flow Distribution

20020008986 Villanova Univ. , PA USA
Investigation of a New Class of Low-Profile Multi-Layer Printed Antennas ***Final Report , 1 Oct. 1997-30 Sep. 2001***
Hoorfar, Ahmad ; Oct. 2001 ; 32p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0090
Report No.(s): AD-A396002 ; TR-527615 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The annual reports, previously submitted to the ONR in 1998, 1999 and 2000, have detailed most of our research work on this project. The present report only covers the progress made during the October 2000 - September 2001 interim period. We have made progress in the following area: (1) The previously developed multi-layered gain enhancement technique for printed antennas has been extended to design of proximity-fed and aperture-fed antennas for millimeter-wave applications. Design optimization for the case of a four-layer proximity-coupled patch at a frequency of 31 GHz is presented and its performance in terms of gain, pattern and surface wave efficiency is analyzed. It is shown that conductor losses using this gain enhancement technique, is significantly less than that in a standard microstrip array with a similar gain. The mutual coupling and surface-wave effects in a linear array of such radiating structures are also studied. In addition, an alternative high gain technique, based on the Yagi-like concept that utilizes parasitic elements at the interface between layers has also been investigated in detail for millimeter-wave applications. (2) Effect of curvature on gain enhancement of a multi-layered microstrip antenna is investigated by analyzing the radiated fields of a patch in a multi-layered cylindrical surface. It is shown that curvature effect could significantly change the

maximum gain conditions previously reported in the literature for a planar multi-layered microstrip antenna. Development of a FDTD code for accurate characterization of the gain-enhanced printed antennas on a cylindrical surface, is presently in progress.
DTIC
Design Optimization ; Antenna Arrays ; Finite Difference Theory ; Planar Structures ; Printed Circuits ; Radar Antennas ; Antenna Feeds ; Yagi Antennas ; Microstrip Antennas

20020008994 Air Force Research Lab. , Rome, NY USA
Complex Band-Pass Filters for Analytic Signal Generation and Their Application
Noga, Andrew J. ; Jul. 2001 ; 29p ; In English
Contract(s)/Grant(s): Proj-459E
Report No.(s): AD-A395963 ; AFRL-IF-RS-TM-2001-1 ; AFRL-IF-RS-TM-2001-1 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The generation of the pre-envelope and complex envelope of an arbitrary band-pass component of a digitized signal is presented. In particular, the complex band-pass filter method of analytic signal generation is generalized. Synchronization is also addressed and an example application of interference cancellation is given.
DTIC
Bandpass Filters ; Signal Processing ; Signal Generators

20020008995 Naval Postgraduate School , Monterey, CA USA
Energetic Electron Generation by Forward Stimulated Raman Scattering Using -.35 and 0.53 Micron Laser Light in a Plasma
Ortelli, Michael A. ; Jun. 2001 ; 54p ; In English
Report No.(s): AD-A395962 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This research investigates the use of high powered lasers to produce 50-100 keV x ray sources for applications for programs such as Stockpile Stewardship and nuclear weapons effects testing (NWET). to produce these x ray sources requires irradiating targets with intense laser light to efficiently generate high energy electrons. Stimulated Raman scattering (SRS) of intense laser light produces electron plasma waves, which in turn generate high energy electrons. to make a high energy x ray source, the maximization of this laser driven instability is desired. Using computer simulations, we show that SRS can be driven by using a combination of frequency tripled and a 'seed' beam of frequency doubled Neodymium laser light in a plasma of the appropriate density. Electron plasma waves with a high phase velocity are produced, which trap electrons and accelerate them to high energy. These energetic electrons will in turn generate high energy x rays via collisions with nearby dense material. By adjusting the angle between the 0.35 micrometers and 0.53 micrometers laser beams, the characteristic temperature of the heated electrons (and the x-rays) can be varied. We show one and two dimensional simulations and illustrate the important role that laser driven ion fluctuations play.
DTIC
Laser Beams ; Raman Spectra ; Plasma Waves ; Electrons ; Particle Production ; X Ray Sources ; Irradiation ; Stimulated Emission

20020009126 Oak Ridge National Lab. , TN USA
Moisture Sensor for Sulfur Nexafluoride (SF6)-filled Circuit Breakers
Sauers, I. ; Apr. 27, 2001 ; 14p ; In English
Report No.(s): DE2001-786766 ; C/ORNL96-0398 ; No Copyright ; Avail: Department of Energy Information Bridge
Measurements at ORNL were made on the Kahn moisture sensor which Doble Engineering wants to evaluate for use in SF6 circuit breakers. Tests conducted at ORNL indicate that vacuum conditions, as might be found in SF6 circuit breakers prior to filling with SF6, could lead to significant changes in calibration, resulting in erroneous readings of moisture content. Similar effects might also be observed in cases where SF6 byproducts are present, due the reactivity of some of these byproducts with water.
NTIS
Circuit Breakers ; Moisture Content ; Galactic Clusters

20020009133 National Renewable Energy Lab. , Golden, CO USA

Photovoltaic Energy Program Overview, Fiscal Year 2000

Weis-Taylor, P. ; Mar. 02, 2001 ; 27p

Report No.(s): DE2001-778895 ; DOE/GO-102001-1168 ; NREL/BR-520-28976 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This 'annual report' details the FY 2000 achievements of the U.S. Department of Energy PV Program in the categories of Research and Development, Technology Development, and Systems Engineering and Applications. Highlights include development of a record-breaking concentrator solar cell that is 32.4% efficient; fabrication of a record CIGS (copper indium gallium diselenide) cell at 18.8% efficiency; sharing an R and D 100 award with Siemens Solar Industries and the California Energy Commission for development and deployment of commercial CIS thin-film modules; and support for the efforts of the PV Industry Roadmap Workshop.

NTIS

Systems Engineering ; Thin Films ; Photovoltaic Effect

20020009200 Army Research Lab. , Sensors Directorate , Adelphi, MD USA

X-Ray Shielding Requirements for a Reltron ***Final Report , Jun. 1999-Dec. 2000***

Kenyon, Christopher S. ; Oct. 2001 ; 24p ; In English

Report No.(s): AD-A396154 ; ARL-TR-2440 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Radiological dose rates from X-rays produced by a reltron (relativistic electron tube) microwave tube are calculated via standard electron-photon Monte Carlo transport software from the Integrated TIGER Series developed by Sandia National Laboratories, Albuquerque, NM. Comparison of an extrapolation of this dose rate for several hypothetical thicknesses of lead shielding surrounding this reltron with the standard maximum worker-allowed radiation level predicts the thickness of lead shielding required in the design of the reltron. Using worst case modeling for the X-rays, the required amount of lead shielding is, roughly, 1 ton.

DTIC

X Rays ; Electron Tubes ; Radiation Dosage

20020009627 Brookhaven National Lab. , Upton, NY USA

Tuning Shims for High Field Quality in Superconducting Magnets

Gupta, ; Anerella, ; Cozzolino, ; Jun. 11, 1995 ; 5p ; In English

Report No.(s): DE2001-777780 ; BNL-68137 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A high field quality in quadrupoles for the interaction region is crucial to the luminosity performance of high energy colliders such as the Relativistic Heavy Ion Collider (RHIC). The field quality in magnets is limited in part by manufacturing tolerances in the parts and assembly. A tuning shim method has been developed to reduce the relative field errors ((Delta)B/B) from approximately 10(exp -4) to approximately 10(exp -5) at 213 of the coil radius. Eight tuning shims having a variable thickness of iron are inserted after the construction and measurement of field harmonics in the magnet. In this paper the tuning shim technique is described for RHIC interaction region quadrupoles. The results of calculations and measurement are also presented.

NTIS

Quadrupoles ; Superconducting Magnets ; Tuning

20020009628 Brookhaven National Lab. , Upton, NY USA

Field Quality Control Through the Production Phase of RHIC Arc Dipoles

Gupta, ; Jain, ; Kahn, ; May 01, 1995 ; 3p ; In English

Report No.(s): DE2001-777779 ; BNL-68136 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The field quality in the arc dipoles built thus far for the Relativistic Heavy Ion Collider (RHIC) not only meets machine requirements, but is significantly better than that expected from scaling laws based on previous large scale superconducting magnet production for particle accelerators. In this paper we describe the evolution of the present cross section and the design philosophy that has led to these improvements. The techniques described here have been found quite efficient to adopt in the production environment, where schedule and cost considerations become important. Moreover, the techniques developed during the research and development program have resulted in making the saturation induced harmonics negligible, despite the fact that the iron is very close to the coil.

NTIS

Particle Accelerators ; Quality Control

20020009629 Brookhaven National Lab. , Upton, NY USA

Field Quality Improvements in Superconducting Magnets for RHIC

Gupta, ; Jain, ; Kahn, ; Morgan, ; Thompson, ; Jun. 27, 1994 ; 6p ; In English

Report No.(s): DE2001-777778 ; BNL-68135 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A number of techniques have been developed and tested to improve the field quality in the superconducting dipole and quadrupole magnets to be used in the Relativistic Heavy Ion Collider (RHIC). These include adjustment in the coil midplane gap to compensate for the allowed and non-allowed harmonics, inclusion of holes and cutouts in the iron yoke to reduce the saturation-induced harmonics, and magnetic tuning shims to correct for the residual errors. We compare the measurements with the calculations to test the validity of these concepts.

NTIS

Harmonics ; Superconducting Magnets

20020009653 Columbia Univ. , New York, NY USA

Research Investigation Directed Toward Extending the Useful Range of the Electromagnetic Spectrum ***Final Report , 15 Apr. 1997-14 Apr 2001***

Flynn, George W. ; Osgood, Richard M., Jr. ; Brus, Louis E. ; Heinz, Tony F. ; Herman, Irving P. ; Jun. 30, 2001 ; 43p ; In English

Contract(s)/Grant(s): DAAG55-97-1-0166

Report No.(s): AD-A396190 ; ARO-36376.31-EL-JSEP ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Experiments are described that have the goal of understanding the basic physics of quantum confined electronics. In the first experiment new fabrication processes for making GaSb-based quantum dots have been examined. The scientific goal of this work is to develop methods to realize damage free etching of the dots. In the second experiment stepped metal surfaces have been used to measure the scattering cross-sections of electrons at simple features, such as used in quantum corrals.

DTIC

Electromagnetic Spectra ; Quantum Electronics

20020009655 Montana State Univ. , Dept. of Physics , Bozeman, MT USA

Wide-Band Optical True-Time Delay and Adaptive Beamforming ***Final Report , 1 May 1998-30 Apr. 2001***

Babbitt, W. R. ; Jan. 2001 ; 138p ; In English

Contract(s)/Grant(s): DAAG66-98-1-0244

Report No.(s): AD-A396183 ; ARO-37769.1-PH-DPS ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

The focus of the research under this ARO DEPSCoR grant is to explore and develop the inherent capabilities of optical coherent transient technology for creating true-time-delays up to several microseconds on signals with wide bandwidths far in excess of a gigahertz on optical waveforms. Coherent transient technology has the advantages that the delays are programmable with amplitude sensitive processing being performed simultaneously. The research effort explores the issues of implementing an optical coherent transient technology in the multi-gigahertz regime and works towards developing an adaptive beamforming system architecture that utilizes optical coherent transient technology. Progress includes development of chirped lasers and linear frequency chirped programming methods on bandwidths of more than 2GHZ, analysis of the continuous programming continuous processing dynamics and spectral filtering effects of the processing material, development of frequency stabilized Ti:Sapphire lasers and diode lasers for use in the evaluations. Also, initial evaluations of the adaptive beamforming architectures were carried out at CU. The thrust of the efforts went into development of multi-GHz OCT technologies, which allows final development of wide-band adaptive beamforming demonstrations.

DTIC

Beamforming ; Time Lag ; Waveforms ; Optical Data Processing

20020009664 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA

Adaptive Polarization of Antennas

Griffin, Brian D. ; Jan. 2001 ; 72p ; In English

Report No.(s): AD-A396162 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Antennas whose polarizations are not aligned for optimal power transfer create a polarization mismatch and a loss in transferred power. A compensation for polarization mismatch is considered using a pair of crossed dipoles. One of the dipoles amplitude and phase is adjusted by a MATLAB optimization, and the Numerical Electromagnetic Code generates the electromagnetic response. Optimizing only for circular polarization produces losses in radiated power that offset the polarization correction. With minimum dipole separation, minor improvements are possible for 0 is less than 15 deg F, but at larger angles the optimizer decreases the power transferred. The polarization optimization improves power transferred when the dipole spacing

is increased. At 0.5 wavelength spacing, the increase in total gain is up to 17 dB. The optimization was modified to consider power transferred, and the power always increased up to a maximum of 2.0 dE at 0 = 800. Crossed dipoles as the transmitter and receiver were also considered and they improved the power transferred.
DTIC
Circular Polarization ; Transmitter Receivers ; Antennas ; Adaptive Control

20020009696 Brookhaven National Lab. , Upton, NY USA
Using condition monitoring to predict remaining life of electric cables
Lofaro, ; Soo, ; Villaran, ; Grove, ; Mar. 29, 2001 ; 11p ; In English
Report No.(s): DE2001-781133 ; BNL-NUREG-68237 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Electric cables are passive components used extensively throughout nuclear power stations to perform numerous safety and non-safety functions. It is known that the polymers commonly used to insulate the conductors on these cables can degrade with time; the rate of degradation being dependent on the severity of the conditions in which the cables operate. Cables do not receive routine maintenance and, since it can be very costly, they are not replaced on a regular basis. Therefore, to ensure their continued functional performance, it would be beneficial if condition monitoring techniques could be used to estimate the remaining useful life of these components. A great deal of research has been performed on various condition monitoring techniques for use on electric cables. In a research program sponsored by the U.S. Nuclear Regulatory Commission, several promising techniques were evaluated and found to provide trendable information on the condition of low-voltage electric cables. These techniques may be useful for predicting remaining life if well defined limiting values for the aging properties being measured can be determined. However, each technique has advantages and limitations that must be addressed in order to use it effectively, and the necessary limiting values are not always easy to obtain. This paper discusses how condition monitoring measurements can be used to predict the remaining useful life of electric cables. The attributes of an appropriate condition monitoring technique are presented, and the process to be used in estimating the remaining useful life of a cable is discussed along with the difficulties that must be addressed.
NTIS
Service Life ; Degradation ; Safety ; Maintenance

20020010113 dpiX, LLC , Palo Alto, CA USA
Holographically Formed Polymer Dispersed Liquid Crystal Display Devices: Fabrication and Characterization ***Final Report , 1 Jul. 1999-31 Dec. 1999***
Fiske, Thomas F. ; Colegrove, Jennifer ; Tran, Hanh ; Lewis, Alan ; Aug. 2001 ; 45p ; In English
Contract(s)/Grant(s): AF Proj. 7184
Report No.(s): AD-A396171 ; AFRL-HE-WP-TR-2001-0131 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Operating video rate, low power reflective display devices samples were built and delivered. These devices were built in the holographically formed polymer dispersed liquid crystal (HPDLC) fabrication facility at dpiX LLC. The goal was to evaluate the potential of HPDLC material to enable creation of a reflective display technology. The performance goals for the delivered cells included peak reflectance of over 60% for monochrome displays, photopic white reflectance of 50% for stacked cells, switching field strengths of less than 20 V/micrometers, and response times of less than 5 ms. The devices delivered operated under test conditions with 1 KHz alternating current (ac) drive voltage amplitudes in the range 0-200 V. The measured photopic reflectances of individual red, green, and blue (RUB) sample cells fabricated with a transmissive diffuser in the laser beam were 2 to 9% with respect to a diffuse, white Lambertian, reflection standard and 76 to 95% with respect to a conventional, specular cell as the reflection standard. The measured photopic reflectance of stacked RUB (i.e., white) sample devices were 3.8% for conventional and 1.4% for diffuse HPDLC. Response times were less than 12 ms; switching field strengths, 29 V/micrometers. Operating voltages remain too high and reflection efficiencies, too low.
DTIC
Characterization ; Display Devices ; Fabrication ; Reflectance ; Holography

20020010128 Oak Ridge National Lab. , TN USA
Atomic Scale Structure of Ultrathin Magnetic Multilayers and Correlation with Resistance and Giant Magnetoresistance and Spin-Dependent Tunneling
Butler, W. H. , Oak Ridge National Lab. , USA ; Feb. 14, 2001 ; 8p ; In English
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-777628 ; C/ORNL97-0477 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

ORNL advanced characterization capabilities were used to determine the physical and chemical structure of magnetic multilayer films intended for application in non-volatile magnetic random access memory devices and as magnetic sensors. ORNL modeling capabilities were used to incorporate this information into a first-principles based tool that can be used to model the magnetic and transport properties of these films. This modeling capability should be useful for understanding and optimizing novel magnetoelectronic devices.
NTIS
Atomic Structure ; Magnetic Storage ; Magnetoresistivity ; Transport Properties ; Electron Tunneling

20020010157 NASA Glenn Research Center , Cleveland, OH USA
Evaluation and Improvement of Eddy Current Position Sensors in Magnetically Suspended Flywheel Systems ***Final Report***
Dever, Timothy P. , QSS Group, Inc. , USA ; Palazzolo, Alan B. , Texas A&M Univ. , USA ; Thomas, Erwin M., III , Texas A&M Univ. , USA ; Jansen, Ralph H. , Ohio Aerospace Inst. , USA ; September 2001 ; 10p ; In English ; 36th Intersociety Conversion Engineering Conference , 29 Jul. - 2 Aug. 2001 , Savannah, GA , USA ; Sponsored by American Society of Mechanical Engineers , USA
Contract(s)/Grant(s): NAS3-00145 ; RTOP 755-1A-09
Report No.(s): NASA/CR-2001-211137 ; E-12992 ; NAS 1.26:211137 ; IECEC2001-ES-20 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Eddy current position sensor performance is evaluated for use in a high-speed flywheel development system. The flywheel utilizes a five axis active magnetic bearing system. The eddy current sensors are used for position feedback for the bearing controller. Measured characteristics include sensitivity to multiple target materials and susceptibility to noise from the magnetic bearings and from sensor-to-sensor crosstalk. Improvements in axial sensor configuration and techniques for noise reduction are described.
Author
Eddy Currents ; Flywheels ; Magnetic Bearings ; Magnetic Suspension ; Sensors

20020010380 Sandia National Labs. , Albuquerque, NM USA
Characterization of Si Nanostructured Surfaces
Brueck, S. R. J. ; Gee, J. M. ; Ruby, D. S. ; Zaidi, S. H. ; Jul. 20, 1999 ; 11p ; In English
Report No.(s): DE2001-9628 ; SAND99-1897C ; No Copyright ; Avail: Department of Energy Information Bridge
Surface texturing of Si to enhance absorption particularly in the IR spectral region has been extensively investigated. Previous research chiefly examined approaches based on geometrical optics. These surface textures typically consist of pyramids with dimensions much larger than optical wavelengths. We have investigated a physical optics approach that relies on surface texture features comparable to, or smaller than, the optical wavelengths inside the semiconductor material. Light interaction at this are strongly dependent on incident polarization and surface profile. Nanoscale textures can be tuned for either narrow band, or broad band absorptive behavior. Lowest broadband reflection has been observed for triangular profiles with linewidths significantly less than 100 nm. Si nanostructures have been integrated into large (approximately 42 square cm) area solar cells, Internal quantum efficiency measurements in comparison with polished and conventionally textured cells show lower efficiency in the UV-visible (350-680 mu), but significantly higher IR (700-1200 nm) efficiency.
NTIS
Semiconductors (Materials) ; Solar Cells ; Silicon ; Nanostructures (Devices)

20020010606 Lawrence Livermore National Lab. , Livermore, CA USA
Mechanical design and fabrication processes for the ALS third-harmonic cavities
Franks, M. ; Henderson, T. ; Hernandez, K. ; Otting, D. ; Plate, D. ; Mar. 25, 1999 ; 5p ; In English
Report No.(s): DE2001-9618 ; UCRL-JC-133056 ; No Copyright ; Avail: Department of Energy Information Bridge
It is planned to install five third-harmonic (1.5 GHz) RF Cavities in May/June 1999 as an upgrade to the Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory (LBNL). This paper presents mechanical design features, their experiences in using electronic design models to expedite the manufacturing process, and the fabrication processes employed to produce these cavities for the ALS. They discuss some of the lessons learned from the PEP-II RF Cavity design and fabrication, and outline the improvements incorporated in the new design. They also report observations from the current effort.
NTIS
Light Sources ; Cavities

20020010613 Sandia National Labs. , Albuquerque, NM USA

Failure Analysis of Worn Surface Micromachined Microengines

Walraven, J. A. ; Headley, T. J. ; Campbell, A. N. ; Tanner, D. M. ; Jul. 21, 1999 ; 12p ; In English

Report No.(s): DE2001-9591 ; SAND99-1849C ; No Copyright ; Avail: Department of Energy Information Bridge

Failure analysis (FA) tools have been applied to analyze failing polysilicon microengines. These devices were stressed to failure under accelerated conditions in both oxidizing and non-oxidizing environments. The dominant failure mechanism of these microengines was identified as wear of rubbing surfaces. This often results in either seized microengines or microengines with broken pin joints. Analysis of these failed polysilicon devices found that wear debris was produced in both oxidizing and non-oxidizing environments. by varying the relative percent humidity (%RH), they observed an increase in the amount of wear debris with decreasing humidity. Plan view imaging using scanning electron microscopy revealed build-up of wear debris on the surface of microengines. Focused ion beam (FIB) cross sections revealed the location and build-up of wear debris on the surface of microengines. Focused ion beam (FIB) cross sections revealed the location and build-up of wear debris within the microengine. Seized regions were also observed in the pin joint area using FIB processing. by using transmission electron microscopy in conjunction with energy dispersive x-ray spectroscopy (EDX) and electron energy loss spectroscopy (EELS), they were able to identify wear debris produced in low (1.8% RH), medium and high (39% RH) humidities.

NTIS

Failure Analysis ; Silicon Polymers

20020010618 Sandia National Labs. , Albuquerque, NM USA

Dual-Side Wafer Processing and Resonant Tunneling Transistor Applications

Moon, J. S. ; Simmons, J. A. ; Wendt, J. R. ; Hietala, V. M. ; Reno, J. L. ; Jul. 20, 1999 ; 13p ; In English

Report No.(s): DE2001-9577 ; SAND99-1419C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We describe dual-side wafer processing and its application to resonant tunneling transistors in a planar configuration. The fabrication technique utilizes a novel flip-chip, wafer thinning process called epoxy-bond and stop-etch (EBASE) process, where the substrate material is removed by selective wet etching and stopped at an etch-stop layer. This EBASE method results in a semiconductor epitaxial layer that is typically less than a micron thick and has a mirror-finish, allowing backside gates to be placed in close proximity to frontside gates. Utilizing this technique, a resonant tunneling transistor--the double electron layer tunneling transistor (DELTT)--can be fabricated in a fully planar configuration, where the tunneling between two selectively-contacted 2DEGs in GaAs or InGaAs quantum wells is modulated by surface Schottky gate. Low temperature electrical characterization yields source-drain I-V curves with a gate-tunable negative differential resistance.

NTIS

Transistors ; Gallium Arsenides ; Semiconductors (Materials) ; Resonant Tunneling ; Joints (Junctions) ; Epoxy Resins

20020010881 Stanford Linear Accelerator Center , Menlo Park, CA USA

Planar Waveguide Hybrids for Very High Power RF

Nantista, C. D. ; May 10, 1999 ; 8p ; In English

Report No.(s): DE2001-784859 ; SLAC-PUB-8142 ; No Copyright ; Avail: Department of Energy Information Bridge

Two basic designs have been developed for waveguide hybrids, or 3-dB couplers, capable of handling hundreds of megawatts at X-band. Coupling is provided by one or two connecting waveguides with h-plane junctions and matching elements. In the former case, the connecting waveguide supports two modes. Small apertures and field-enhancing e-bends are avoided to reduce risk of rf breakdown. The h-plane symmetry also allows the use of over-moded rectangular waveguide in which the height has been increased to reduce field amplitudes without affecting the scattering matrix. The theory and designs are presented, along with the results of prototype tests of functionality and power-handling capability. Such a device is integral to the rf pulse compression or power distribution systems (2) of the Next Linear Collider (NLC) (1) for combining, splitting, and directing power. This work was motivated by the observation of rf breakdown at power levels above 200 NW in conventional and modified magic-T's.

NTIS

Apertures ; Radio Frequencies ; Rectangular Waveguides ; Prototypes ; Planar Structures ; Design Analysis

20020010886 Stanford Linear Accelerator Center , Menlo Park, CA USA

Design for a One-Gigawatt, Annular-Beam Klystron

Arfin, B. ; Jan. 23, 2001 ; 4p ; In English

Report No.(s): DE2001-784852 ; SLAC-PUB-8765 ; No Copyright ; Avail: Department of Energy Information Bridge

A one-gigawatt, annular beam klystron (ABK) is being developed by Los Alamos National Laboratory in collaboration with the Stanford Linear Accelerator Center (SLAC). The pulse length is 1 us, the pulse repetition frequency is 5 Hz, and the operating

frequency is 1.3 GHz. The beam voltage and current are considerably beyond the state-of-the-art, an aggressive cathode and electron gun design is required. The magnetron injection gun (MIG) configuration was chosen over the standard Pierce geometry that is typically used in klystrons. The tube design, design issues, and status are presented.
NTIS
Klystrons ; Linear Accelerators ; Design Analysis ; Electron Guns ; Frequencies

20020010892 National Inst. of Standards and Technology , Optoelectronics Div. , Boulder, CO USA
Optoelectronics at NIST: Brief Research Summaries from throughout the Institute
Day, G. W. , Editor ; Jun. 2001 ; 79p ; In English
Report No.(s): PB2001-105205 ; NISTIR-6608 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
Optoelectronics is the marriage of optics and electronics that has enabled many familiar and diverse high-technology products and processes-high-quality telecommunication systems, the Internet, laser printing, fax machines, bar code scanning, optical disk technology, displays, electronic cameras, advanced manufacturing processes, and new medical diagnostic and treatment procedures. The industry is large and growing rapidly as new advances emerge from research laboratories. NIST's work in optoelectronics is as diverse as the field, and is scattered throughout the Institute. Some of it represents traditional NIST efforts to provide the optoelectronics industry with measurement technology, standards, and traceability. Some of it involves the use of optoelectronic technologies to achieve NIST's goals in other areas-in support of other industries, in support of the scientific community, or in fundamental research. All of it represents expertise and resources that may be applicable to problems well removed from those on which they are currently focused. This document contains summaries of sixty-four NIST projects in which optoelectronics plays an important role.
NTIS
Electro-Optics ; Telecommunication ; Coding ; Display Devices ; Facsimile Communication

20020011231 Lawrence Livermore National Lab. , Livermore, CA USA
Thermally robust optical semiconductor devices using molecular beam epitaxy grown AlGaInAs
Pijaili, S. ; Dec. 01, 1997 ; 17p ; In English
Report No.(s): DE2001-9794 ; UCRL-ID-129086 ; REPT-96-ERD-058 ; No Copyright ; Avail: Department of Energy Information Bridge
In FY96, they proposed and demonstrated a thermally robust semiconductor optical amplifier (SOA) at 1.5 (micro)m wavelength. The novel contributions were the use of a thermally robust gain medium at 1.5 (micro)m wavelength and the use of a highly thermally conductive dielectric used in the fabrication of the SOA. The devices possessed high gain, over 30 dB, and thermally robust behavior in pulsed operation from 60 to 80 C. In FY97, they proposed and demonstrated the necessary components in a thermally robust long wavelength vertical cavity surface emitting laser (VCSEL) diode. A highly thermally conductive and high reflectivity mirror process was developed for the 1.3 (micro)m or 1.5 (micro)m wavelength region. The thermal conductivity is several times larger than other published work and the reflectivity is greater than 99 %. Thermally robust gain media, AlGaInAs/InP quantum wells, were developed at 1.3 and 1.5 (micro)m wavelengths for incorporation into the thermally robust, long wavelength VCSEL devices. Also, a unique and compact high-speed fiber optics package was developed for long wavelength semiconductor optical amplifiers (SOA) and laser diodes.
NTIS
Amplifiers ; Fiber Optics ; Lasers ; Surface Emitting Lasers ; Indium Aluminum Arsenides ; Semiconductor Devices ; Aluminum Gallium Arsenides ; Indium Gallium Arsenides

20020011378 National Inst. of Standards and Technology , Electricity Div. , Gaithersburg, MD USA
Proposed Diffuse Ambient Contrast Measurement Methods for Flat Panel Displays
Kelley, E. F. ; April 2001 ; 12p ; In English
Report No.(s): PB2001-108259 ; NISTIR-6738 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
We want to measure the contrast (ratio of white to black) of a display under uniform diffuse illumination to provide an indication of the legibility of the display under diffuse-ambient lighting conditions. This is the type of illumination that can be generated by a bright overcast day. Several methods can be used to make this kind of measurement. The methods vary depending upon the way the diffuse illumination is provided. We show three methods that should provide ambient contrast measurement results with an uncertainty of no greater than 6% (expanded uncertainty with a coverage factor of two-in the past described as a two-sigma uncertainty). These are the (1) Integrating Sphere Method, (2) Open Box Method, and (3) Sampling Sphere Method. We will describe how the measurement results are properly scaled, discuss the light sources to be used, obtain the starting

conditions in Step 0, and detail the methods. These methods can be applied to both emissive and reflective displays. In the following, we show a flat panel display (FPD) being measured, but these results are applicable to all direct-view displays.
NTIS
Display Devices ; Image Contrast ; Electroluminescence

20020011602 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
High Power Microwave (HPM) Detectors ***Hoegeffekt Pulsad Mikrovaegs (HPM) DetektorerHigh Power Microwave***
Madsen, K. ; Dec. 1999 ; 32p ; In English
Report No.(s): PB2001-108146 ; FOA-R-99-01213-612-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report on High Power Microwave (HPM) detectors contains a background, the principles and some applications of HPM-detectors. The potential market is also outlined. Two basic concepts of HPM-detectors are described in this work, one of them operates on the principle microwave breakdown in narrow slots and the other one on the high power microwave ionization of a gas in ordinary tube light lamps. Both concepts have been described in applications for patent which have been filed to the Swedish Patent Bureau and they have also been approved as Swedish patents. Experimental prototypes of HPM detectors have been made at FOA and a number of different experiments have been performed at different frequencies and power levels. These experiments indicate only partial functionality of the first detector prototypes by preliminary conclusions and suggestions for further investigations and prototyping conclude the report. The passive versions of the slot detector and the light lamp detector are shown to operate, but the field strength levels needed for the detector 'turn on' are so far quite high compared with the threat levels considered for tactical HPM-sabotage scenarios.
NTIS
Detectors ; Microwaves ; Gas Ionization ; Field Strength

20020011681 NASA Glenn Research Center , Cleveland, OH USA
Performance of Power Converters at Cryogenic Temperatures
Elbuluk, Malik E. , Akron Univ. , USA ; Gerber, Scott , ZIN Technologies, Inc. , USA ; Hammoud, Ahmad , QSS Group, Inc. , USA ; Patterson, Richard L. , NASA Glenn Research Center , USA ; September 2001 ; 10p ; In English ; Eighth International Conference on Electronics, Circuits and Systems , 2-5 Sep. 2001 , Malta ; Sponsored by Institute of Electrical and Electronics Engineers , USA
Contract(s)/Grant(s): NAS3-00145 ; RTOP 755-A4-12
Report No.(s): NASA/TM-2001-211130 ; E-12979 ; NAS 1.15:211130 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Power converters capable of operation at cryogenic temperatures are anticipated to play an important role in the power system architecture of future NASA deep space missions. Design of such converters to survive cryogenic temperatures will improve the power system performance and reduce development and launch costs. Aerospace power systems are mainly a DC distribution network. Therefore, DC/DC and DC/AC converters provide the outputs needed to different loads at various power levels. Recently, research efforts have been performed at the NASA Glenn Research Center (GRC) to design and evaluate DC/DC converters that are capable of operating at cryogenic temperatures. This paper presents a summary of the research performed to evaluate the low temperature performance of five DC/DC converters. Various parameters were investigated as a function of temperature in the range of 20 to -196 C. Data pertaining to the output voltage regulation and efficiency of the converters is presented and discussed.
Author
Cryogenic Temperature ; Inverted Converters (DC To Ac) ; Power Converters ; Voltage Converters (DC to DC) ; Spacecraft Electronic Equipment

20020011704 National Inst. of Standards and Technology , Electricity Div. , Gaithersburg, MD USA
Setup Patterns for Display Measurements: Version 1.0
Kelley, E. F. , National Inst. of Standards and Technology , USA ; Miseli, J. V. , Sun Microsystems, Inc. , USA ; June 2001 ; 22p ; In English
Report No.(s): PB2001-108260 ; NISTIR-6758 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In our work in the laboratory developing methods to measure displays as well as work on standards, committees, we have developed a number of targets for use in setting up displays, making measurements on displays, and giving demonstrations of displays to visitors. We place these targets composed on images and patterns in the public domain to be used as desired. In section 1, the first target in the setup series provides basic information about the use and construction of the targets. Section 2 provides

some of the construction details for a number of pixel arrays. Section 3 provides the naming conventions used for any bit-mapped renderings of these images. Section 4 show the setup file sequence, and Section 5 shows special bit-mapped patterns.
NTIS
Flat Panel Displays ; Test Pattern Generators

20020011714 Sandia National Labs. , Albuquerque, NM USA
Parallel-Plate Electrostatic Dual Mass Oscillator
Allen, J. J. ; Dyck, C. W. ; Huber, R. J. ; Jul. 22, 1999 ; 14p ; In English
Report No.(s): DE2001-9509 ; SAND99-0510C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A surface-micromachined two-degree-of-freedom system that was driven by parallel-plate actuation at antiresonance was demonstrated. The system consisted of an absorbing mass connected by folded springs to a drive mass. The system demonstrated substantial motion amplification at antiresonance. The absorber mass amplitudes were 0.8-0.85 pm at atmospheric pressure while the drive mass amplitudes were below 0.1 pm. Larger absorber mass amplitudes were not possible because of spring softening in the drive mass springs. Simple theory of the dual-mass oscillator has indicated that the absorber mass may be insensitive to limited variations in strain and damping. This needs experimental verification. Resonant and antiresonant frequencies were measured and compared to the designed values. Resonant frequency measurements were difficult to compare to the design calculations because of time-varying spring softening terms that were caused by the drive configuration. Antiresonant frequency measurements were close to the design value of 5.1 kHz. The antiresonant frequency was not dependent on spring softening. The measured absorber mass displacement at antiresonance was compared to computer simulated results. The measured value was significantly greater, possibly due to neglecting fringe fields in the force expression used in the simulation.
NTIS
Electrostatics ; Oscillators ; Computerized Simulation ; Degrees of Freedom ; Resonant Frequencies

20020011868 Helsinki Univ. of Technology , Signal Processing Lab. , Espoo, Finland
Helsinki University of Technology, Signal Processing Laboratory *Annual Report , 2000*
2001 ; 42p ; In English
Report No.(s): PB2002-100324 ; Copyright ; Avail: National Technical Information Service (NTIS)
The authors' laboratory teaches and carries out research work in the area of digital signal processing and digital circuit technology. Undergraduate education consists of computer technology, system level concepts of modern digital hardware design, and implementation of digital signal processing algorithms. During 2000 the numbers of professors in the authors' laboratory was increased as they could welcome Timo Laakso and his group to joint them. The areas of research are: Statistical Signal Processing; Implementation of Signal Processing Systems; and Signal Processing for Communications.
NTIS
Signal Processing ; Computer Systems Design ; Digital Electronics ; Logic Circuits

20020012230 Lawrence Livermore National Lab. , Livermore, CA USA
EUVL mask substrate specifications (wafer-type)
Tong, W. ; Jul. 01, 1999 ; 7p ; In English
Report No.(s): DE2001-13758 ; UCRL-ID-135579 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Extreme Ultraviolet Lithography (EUVL) program currently is constructing an alpha-class exposure tool known as the Engineering Test Stand (ETS) that will employ 200mm wafer format masks. This document lists and explains the current specifications for the EUVL mask substrates suitable for use on the ETS.
NTIS
Lithography ; Test Stands

20020012234 Lawrence Livermore National Lab. , Livermore, CA USA
Subpicosecond single-shot waveform measurement using temporal imaging
Bennett, C. V. ; Kolner, B. H. ; Jul. 19, 1999 ; 5p ; In English
Report No.(s): DE2001-13754 ; UCRL-JC-135110 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Experimental results from a new single-transient optical recorder with less than 300 fs resolution are presented. The system uses a 103 temporal imaging system to expand the waveform which is then recorded with a streak camera.
NTIS
Optical Equipment ; Waveforms

20020012346 Stanford Linear Accelerator Center , Menlo Park, CA USA

Compact, Planar, Eight-Port Waveguide Power Divider/Combiner: The Cross Potent Superhybrid

Nantista, C. D. ; Feb. 06, 2001 ; 4p ; In English

Report No.(s): DE2001-784873 ; SLAC-PUB-8771 ; No Copyright ; Avail: Department of Energy Information Bridge

We present a novel four-way divider/combiner in rectangular waveguide. The design is completely two-dimensional in the h-plane, with eight-fold mirror symmetry, and is based on a recent four-port hybrid design. In combining mode, it can function as a phased array with four inputs and four outputs. The planar nature of this design provides advantages, such as the freedom to increase the waveguide height beyond the over-moding limit in order to reduce field strengths. Along with its open geometry, this makes it ideal for high-power applications where rf break down is a concern. Design criteria, field-solver simulation results, and prototype measurements are presented.

NTIS

Waveguides ; Design Analysis ; Radio Frequencies

20020012427 NASA Glenn Research Center , Cleveland, OH USA

Performance of High-Speed PWM Control Chips at Cryogenic Temperatures

Elbuluk, Malik E. , Akron Univ. , USA ; Gerber, Scott , ZIN Technologies, Inc. , USA ; Hammoud, Ahmad , QSS Group, Inc. , USA ; Patterson, Richard , NASA Glenn Research Center , USA ; Overton, Eric , NASA Glenn Research Center , USA ; September 2001 ; 12p ; In English ; 2001 Industry Applications Society Annual Meeting , 30 Sep. - 5 Oct. 2001 , Chicago, IL , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA

Contract(s)/Grant(s): NAS3-98008 ; RTOP 755-A4-12

Report No.(s): NASA/TM-2001-211123 ; NAS 1.15:211123 ; E-12972 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The operation of power electronic systems at cryogenic temperatures is anticipated in many NASA space missions such as planetary exploration and deep space probes. In addition to surviving the space hostile environment, electronics capable of low temperature operation would contribute to improving circuit performance, increasing system efficiency, and reducing development and launch costs. As part of the NASA Glenn Low Temperature Electronics Program, several commercial high-speed Pulse Width Modulation (PWM) chips have been characterized in terms of their performance as a function of temperature in the range of 25 to -196 C (liquid nitrogen). These chips ranged in their electrical characteristics, modes of control, packaging options, and applications. The experimental procedures along with the experimental data obtained on the investigated chips are presented and discussed.

Author

Chips (Electronics) ; Cryogenic Temperature ; Spacecraft Electronic Equipment ; Integrated Circuits ; Electronic Equipment Tests

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20020005970 Computer Sciences Corp. , Moffett Field, CA USA

FLOWVIZ

Forssell, Lisa , Computer Sciences Corp. , USA ; [1994] ; 1p ; In English

Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

FlowViz is a flow visualization application that uses Line Integral Convolution and the texture mapping capabilities of a graphics workstation to create an animation of flow over a curvilinear grid surface.

Author

Flow Visualization ; Spherical Coordinates ; Computer Graphics ; Convolution Integrals

20020006058 NASA Ames Research Center , Moffett Field, CA USA

Numerical Simulation of Inlet Bleed with Circular Holes on Plate Under Shock-Wave/Boundary-Layer Interactions

Chyu, Wei J. , NASA Ames Research Center , USA ; Rimlinger, Mark J. , Carnegie-Mellon Univ. , USA ; Shih, Tom I.-P. , Carnegie-Mellon Univ. , USA ; [1994] ; 1p ; In English ; NASA Workshop on Surface Modeling, Grid Generation and Related Issues in CFD Solutions , 9-11 May 1995 , Cleveland, OH , USA ; Sponsored by NASA , USA

Contract(s)/Grant(s): NAG2-709 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A numerical study was performed to investigate the shock-wave/boundary-layer interactions on a flat plate with bleed through one or more circular holes that vent into a plenum. The bleed-hole patterns considered for the study include in-line multiple holes and staggered multiple-row holes that are configured to simulate the patterns used in inlet bleed systems of high performance aircraft. The focus of the study was to examine how the bleed through multiple holes affect bleed rate and the pressure and Mach number distributions. Since the bleed performance was found sensitive to the change in bleed conditions, a computational procedure was developed to give a good turnaround computational time for parametric studies involving changes in bleed hole geometry and the structure of shock-wave/boundary-layer flowfield. The procedure includes the grid-generation methodology and the flow simulation with solutions from the Navier-Stokes equations. The computational techniques permit analysis of complex bleed systems and make possible the investigation of a broader range of design variables associated with inlet bleed operation.

Author

Analysis (Mathematics) ; Boundary Layers ; Computation ; Design Analysis ; Flat Plates ; Intake Systems

20020006162 Sandia National Labs. , Albuquerque, NM USA

Bibliography for Verification and Validation in Computational Simulations

Oberkampf, W. L. ; Oct. 01, 1998 ; 118p ; In English

Report No.(s): DE2001-701 ; SAND98-2041 ; No Copyright ; Avail: Department of Energy Information Bridge

A bibliography has been compiled dealing with the verification and validation of computational simulations. The references listed in this bibliography are concentrated in the field of computational fluid dynamics (CFD). However, references from the following fields are also included: operations research, heat transfer, solid dynamics, software quality assurance, software accreditation, military systems, and nuclear reactor safety. This bibliography, containing 221 references, is not meant to be comprehensive. It was compiled during the last ten years in response to the author's interest and research in the methodology for verification and validation. The emphasis in the bibliography is in the following areas: philosophy of science underpinnings, development of terminology and methodology, high accuracy solutions for CFD verification, experimental datasets for CFD validation, and the statistical quantification of model validation. This bibliography should provide a starting point for individual researchers in many fields of computational simulation in science and engineering.

NTIS

Bibliographies ; Computerized Simulation ; Computational Fluid Dynamics ; Proving

20020006178 RECOM Technologies, Inc. , Moffett Field, CA USA

Automated Instrumentation, Monitoring and Visualization of PVM Programs Using AIMS

Mehra, Pankaj , RECOM Technologies, Inc. , USA ; VanVoorst, Brian , RECOM Technologies, Inc. , USA ; Yan, Jerry , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; SIAM Conference for Scientific Computing , 15-17 Feb. 1995 , San Francisco, CA , USA ; Sponsored by Society for Industrial and Applied Mathematics , USA

Contract(s)/Grant(s): RTOP 509-10-31 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We present views and analysis of the execution of several PVM codes for Computational Fluid Dynamics on a network of Sparcstations, including (a) NAS Parallel benchmarks CG and MG (White, Alund and Sunderam 1993); (b) a multi-partitioning algorithm for NAS Parallel Benchmark SP (Wijngaart 1993); and (c) an overset grid flowsolver (Smith 1993). These views and analysis were obtained using our Automated Instrumentation and Monitoring System (AIMS) version 3.0, a toolkit for debugging the performance of PVM programs. We will describe the architecture, operation and application of AIMS. The AIMS toolkit contains (a) Xinstrument, which can automatically instrument various computational and communication constructs in message-passing parallel programs; (b) Monitor, a library of run-time trace-collection routines; (c) VK (Visual Kernel), an execution-animation tool with source-code clickback; and (d) Tally, a tool for statistical analysis of execution profiles. Currently, Xinstrument can handle C and FORTRAN77 programs using PVM 3.2.x; Monitor has been implemented and tested on Sun 4 systems running SunOS 4.1.2; and VK uses X11R5 and Motif 1.2. Data and views obtained using AIMS clearly illustrate several characteristic features of executing parallel programs on networked workstations: (a) the impact of long message latencies; (b) the impact of multiprogramming overheads and associated load imbalance; (c) cache and virtual-memory effects; and (4significant skews between workstation clocks. Interestingly, AIMS can compensate for constant skew (zero drift) by calibrating

the skew between a parent and its spawned children. In addition, AIMS' skew-compensation algorithm can adjust timestamps in a way that eliminates physically impossible communications (e.g., messages going backwards in time). Our current efforts are directed toward creating new views to explain the observed performance of PVM programs. Some of the features planned for the near future include: (a) ConfigView, showing the physical topology of the virtual machine, inferred using specially formatted IP (Internet Protocol) packets; and (b) LoadView, synchronous animation of PVM-program execution and resource-utilization patterns.
Author
Algorithms ; Computational Fluid Dynamics ; Protocol (Computers) ; Automatic Control ; Program Verification (Computers) ; Virtual Memory Systems

20020006302 NASA Ames Research Center , Moffett Field, CA USA
Trajectory Based Heating and Ablation Calculations for MESUR Pathfinder Aeroshell
Chen, Y. K. , Eloret Corp. , USA ; Henline, W. D. , NASA Ames Research Center , USA ; Tauber, M. E. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): NAS2-14031 ; RTOP 232-01-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Based on the geometry of Mars Environment Survey (MESUR) Pathfinder aeroshell and an estimated Mars entry trajectory, two-dimensional axisymmetric time dependent calculations have been obtained using GIANTS (Gauss-Siedel Implicit Aerothermodynamic Navier-Stokes code with Thermochemical Surface Conditions) code and CMA (Charring Material Thermal Response and Ablation) Program for heating analysis and heat shield material sizing. These two codes are interfaced using a loosely coupled technique. The flowfield and convective heat transfer coefficients are computed by the GIANTS code with a species balance condition for an ablating surface, and the time dependent in-depth conduction with surface blowing is simulated by the CMA code with a complete surface energy balance condition. In this study, SLA-561V has been selected as heat shield material. The solutions, including the minimum heat shield thicknesses over aeroshell forebody, pyrolysis gas blowing rates, surface heat fluxes and temperature distributions, flowfield, and in-depth temperature history of SLA-561V, are presented and discussed in detail.
Author
Trajectories ; Heating ; Ablation ; Aeroshells ; Mars Pathfinder ; Heat Shielding

20020006303 MCAT Inst. , Mountain View, CA USA
CFD Optimization on Network-Based Parallel Computer System
Cheung, Samson H. , MCAT Inst. , USA ; [1994] ; 1p ; In English ; NASA CAS Workshop , 7-9 Mar. 1995 , Moffett Field, CA , USA ; Sponsored by NASA , USA
Contract(s)/Grant(s): NCC2-617 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Combining multiple engineering workstations into a network-based heterogeneous parallel computer allows application of aerodynamic optimization with advance computational fluid dynamics codes, which is computationally expensive in mainframe supercomputer. This paper introduces a nonlinear quasi-Newton optimizer designed for this network-based heterogeneous parallel computer on a software called Parallel Virtual Machine. This paper will introduce the methodology behind coupling a Parabolized Navier-Stokes flow solver to the nonlinear optimizer. This parallel optimization package has been applied to reduce the wave drag of a body of revolution and a wing/body configuration with results of 5% to 6% drag reduction.
Author
Computational Fluid Dynamics ; Parallel Computers ; Computer Networks ; Optimization ; Software Engineering ; Nonlinearity

20020006304 NASA Glenn Research Center , Cleveland, OH USA
Parametric Data from a Wind Tunnel Test on a Rocket-Based Combined-Cycle Engine Inlet
Fernandez, Rene , NASA Glenn Research Center , USA ; Trefny, Charles J. , NASA Glenn Research Center , USA ; Thomas, Scott R. , NASA Glenn Research Center , USA ; Bulman, Mel J. , Aerojet-General Corp. , USA ; November 2001 ; 20p ; In English ; 1995 Airbreathing Propulsion Subcommittee Meeting , 5-9 Dec. 1995 , Tampa, FL , USA ; Sponsored by Department of the Army , USA
Contract(s)/Grant(s): RTOP 708-48-13
Report No.(s): NASA/TM-2001-107181 ; E-10144 ; NAS 1.15:107181 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A 40-percent scale model of the inlet to a rocket-based combined-cycle (RBCC) engine was tested in the NASA Glenn Research Center 1- by 1-Foot Supersonic Wind Tunnel (SWT). The full-scale RBCC engine is scheduled for test in the Hypersonic Tunnel Facility (HTF) at NASA Glenn's Plum Brook Station at Mach 5 and 6. This engine will incorporate the configuration of

this inlet model which achieved the best performance during the present experiment. The inlet test was conducted at Mach numbers of 4.0, 5.0, 5.5, and 6.0. The fixed-geometry inlet consists of an 8 deg.. forebody compression plate, boundary layer diverter, and two compressive struts located within 2 parallel sidewalls. These struts extend through the inlet, dividing the flowpath into three channels. Test parameters investigated included strut geometry, boundary layer ingestion, and Reynolds number (Re). Inlet axial pressure distributions and cross-sectional Pitot-pressure surveys at the base of the struts were measured at varying back-pressures. Inlet performance and starting data are presented. The inlet chosen for the RBCC engine self-started at all Mach numbers from 4 to 6. Pitot-pressure contours showed large flow nonuniformity on the body-side of the inlet. The inlet provided adequate pressure recovery and flow quality for the RBCC cycle even with the flow separation.
Author
Scale Models ; Inlet Pressure ; Performance Tests ; Wind Tunnel Tests ; Rocket-Based Combined-Cycle Engines

20020006500 Woods Hole Oceanographic Inst. , MA USA
Vertical Mixing and Horizontal Transport in Stratified Flow at a Near Coastal Site
Musak, Jeffrey D. ; Stacey, Mark T. ; Sereno, Deanna ; Powell, Thomas M. ; Monismith, Stephen G. ; Jan. 2000 ; 8p ; In English ; Presented at International Symposium on Stratified Flows (5th) held at British Columbia Univ., Vancouver, Canada on Jul. 10-13, 2000
Contract(s)/Grant(s): N00014-99-1-0280
Report No.(s): AD-A395797 ; WHOI-CONTR-10218 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Frequent stratification (and restratification) episodes, strong along-shore tidal flows and variable local bathymetry characterize near coastal environments. These features are thought to control vertical mixing and horizontal transport in such near shore regions. to better understand this environment, a dye-dispersion study was performed in an area off San Clemente Island, CA-in March 1999, along with detailed measurements of the flow and vertical mixing. The major result of this work is that observed horizontal dispersion rates of towed fluorometer data are about 2 orders of magnitude larger than generally accepted values. Even when scale dependent dispersion is applied to the problem, the coefficient of the dispersion term are 0.08 cm(exp 2/3)/s, substantially larger than observed values.
DTIC
Stratified Flow ; Stratification ; Coasts ; Computational Fluid Dynamics

20020006785 Stanford Univ. , Board of Trustees , Stanford, CA USA
Ultrafast Nonlinear Optical Investigations of Supercritical Fluids ***Final Report , 15 Jan. 1997-30 Nov. 2000***
Fayer, Michael D. ; May 08, 2001 ; 8p ; In English
Contract(s)/Grant(s): F469620-97-1-0061
Report No.(s): AD-A395545 ; AFRL-SR-BL-TR-01-0529 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Both experimental and theoretical methods were employed to gain a molecular level understanding of vibrational energy flow and solute-solvent interactions in supercritical fluids (SCF) as a function of temperature and pressure. Infrared (IR) Ps pump-probe experiments and vibrational absorption spectroscopy were employed to study the vibrational dynamics of solutes in a variety of supercritical fluids. The SCF solvents were ethane, fluoroform, and carbon dioxide. Pump-probe (transient absorption) experiments were used to directly follow the relaxation of vibrational energy as a function of the density at fixed temperature and the temperature at fixed density in SCF solvents. Vibrational spectra were used to observe the spectroscopic shifts of vibrational peaks as a function of density and temperature. Detailed theory was developed to describe the density and temperature dependence of vibrational relaxation. The theory was able to reproduce the experimental results with considerable accuracy using a minimal number of parameters.
DTIC
Nonlinear Optics ; Supercritical Flow ; Self Consistent Fields ; Molecular Relaxation

20020006787 Sandia Corp. , Albuquerque, NM USA
Pressure Response in a Long Tube Which is Closed at One End
Bennett, M. D. ; November 1961 ; 25p ; In English
Report No.(s): AD-A395542 ; SC-4646 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
An equation is derived that approximately describes pressure response in a long constant-diameter tube which is closed at one of its extremities. Numerical solutions are presented for several types of forcing functions.
DTIC
Numerical Analysis ; Thermodynamics ; Pressure

20020006792 Army Engineer Research and Development Center , Vicksburg, MS USA
Olmsted Horse Wicket Experiment in 1:5-Scale Hydraulic Flume Model ***Final Report***
Chowdhury, Mostafiz R. ; Davis, W. Glenn ; September 2001 ; 322p ; In English
Report No.(s): AD-A395535 ; ERDC-TR-01-11 ; No Copyright ; Avail: CASI ; A14 , Hardcopy ; A03 , Microfiche

The experimental results proposed for the Olmsted Dam operations of the horse wicket in the 1:5-scale hydraulic models are presented in this document. The results of this model investigation provide guidance to design necessary equipment and appurtenances for horse wicket operations in the field. The horse wicket will be used in a 1,400-ft-wide navigable pass of the Olmsted Dam. No significant operational problem was discovered during the normal dam operations investigated in this study. Flipping of the bottom-held wicket for which the bottom of the wicket was pushed down to flip the wicket into its up position must be restricted to reduce inelastic deformation of the wicket components.
DTIC
Scale Models ; Dams ; Hydraulics

20020006812 Virginia Polytechnic Inst. and State Univ. , Dept. of Aerospace and Ocean Engineering , Blacksburg, VA USA
An Experimental Investigation of Pressure Fluctuations in Three-Dimensional Turbulent Boundary Layers
Goody, Michael C. ; Simpson, Roger L. ; Dec. 15, 1999 ; 337p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-94-1-0092 ; N00014-94-1-0802
Report No.(s): AD-A395634 ; VPI-AOE-268 ; No Copyright ; Avail: CASI ; A15 , Hardcopy ; A03 , Microfiche

Experimental surface pressure fluctuations measurements over a wide range of Reynolds number (1400 less than Re(0) less than 23000) are presented for 3 types of turbulent boundary layers: 1) a zero pressure gradient 2-D turbulent boundary layer, 2) a 3-D pressure-driven turbulent boundary layer that forms away from a wing-body junction, and 3) the separating flow about the leeside of a 6:1 prolate spheroid at angle of attack. The statistics of the fluctuating surface pressure and existing measurements of the velocity field and the covariance of the surface pressure and fluctuating velocity components were studied. The spectral power density of surface pressure fluctuations beneath highly three-dimensional flow contain nearly constant spectral levels within a middle to high frequency range, due to a lack of overlapping frequency structure between the large-scale motions and the viscous-dominated motions. Each of these types of motion have different flow histories due to the three-dimensional flow structure. The resulting RMS surface pressure fluctuation distributions reflect the importance of the high frequency wall region contributions. Scaling parameters for the spectra beneath three-dimensional flows must incorporate local flow structure in order to be successful. An analysis based on the Poisson equation shows that the variation of the high frequency spectral levels is related to the variation of near-wall mean velocity gradients and v(sup 2) structure. In the 6:1 prolate spheroid flow, near regions of crossflow Separation there is a local minimum in RMS surface pressure fluctuations, whereas around reattachments and under the large shed vortices there is a local maximum in RMS surface pressure fluctuations.
DTIC
Pressure Gradients ; Three Dimensional Boundary Layer ; Turbulent Boundary Layer ; Pressure Oscillations ; Body-Wing Configurations

20020006813 Virginia Polytechnic Inst. and State Univ. , Dept. of Aerospace and Ocean Engineering , Blacksburg, VA USA
Unsteady Skin-Friction Measurements on a Maneuvering DARPA2 Suboff Model
Hosder, Serhat ; Simpson, Roger L. ; Jun. 15, 2001 ; 226p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-99-1-0428 ; N00014-01-1-0420
Report No.(s): AD-A395632 ; VPI-AOE-272 ; No Copyright ; Avail: CASI ; A11 , Hardcopy ; A03 , Microfiche

The skin-friction magnitude was measured for steady and unsteady flow over a Suboff submarine model by surface hot-film constant temperature sensors. The locations of the local spatial minima in the skin-friction magnitudes are used to obtain the separation locations. Steady surface static pressures were measured at 100 and 200 angles of attack. The dynamic plunge-pitch-roll model mount (DyPPiR) in the Stability Wind Tunnel was used to simulate rapid pitch-up maneuvers, which are a linear ramp from 10 to 27 deg in 0.33 seconds, for the bare-body and sail-on-side cases at Re(t)=5.5 x 1,000,000. Steady results show a cross-flow separation structure on the leeward side of the bare-body. In the sail-on-side case, the separation pattern of the non-sail region follows the bare-body separation trends; on the sail side it is strongly affected by the presence of the sail-body junction and its horseshoe-vortex type separation. Unsteady results of the bare-body and the non-sail region of the sail-on-side case show a different separation topology from the steady flow separation structure and significant time lags, which are described by a first-order time lag model. The unsteady separation pattern of the sail side does not follow the quasi-steady data with a time lag.
DTIC
Skin Friction ; Wind Tunnel Models ; Unsteady Aerodynamics ; Stability ; Maneuverability

20020006814 Virginia Polytechnic Inst. and State Univ. , Dept. of Aerospace and Ocean Engineering , Blacksburg, VA USA
Near-Wall Investigation of Three-Dimensional Turbulent Boundary Layers
Kuhl, David D. ; Simpson, Roger L. ; Aug. 22, 2001 ; 213p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-99-1-0302
Report No.(s): AD-A395629 ; VPI-AOE-273 ; No Copyright ; Avail: CASI ; A10 , Hardcopy ; A03 , Microfiche

This report documents the experimental study for four different three-dimensional turbulent flows. The investigation focuses on near wall measurements in these flows. Several experimental techniques are used in the studies; however, the bulk of the investigation focuses on a three-orthogonal-velocity-component fiber-optic laser Doppler anemometer (3D-LDA) system. The control volume of the 3D-LDA is on the order of 50 micrometer in size, or a y(+) distance of around 2.3 units. An auxiliary small boundary layer wind tunnel (auxiliary tunnel) and a low speed linear compressor cascade wind tunnel (cascade tunnel) are utilized in this study. One of four flow experiments is done in the auxiliary tunnel the other three are in the cascade tunnel. The first three-dimensional turbulent flow is a vortical flow created by two half-delta wing vortex generators. Near wall secondary flow features are found. The second flow is an investigation of the first quarter chord tip gap flow in the cascade tunnel. Strong three-dimensional phenomena are found. The third flow investigated is the inflow to the compressor cascade with the moving wall. The experiment records shear layer interaction between the upstream flow and moving wall. Finally the fourth flow investigated is the inflow to the compressor cascade with the moving wall with half-delta wing vortex generators attached. Phase-averaged data reveal asymmetrical vortex structures just downstream of the vortex generators. This is the first time near wall turbulence data have been taken on these types of flows.
DTIC
Cascade Wind Tunnels ; Three Dimensional Boundary Layer ; Three Dimensional Flow ; Turbulent Boundary Layer ; Wall Flow

20020006832 Notre Dame Univ. , IN USA
Inclusion of the Interfacial Area Between Phases in the Physical and Mathematical Description of Subsurface Multiphase Flow
Gray, W. G. ; Jan. 25, 2001 ; 32p ; In English
Report No.(s): DE2001-775372 ; DOE/ER/14701 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This project has contributed to the improved understanding and precise physical description of multiphase subsurface flow by combining theoretical derivation of equations, lattice Boltzmann modeling of hydrodynamics to identify characteristics and parameters, and simplification of field-scale equations to assess the advantages and disadvantages of the complete theory.
NTIS
Hydrodynamics ; Multiphase Flow ; Hydrodynamic Equations

20020006912 American Univ. , Beirut Lebanon
A Pressure-Based Finite Volume Method with Full Multi-Grid Acceleration for Multi-Fluid Flow at All Speeds ***Final Report***
Moukalled, Fadi ; Sep. 30, 2001 ; 93p ; In English
Contract(s)/Grant(s): F61775-00-WE071
Report No.(s): AD-A395564 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

This report results from a contract tasking American University of Beirut as follows: Solving a variety of two-dimensional unsteady turbulent multi-fluid flow problems at all speeds (subsonic, transonic, and supersonic regimes) will test the newly implemented algorithms. Examples include: (1) Dam-type problem (fluid-air); (2) Gas-particle flow in a venturi meter; (3) Two fluid mixture at subsonic flow conditions (incompressible); (4) Two gas mixture at supersonic flow conditions; and (5) Multi-component turbulent combusting flows (i.e., chemical reaction with significant heat release).
DTIC
Algorithms ; Turbulent Flow ; Computational Fluid Dynamics ; Two Dimensional Flow ; Unsteady Flow

20020006916 Kyushu Univ. , Faculty of Engineering , Fukuoka, Japan
Shock Wave Production in Water from the Roughened Optical Fiber Output Surface
Nakahara, Motonao , Kyushu Univ. , Japan ; Nagayama, Kunihito , Kyushu Univ. , Japan ; Technology Reports of Kyushu University ; November 2001 ; ISSN 0023-2718 ; Volume 74 , No. 6 , pp. 653-658 ; In Japanese ; Copyright ; Avail: Issuing Activity

A high pressure pulse is produced from the optical fiber output surface by a pulse laser energy input. We found that enhancement of absorption of laser energy takes place at the output surface, if the surface is intentionally roughened. The effect causes the pressure enhancement of the generated shock waves in water. More effective high-pressure shock wave can be generated by the aluminum coating on the roughened fiber surface. These phenomena can be used as a controllable pressure pulse

source for microsurgery in medicine or initiation of high explosives by pulse laser. The phenomena have been observed by the pulse laser shadowgraphy, framing high-speed photography and streak photography. Shock wave propagation characteristics are found to depend upon various parameters such as the fiber diameter, fiber material, Surface roughness, ambient medium, laser energy, aluminum coating on the surface, etc. Shock wave generation can be detected successively by the laser input, but found to degrade down. Cavitation bubbles have also been created after every shot. The possible mechanism of the light absorption at the roughened surface is discussed on the basis of observed shock propagation characteristics.
Author
Shock Wave Propagation ; Water ; Augmentation ; Cavitation Flow ; Fiber Lasers ; High Pressure ; Optical Fibers

20020006932 Computer Sciences Corp. , Moffett Field, CA USA
Visualizing Flow Over Parametric Surfaces Using Line Integral Convolution
Forssell, Lisa , Computer Sciences Corp. , USA ; [1994] ; 1p ; In English ; Visualization 1994 , 17-21 Oct. 1994 , Washington, DC , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Line Integral Convolution (LIC) is a powerful technique for imaging and animating vector fields. We extend the LIC paradigm in three ways: (1) The existing technique is limited to vector fields over a regular Cartesian grid. We extend it to vector fields over parametric surfaces, such as those found in curvilinear grids, used in computational fluid dynamics simulations; (2) Periodic motion filters can be used to animate the flow visualization. When the flow lies on a parametric surface, however, the motion appears misleading. We explain why this problem arises and show how to adjust the LIC algorithm to handle it; (3) We introduce a technique to visualize vector magnitudes as well as vector direction. Cabral and Leedom have suggested a method for variable-speed animation, which is based on varying the frequency of the filter function. We develop a different technique based on kernel phase shifts which we have found to show substantially better results. Our implementation of these algorithms utilizes texture-mapping hardware to run in real time, which allows them to be included in interactive applications.
Author
Flow Visualization ; Convolution Integrals

20020006951 NASA Ames Research Center , Moffett Field, CA USA
Grid Convergence of High Order Methods for Multiscale Complex Unsteady Viscous Compressible Flows
Sjoegreen, B. , Research Inst. for Advanced Computer Science , USA ; Yee, H. C. , NASA Ames Research Center , USA ; March 2001 ; 24p ; In English ; 15th AIAA CFD Conference , 11-14 Jun. 2001 , Anaheim, CA , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA
Report No.(s): AIAA Paper 2001-2599 ; Copyright ; Avail: Issuing Activity

Grid convergence of several high order methods for the computation of rapidly developing complex unsteady viscous compressible flows with a wide range of physical scales is studied. The recently developed adaptive numerical dissipation control high order methods referred to as the ACM and wavelet filter schemes are compared with a fifth-order weighted ENO (WENO) scheme. The two 2-D compressible full Navier-Stokes models considered do not possess known analytical and experimental data. Fine grid solutions from a standard second-order TVD scheme and a MUSCL scheme with limiters are used as reference solutions. The first model is a 2-D viscous analogue of a shock tube problem which involves complex shock/shear/boundary-layer interactions. The second model is a supersonic reactive flow concerning fuel breakup. The fuel mixing involves circular hydrogen bubbles in air interacting with a planar moving shock wave. Both models contain fine scale structures and are stiff in the sense that even though the unsteadiness of the flows are rapidly developing, extreme grid refinement and time step restrictions are needed to resolve all the flow scales as well as the chemical reaction scales.
Author
Computational Grids ; Essentially Non-Oscillatory Schemes ; Unsteady Flow ; Wavelet Analysis ; Viscous Flow ; Computational Fluid Dynamics

20020007086 Los Alamos National Lab. , NM USA
Method of treating unstructured concave cells in staggered-grid lagrangian hydrodynamics
Rousculp, C. ; Burton, D. ; Dec. 01, 2000 ; 8p ; In English
Report No.(s): DE2001-772607 ; LA-UR-00-6068 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A method is proposed for the treatment of concave cells in staggered-grid Lagrangian hydrodynamics. The method is general enough to be applied to two- and three-dimensional unstructured cells. Instead of defining a cell-point as the geometric average

of its nodes (a cell-center), the cell-point is that which equalizes the triangular/tetrahedral area/volume in two/three dimensions. Examples are given.
NTIS
Hydrodynamics ; Concavity ; Lagrangian Function

20020007088 Argonne National Lab. , IL USA
Coupled Newton-Krylov solver for improved CHAD cache utilization and performance
Canfield, T. R. ; Chien, T. H. ; Domanus, H. M. ; Tentner, A. M. ; Tzanos, C. P. ; Mar. 24, 2000 ; 4p ; In English
Report No.(s): DE2001-775257 ; ANL/MCS/CP-101405 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

CHAD (Computational Hydrodynamics for Advanced Design) is a computer program that has been developed to analyze flows in automotive and defense applications. Extensive performance analysis of the CHAD computer program indicated a need to address cache memory use to increase computational performance. Several strategies have been adopted to achieve this goal: simultaneous solution of the coupled Navier-Stokes equations, data clustering, and data ordering. A coupled Newton-Krylov solver has been incorporated into a version of the CHAD program, resulting in consistent improvement in run times that varies from 50% to 200%. Further work will be required to tune the solver for optimal performance. In addition, experiments with data cluster and reordering indicate a potential for performance improvement.
NTIS
Fluid Flow ; Hydrodynamics ; Computerized Simulation ; Computational Fluid Dynamics

20020008235 Pennsylvania State Univ. , Applied Research Lab. , University Park, PA USA
Basic Research into High-Speed Supercavitating Bodies ***Final Report , 1 Dec. 1996-21 Feb. 2001***
Stinebring, David R. ; Feb. 2001 ; 33p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-97-1-0126
Report No.(s): AD-A395886 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Critical technologies related to SCAT development, including cavitator hydrodynamics, control surface hydrodynamics, static pressure sensing, flow noise calculations and hydrodynamics modeling of high-speed supercavitating flows. Focused on critical technologies related to SCAT development, including hydrodynamics of advanced cavitator concepts, control surface hydrodynamics, cavity geometry studies for comparison with CFD modeling, small-scale model design and fabrication, and flow noise testing and modeling.
DTIC
Computational Fluid Dynamics ; High Speed ; Hydrodynamics ; Supercavitating Flow ; Scale Models ; Hydraulic Test Tunnels

20020008245 Naval Research Lab. , Marine Geosciences Div. , Stennis Space Center, MS USA
A Monte Carlo Simulation of Thermal-Driven Fluid: Flux Rate and Density Profile
Pandey, R. B. ; Gettrust, J. F. ; Aug. 15, 2000 ; 13p ; In English
Report No.(s): AD-A395742 ; NRL/JA/7430-00-0028 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Effects of uniform temperature and linear temperature gradient on flow rate and density profile of fluid from a source to an open system is studied by a Monte Carlo simulation in three dimensions. The steady-state density profile with uniform temperature differs significantly from that of the temperature gradient at all but high-temperature regimes, where the profile is a linear density gradient the crossover to linear density gradient of the profile is sensitive to range of temperature variation. The response of the flow rate density to the temperature is nonlinear.
DTIC
Monte Carlo Method ; Temperature Effects ; Flux Density ; Flow Velocity ; Fluid Mechanics

20020008664 NASA Ames Research Center , Moffett Field, CA USA
Statistical Ensemble of Large Eddy Simulations
Carati, Daniele , Association Euratom-Etat Belge , Belgium ; Rogers, Michael M. , NASA Ames Research Center , USA ; Wray, Alan A. , NASA Ames Research Center , USA ; [2001] ; 8p ; In English
Contract(s)/Grant(s): NATO-CRG-970213 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

A statistical ensemble of large eddy simulations (LES) is run simultaneously for the same flow. The information provided by the different large scale velocity fields is used to propose an ensemble averaged version of the dynamic model. This produces local model parameters that only depend on the statistical properties of the flow. An important property of the ensemble averaged dynamic procedure is that it does not require any spatial averaging and can thus be used in fully inhomogeneous flows. Also, the

ensemble of LES's provides statistics of the large scale velocity that can be used for building new models for the subgrid-scale stress tensor. The ensemble averaged dynamic procedure has been implemented with various models for three flows: decaying isotropic turbulence, forced isotropic turbulence, and the time developing plane wake. It is found that the results are almost independent of the number of LES's in the statistical ensemble provided that the ensemble contains at least 16 realizations.
Author
Isotropic Turbulence ; Large Eddy Simulation ; Dynamic Models

20020008898 Los Alamos National Lab. , NM USA
Comparison of monte carlo methods for nonlinear radiation transport
Martin, W. R. ; Brown, F. B. ; Mar. 01, 2001 ; 24p ; In English
Report No.(s): DE2001-776954 ; LA-UR-01-1728 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Five Monte Carlo methods for solving the nonlinear thermal radiation transport equations are compared. The methods include the well-known Implicit Monte Carlo method (IMC) developed by Fleck and Cummings, an alternative to IMC developed by Carter and Forest, an 'exact' method recently developed by Ahrens and Larsen, and two methods recently proposed by Martin and Brown. The five Monte Carlo methods are developed and applied to the radiation transport equation in a medium assuming local thermodynamic equilibrium. Conservation of energy is derived and used to define appropriate material energy update equations for each of the methods. Details of the Monte Carlo implementation are presented, both for the random walk simulation and the material energy update. Simulation results for all five methods are obtained for two infinite medium test problems and a 1-D test problem, all of which have analytical solutions. Conclusions regarding the relative merits of the various schemes are presented.
NTIS
Nonlinear Equations ; Radiation Transport ; Monte Carlo Method ; Simulation ; Energy Conservation

20020008899 National Renewable Energy Lab. , Golden, CO USA
Using an Ersatz Thermosiphon Loop to Model Natural Convection Flows Inside a Shallow Enclosure
Burch, J. D. ; Gawlik, K. M. ; Feb. 20, 2001 ; 11p ; In English
Report No.(s): DE2001-776940 ; NREL/CP-550-29631 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Natural convection loops (NCL) can occur when extracting energy from thermal storage with immersed heat exchangers. to assist in heat exchanger design and annual performance simulations of such systems, this paper proposes modeling an NCL with a comparatively simple ersatz thermosiphon loop (ETL). In an actual thermosiphon loop, fluid in channels or pipes flows in a closed loop, driven by a net buoyancy head which is equal to the total pressure drop. In the proposed approach, ersatz flow channels corresponding to the actual NCL flow are first defined, based upon experiment, numerical solution, or other information. The heat transfer and friction coefficients in the simplified ETL model must then be adjusted to fit these known data. The test case analyzed here is a horizontal shallow enclosure with temperature boundary conditions at both ends. A numerical solution is used to calibrate the ETL, and an analytical solution is used to extrapolate to other conditions for testing the ETL mo del predictions. It is shown that over two orders of magnitude variation in heat transfer, the calibrated ETL model predicts the heat transfer to 8% RMSD.
NTIS
Solar Energy ; Thermosiphons ; Heat Exchangers ; Loops

20020008984 Atomic Energy Commission , Washington, DC USA
The Propagation of Spherical Shock Waves
Ungar, Eric E. ; May 04, 1953 ; 71p ; In English
Report No.(s): AD-A396007 ; AECU-3201 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This report is a summary of unclassified theoretical work on propagation of one-dimensional shock waves and on the propagation of spherical shock waves in gases.
DTIC
Shock Waves ; Spherical Waves ; Shock Wave Propagation ; Gases

20020008985 Los Alamos National Lab. , NM USA
Fluid Dynamics - An Introductory Test
Harlow, Francis H. ; Amsden, Anthony A. ; Feb. 1970 ; 95p ; In English
Contract(s)/Grant(s): W-7405-ENG
Report No.(s): AD-A396003 ; LA-4100 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

This report presents a discussion of basic physical fluid dynamics, shows some useful techniques for obtaining solutions, and illustrates a variety of fluid flow phenomena by means of some solved problems. No prior fluid dynamics experience is required of the reader.
DTIC
Fluid Dynamics ; Lectures ; Fluid Flow

20020009004 Illinois Univ. , Dept. of Theoretical and Applied Mechanics , Urbana, IL USA
Vortex Packets in Turbulent Boundary Layers with Application to High Reynolds Number Effects, Isolated and Patterned Roughness, Near Wall Modeling and Strategies for Drag Reduction ***Final Report , 1 Apr. 1999-9 Apr 2001***
Adrian, R. J. ; Balachandar, S. ; Nov. 02, 2001 ; 16p ; In English
Contract(s)/Grant(s): N00014-99-1-0188
Report No.(s): AD-A395935 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The scientific goals of this work are to develop a complete physical model of turbulence in wall boundary layers and to develop means of describing and modeling surface roughness effect. We make use of recent developments in our understanding of the mechanistic structure of near wall turbulence for smooth walls at low Reynolds numbers to understand how large Reynolds number and wall roughness affect turbulence. We build upon experimental and computational evidence from smooth walls to extend the mechanistic picture of turbulence based on a paradigm of hierarchy of hairpin packets to high Reynolds number, when roughness effect increases in importance. Both experimental measurements of velocity field in smooth and rough walls and direct numerical simulations of evolution and interaction of hairpin vortices are used.
DTIC
Turbulent Boundary Layer ; Horseshoe Vortices ; High Reynolds Number ; Wall Flow ; Surface Roughness Effects

20020009016 NASA Glenn Research Center , Cleveland, OH USA
CFD Modeling of Free-Piston Stirling Engines
Ibrahim, Mounir B. , Cleveland State Univ. , USA ; Zhang, Zhi-Guo , Cleveland State Univ. , USA ; Tew, Roy C., Jr. , NASA Glenn Research Center , USA ; Gedeon, David , Gedeon Associates , USA ; Simon, Terrence W. , Minnesota Univ. , USA ; September 2001 ; 12p ; In English ; 36th Intersociety Energy Conversion Engineering Conference , 29 Jul. - 2 Aug. 2001 , Savannah, GA , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA
Contract(s)/Grant(s): NAG3-2482 ; RTOP 755-1A-14
Report No.(s): NASA/TM-2001-211132 ; E-12981 ; NAS 1.15:211132 ; IECEC2001-CT-38 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
NASA Glenn Research Center (GRC) is funding Cleveland State University (CSU) to develop a reliable Computational Fluid Dynamics (CFD) code that can predict engine performance with the goal of significant improvements in accuracy when compared to one-dimensional (1-D) design code predictions. The funding also includes conducting code validation experiments at both the University of Minnesota (UMN) and CSU. In this paper a brief description of the work-in-progress is provided in the two areas (CFD and Experiments). Also, previous test results are compared with computational data obtained using (1) a 2-D CFD code obtained from Dr. Georg Scheuerer and further developed at CSU and (2) a multidimensional commercial code CFD-ACE+. The test data and computational results are for (1) a gas spring and (2) a single piston/cylinder with attached annular heat exchanger. The comparisons among the codes are discussed. The paper also discusses plans for conducting code validation experiments at CSU and UMN.
Author
Computational Fluid Dynamics ; Free-Piston Engines ; Stirling Engines ; Mathematical Models ; Applications Programs (Computers)

20020009017 Los Alamos National Lab. , NM USA
Liquid butane filled load for a liner driven pegasus experiment
Salazar, M. A. ; Anderson, W. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783257 ; LA-UR-01-3226 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A hydrogen rich, low density liquid, contained within the internal volume of a cylindrical liner, was requested of the Polymers and Coatings Group (MST-7) of the Los Alamos Materials Science Division for one of the last liner driven experiments conducted on the Los Alamos Pegasus facility. The experiment was a continuation of the Raleigh-Taylor hydrodynamics series of experiments and associated liners that have been described previously.
NTIS
Hydrodynamics ; Polymers

20020009181 Army Research Lab. , Weapons and Materials Research Directorate , Aberdeen Proving Ground, MD USA

Experimental Validation of Elliptical Fin Opening Behavior

Garner, James M. ; Welnacht, Paul ; Kaste, Robert P. ; Sep. 2001 ; 31p ; In English ; Original contains color images

Report No.(s): AD-A395839 ; ARL-TR-2527 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

An effort to improve the performance of ordnance has led to the consideration of the use of folding elliptical fins for projectile stabilization. A second order differential equation was used to model elliptical fin deployment history and accounts for deployment with respect to the geometric properties of the fin, the variation in fin aerodynamics during deployment, the initial yaw effect on fin opening, and the variation in deployment speed based on changes in projectile spin. This model supports tests conducted at the Transonic Experimental Facility, Aberdeen Proving Ground, Maryland, which examined the opening behavior of these uniquely shaped fins. A companion boat tail configuration is created by sectioning the projectile base and joining with the fin. The configuration is both space efficient and aerodynamic. Reduced drag coefficients have been documented for this configuration and it is employable on a variety of projectiles. The fins use the centrifugal force from the projectile spin to deploy. During the deployment, the fin aerodynamic forces vary with angle-of-attack changes in the free stream. Model results indicate that projectile spin dominates the initial opening rates and that aerodynamics dominate near the fully open state. Vibratory fin motions after elastic and inelastic collisions with the fin stop are also examined. The aerodynamics and initial state conditions correspond to a zone 7w artillery firing (roughly Mach 2.25) that uses a slip band obturator and with muzzle exit yaws of 0 and 5 degrees. The model results are examined to explain the observed behavior and to suggest improvements for later designs.

DTIC

Fins ; Aerodynamic Forces ; Projectiles ; Openings ; Tail Assemblies ; Aerodynamic Coefficients ; Aerodynamics ; Artillery

20020009205 Technical Univ. of Istanbul , Turkey

The International Conference (2nd) on Vortex Methods Held in ITU Macka Campus, Istanbul, Turkey on September 26-28, 2001

Uenal, M. F. ; Sep. 2001 ; 262p ; In English ; Original contains color images

Contract(s)/Grant(s): F61775-01-W-F035

Report No.(s): AD-A396146 ; EOARD-CSP 01-5035 ; No Copyright ; Avail: CASI ; A12 , Hardcopy ; A03 , Microfiche

This report contains the Final Proceedings for Second International Conference on Vortex Methods, 26 September 2001 - 28 September 2001. New Developments in mathematical and physical modeling techniques and engineering applications of vortex methods are reported. The conference will cover topics spreading from basic theory of vortex methods to its engineering applications to unsteady flow problems such as loading of surfaces of aircraft and two phase flows with vibration, heat transfer and turbulence.

DTIC

Vortices ; Conferences ; Computational Fluid Dynamics

20020009544 NASA Ames Research Center , Moffett Field, CA USA

Merging Intelligent Systems Technologies with CFD Analysis Strategies: Prototype Development at NASA Ames

Thompson, David E. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Improving the CFD Application Process Workshop , 8-9 Nov. 1994 , Stanford, CA , USA

Contract(s)/Grant(s): RTOP 505-59-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A collaborative team of researchers from fields of Computational Fluid Dynamics (CFD), fluid physics, computer architectures, and computer science and knowledge engineering have begun work on a prototype system that addresses several of industry's concerns in using NASA-developed CFD codes as part of the design cycle. A major problem exists in the application of CFD technologies within the aeronautics design cycle due primarily to misunderstandings in the ranges of applicability of the various solver codes or turbulence models. Features that arise during the CFD solution process need to be discriminated and recognized as actual flow features with physical support in the geometry and flow conditions of the problem being solved, or as numerical or non-physical errors arising from mis-application of solver code and its parameters, gridding strategies, or discretization. interpolations. The fundamental concept is to develop an intelligent computational system that can accept the engineer's definition of the problem and construct an optimal CFD solution. to do this requires capturing both the knowledge of how to apply the various CFD tools and how to adapt the application of those tools to flow structures as they evolve during the flow simulation. Embedded within this adaptive system approach is the additional desire to automatically identify and quantify the quality of resolution of the pertinent flow structures, be they genuine or error-induced, and then to adjust the solution strategy accordingly. This paper discusses the status of that prototyping effort.

Author

Computational Fluid Dynamics ; Prototypes ; Expert Systems ; Simulation ; Turbulence Models

20020009560 NASA Ames Research Center , Moffett Field, CA USA

Applied Computational Fluid Dynamics at NASA Ames Research Center

Holst, Terry L. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English , 28 Oct. 1994 , AZ , USA

Contract(s)/Grant(s): RTOP 509-10-00 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The field of Computational Fluid Dynamics (CFD) has advanced to the point where it can now be used for many applications in fluid mechanics research and aerospace vehicle design. A few applications being explored at NASA Ames Research Center will be presented and discussed. The examples presented will range in speed from hypersonic to low speed incompressible flow applications. Most of the results will be from numerical solutions of the Navier-Stokes or Euler equations in three space dimensions for general geometry applications. Computational results will be used to highlight the presentation as appropriate. Advances in computational facilities including those associated with NASA's CAS (Computational Aerosciences) Project of the Federal HPCC (High Performance Computing and Communications) Program will be discussed. Finally, opportunities for future research will be presented and discussed. All material will be taken from non-sensitive, previously-published and widely-disseminated work.

Author

Numerical Analysis ; Hypersonic Speed ; Computer Networks ; Fluid Mechanics

20020009568 Tamkang Univ. , Dept. of Aerospace Engineering , Taipei, Taiwan, Province of China

The Friction Characteristics of Gaseous Slip Flow in Microtubes

Chen, Ching-Shung , Tamkang Univ. , Taiwan, Province of China ; Kang, Shung-Wen , Tamkang Univ. , Taiwan, Province of China ; Kuo, Wei-Jen , Tamkang Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 641-647 ; In English ; Copyright ; Avail: Issuing Activity

The present work studies the friction characteristics of gaseous slip flow in microtubes. The reduced diameter of microtubes has significant influences on the flow. The degree of influence depends on the Knudsen number. If the Knudsen number is in the range of 10(exp -3) to 0.1, the fluid can be assumed to be a continuum but a slip boundary condition at the tube wall has to be employed to account for the incomplete tangential momentum and energy exchanges between the gas molecules and the wall. Although slip flow in microtubes can be investigated by solving numerically the compressible Navier-Stokes equations, the hyperbolic-parabolic character of the equations makes it very inefficient. The very large length to diameter ratio of microtube flows suggests that they can be predicted accurately as well as efficiently by solving the compressible boundary-layer equations. The parabolic character of the boundary-layer equations renders the present method a very efficient and accurate tool in studying slip flows. The results confirm the findings of earlier investigators that the product of f center dote Re is smaller for laminar microtube flows than that predicted by the conventional theory when the flow is in the slip region.

Author

Friction Factor ; Gaseous Diffusion ; Slip Flow ; Boundary Conditions

20020009570 National Taiwan Univ. , Dept. of Mechanical Engineering , Taipei, Taiwan, Province of China

Heat and Mass Transfer in the Vertical Twin-Parallel-Tube Absorber-Evaporator Unit

Tsern, Ing-Peir , National Taiwan Univ. , Taiwan, Province of China ; Lin, Heng-I. , National Taiwan Univ. , Taiwan, Province of China ; Chou, Shyan-Fu , National Taiwan Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 581-593 ; In English ; Copyright ; Avail: Issuing Activity

A vertical twin-parallel-tube absorber-evaporator unit was built for the present Study to investigate the overall heat transfer and mass absorption rates at various operation conditions. In order to establish the optimal surface wetting condition for the thin absorbent film during operation process, an annular-slot type solution distributor with declining surface was adopted for the present system. Tile main objective of the present study is to perform an experimental investigation of the controlling parameters associated with absorption by failing film, including the operation pressure, the inlet temperature of the cooling water, and the Reynolds number, temperature, and concentration of the inlet absorbent solution. An analogy between heat and mass transfer near the film surface is then applied to calculate tile interfacial concentration and temperature of the absorbent film, and thus the heat and mass transfer coefficients of the absorbent film is determined. The present results show that, the higher the inlet Reynolds number of the absorbent solution is, the lower the total heat transfer rate is. Increasing operation pressure will increase the concentration difference of the absorbent solution. The concentration difference of absorbent solution film between inlet and outlet increases sharply as the Reynolds number of the inlet absorbent film decreases below 200. When the Reynolds number of the inlet absorbent film is around 200, optimal absorption-evaporation exists and will provide appropriate conditions for a high efficiency absorption air conditioning system.

Author

Heat Transfer ; Mass Transfer ; Tubes ; Evaporators ; Fabrication

20020009599 Los Alamos National Lab. , NM USA

Rationale for implicit turbulence modeling

Margolin, L. G. ; Rider, W. J. ; Apr. 01, 2001 ; 25p ; In English

Report No.(s): DE2001-780353 ; LA-UR-01-793 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We present a rationale for the success of nonoscillatory finite volume (NFV) difference schemes in modeling turbulent flows without need of subgrid scale models. Our exposition focuses on certain truncation terms that appear in the modified equation of one particular NFV (numerical flow visualization) scheme, MPDATA. We demonstrate that these truncation terms have physical justification, representing the modifications to the governing equations that arise when one considers the motion of finite volumes of fluid over finite intervals of time.

NTIS

Finite Volume Method ; Numerical Flow Visualization ; Turbulence Models

20020010159 NASA Glenn Research Center , Cleveland, OH USA

A Three-Dimensional CFD Investigation of Secondary Flow in an Accelerating, 90 deg Elbow

Cavicchi, Richard H. , NASA Glenn Research Center , USA ; December 2001 ; 34p ; In English ; Original contains color illustrations

Contract(s)/Grant(s): RTOP 714-04-50

Report No.(s): NASA/TM-2001-211219 ; E-13071 ; NAS 1.15:211219 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

NASA Glenn Research Center has recently applied the WIND National Code flow solver to an accelerating elbow with a 90 deg. bend to reveal aspects of secondary flow. This elbow was designed by NACA in the early 1950's such that flow separation would be avoided. Experimental testing was also done at that time. The current three dimensional CFD investigation shows that separation has indeed been avoided. Using its three-dimensional capability, this investigation provides various viewpoints in several planes that display the inception, development, and final location of a passage vortex. Its shape first becomes discernible as a vortex near the exit of the bend. This rendition of the exit passage vortex compares well with that found in the experiments. The viewpoints show that the passage vortex settles on the suction surface at the exit about one-third of the distance between the plane wall and midspan. Furthermore, it projects into the mainstream to about one-third of the channel width. of several turbulence models used in this investigation, the Spalart Alimaras, Baldwin Lomax, and SST (Shear Stress Transport) models were by far the most successful in matching the experiments.

Author

Computational Fluid Dynamics ; Secondary Flow ; Turbulence Models ; Vortices

20020010573 NASA Goddard Space Flight Center , Greenbelt, MD USA

Carbon-Carbon Radiator

Butler, Dan , NASA Goddard Space Flight Center , USA ; [2001] ; 13p ; In English ; Mission Technology Forum , 15-16 Aug. 2001 , Unknown ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Carbon-Carbon (C-C) Radiator was a success and proved that the technology can work to reduce Spacecraft weight. C-C has a niche, especially for high temperatures. C-C still needs further development: reduction in fabrication time and cost - high conductivity "traditional" composites are more competitive, and CTE interface issues with heat pipes. Redundancy a good idea - we flew the spare panel. CSRP was a success -informal inter-agency partnership. Possible follow-on: C-C foam for low CTE mirrors/optical benches.

Derived from text

Carbon ; Weight Reduction ; Radiators ; Fabrication

20020010585 RECOM Technologies, Inc. , Moffett Field, CA USA

Automated Instrumentation, Monitoring and Visualization of PVM Programs Using AIMS

Mehra, Pankaj , RECOM Technologies, Inc. , USA ; VanVoorst, Brian , RECOM Technologies, Inc. , USA ; Yan, Jerry , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; 1994 Simulation Multi Conference , 19-20 May 1994 , Oakridge, TN , USA

Contract(s)/Grant(s): RTOP 509-10-31 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We present views and analysis of the execution of several PVM (Parallel Virtual Machine) codes for Computational Fluid Dynamics on a networks of Sparcstations, including: (1) NAS Parallel Benchmarks CG and MG; (2) a multi-partitioning algorithm for NAS Parallel Benchmark SP; and (3) an overset grid flowsolver. These views and analysis were obtained using our Automated Instrumentation and Monitoring System (AIMS) version 3.0, a toolkit for debugging the performance of PVM programs. We will describe the architecture, operation and application of AIMS. The AIMS toolkit contains: (1) Xinstrument,

which can automatically instrument various computational and communication constructs in message-passing parallel programs; (2) Monitor, a library of runtime trace-collection routines; (3) VK (Visual Kernel), an execution-animation tool with source-code clickback; and (4) Tally, a tool for statistical analysis of execution profiles. Currently, Xinstrument can handle C and FORTRAN 77 programs using PVM 3.2.x; Monitor has been implemented and tested on Sun 4 systems running SunOS 4.1.2; and VK uses XIIR5 and Motif 1.2. Data and views obtained using AIMS clearly illustrate several characteristic features of executing parallel programs on networked workstations: (1) the impact of long message latencies; (2) the impact of multiprogramming overheads and associated load imbalance; (3) cache and virtual-memory effects; and (4) significant skews between workstation clocks. Interestingly, AIMS can compensate for constant skew (zero drift) by calibrating the skew between a parent and its spawned children. In addition, AIMS' skew-compensation algorithm can adjust timestamps in a way that eliminates physically impossible communications (e.g., messages going backwards in time). Our current efforts are directed toward creating new views to explain the observed performance of PVM programs. Some of the features planned for the near future include: (1) ConfigView, showing the physical topology of the virtual machine, inferred using specially formatted IP (Internet Protocol) packets: and (2) LoadView, synchronous animation of PVM-program execution and resource-utilization patterns.
Author
Computer Systems Design ; Computational Fluid Dynamics ; Parallel Programming

20020010612 Atomic Energy Commission , Idaho Falls, ID USA
B-Spline-Based Colocation Method to Approximate the Solutions to the Equations of Fluid Dynamics
Landon, M. D. ; Johnson, R. W. ; Jul. 01, 1999 ; 7p ; In English
Report No.(s): DE2001-9603 ; INEEL/CON-99-00180 ; No Copyright ; Avail: Department of Energy Information Bridge
The potential of a B-spline collocation method for numerically solving the equations of fluid dynamics is discussed. It is known that B-splines can resolve complex curves with drastically fewer data than can their standard shape function counterparts. This feature promises to allow much faster numerical simulations of fluid flow than standard finite volume/finite element methods without sacrificing accuracy. An example channel flow problem is solved using the method.
NTIS
Computational Fluid Dynamics ; Fluid Flow ; Computerized Simulation

20020010631 Oak Ridge National Lab. , TN USA
Experimental Analysis of Local Heat and Mass Transfer Data for Vertical Falling Film Absorption
Keyhani, M. ; Miller, W. A. ; Nov. 14, 1999 ; 9p ; In English
Report No.(s): DE2001-9280 ; ORNL/CP-103985 ; EC-12-02-00-0 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In pure heat transfer, specifications of effectiveness, fluid properties, and flows enable calculation of the heat exchanger area. In the case of falling film absorption, a simultaneous heat and mass transfer governs the performance of the absorber. The exchange of mass across the liquid-vapor interface involves the generation of heat. The heat effects associated with the mass exchange increase the temperature, which affects the equilibrium state of the pressure and composition and in turn affects the mass. The falling film flow rate coupled to the physical properties of kinematic viscosity and surface tension govern the flow regime of a vertical falling film. Wavy-laminar, roll-wave laminar, and turbulent flows will develop convective contributions that can enhance the transfer of mass into the film. The combined interaction of all these factors makes the absorption process very difficult to analyze and predict. A study of simultaneous heat and mass transfer was therefore conduct ed on a vertical falling film absorber to better understand the mechanisms driving the heat and mass transfer processes. Falling films are characteristically unstable, and a wavy-laminar flow was observed during the experimental study. The wavy flow further complicates the problem; therefore, only limited information is known about the temperature and concentration profiles along the length of the absorber that describe the local heat and mass transfer rates.
NTIS
Fluid Flow ; Heat Transfer ; Mass Transfer ; Liquid-Vapor Interfaces

20020010907 Wyoming Univ. , Dept. of Mechanical Engineering , Laramie, WY USA
Automatic Fringe Detection for Oil Film Interferometry Measurement of Skin Friction ***Final Report***
Naughton, Jonathan W. , Wyoming Univ. , USA ; Decker, Robert K. , Wyoming Univ. , USA ; Jafari, Farhad , Wyoming Univ. , USA ; Nov. 26, 2001 ; 32p ; In English ; Original contains color illustrations
Contract(s)/Grant(s): NCC2-5315
Report No.(s): UWAL-JN-2001-01 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report summarizes two years of work on investigating algorithms for automatically detecting fringe patterns in images acquired using oil-drop interferometry for the determination of skin friction. Several different analysis methods were tested, and a combination of a windowed Fourier transform followed by a correlation was found to be most effective. The implementation of this method is discussed and details of the process are described. The results indicate that this method shows promise for automating the fringe detection process, but further testing is required.
Author
Algorithms ; Diffraction Patterns ; Friction Measurement ; Skin Friction ; Detection

20020010929 Lawrence Livermore National Lab. , Livermore, CA USA
Compressible Turbulence Transport Equations for Generalized Second Order Closure
Cloutman, L. D. ; May 01, 1999 ; 29p ; In English
Report No.(s): DE2001-9097 ; UCRL-ID-134075 ; No Copyright ; Avail: Department of Energy Information Bridge
Progress on the theory of second order closure in turbulence models of various types requires knowledge of the transport equations for various turbulence correlations. This report documents a procedure that provides such equations for a wide variety of turbulence averages for compressible flows of a multicomponent fluid. Generalizing some work by Germano for incompressible flows, we introduce an appropriate extension of his generalized second order correlations and use a generalized mass-weighted averaging procedure to derive transport equations for the correlations. The averaging procedure includes all of the commonly used averages as special cases. The resulting equations provide an internally consistent starting point for future work in developing single-point statistical turbulence transport models for fluid flows. The form invariance of the incompressible equations also holds for the compressible case, and we discuss some of the closure issues and frequently ignored complications of statistical turbulence models of compressible flows.
NTIS
Correlation ; Turbulence Models ; Incompressible Flow ; Compressible Flow

20020010953 Sandia National Labs. , Albuquerque, NM USA
High-Resolution Modeling of Multiscale Transient Phenomena in Turbulent Boundary Layers
Kerstein, A. R. ; Schmidt, R. C. ; Wunsch, S. ; Ashurst, W. T. ; Nilsen, V. ; Jan. 01, 2001 ; 94p ; In English
Report No.(s): DE2001-781975 ; SAND2001-8108 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
High fidelity numerical simulation of wall-bounded turbulence requires physically sound representation of the small scale unsteady processes governing near-wall momentum, heat, and mass transfer. Conventional wall treatments do not capture the diverse multiphysics flow regimes relevant to engineering applications. to obtain a robust yet computationally affordable near-wall submodel for turbulent flow computations, the fine-grained spatial structure and time evolution of the near-wall flow is simulated using a model formulated on a 1D domain corresponding to the wall-normal direction. This approach captures the strong variation of flow properties in the wall-normal direction and the transient interactions between this highly inhomogeneous region and the more nearly homogeneous (at fine scales) flow farther from the wall. The 1D simulation utilizes the One Dimensional Turbulence (ODT) methodology, whose formulation for the present application is described in detail. Demonstrations of ODT performance with regard to aspects of flow physics relevant to near-wall flow modeling are presented. The coupling of ODT to a large eddy simulation (LES) of confined turbulent flow is described, and the performance of the coupled formulation is demonstrated. It is concluded that this formulation has the potential to provide the fidelity needed for engineering applications at an affordable computational cost.
NTIS
Flow Characteristics ; Fluid Dynamics ; Large Eddy Simulation ; Computerized Simulation ; Turbulent Boundary Layer ; Turbulent Flow ; Wall Flow

20020011038 NASA Glenn Research Center , Cleveland, OH USA
Flow Visualization in Evaporating Liquid Drops and Measurement of Dynamic Contact Angles and Spreading Rate
Zhang, Neng-Li , Ohio Aerospace Inst. , USA ; Chao, David F. , NASA Glenn Research Center , USA ; November 2001 ; 12p ; In English ; 2001 International Mechanical Engineering Congress and Exposition , 11-16 Nov. 2001 , New York, NY , USA ; Sponsored by American Society of Mechanical Engineers , USA ; Original contains color illustrations
Contract(s)/Grant(s): RTOP 101-53-00
Report No.(s): NASA/TM-2001-211284 ; E-13084 ; NAS 1.15:211284 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A new hybrid optical system, consisting of reflection-refracted shadowgraphy and top-view photography, is used to visualize flow phenomena and simultaneously measure the spreading and instant dynamic contact angle in a volatile-liquid drop on a nontransparent substrate. Thermocapillary convection in the drop, induced by evaporation, and the drop real-time profile data are synchronously recorded by video recording systems. Experimental results obtained from this unique technique clearly reveal that thermocapillary convection strongly affects the spreading process and the characteristics of dynamic contact angle of the drop. Comprehensive information of a sessile drop, including the local contact angle along the periphery, the instability of the three-phase contact line, and the deformation of the drop shape is obtained and analyzed.
Author
Flow Visualization ; Drops (Liquids) ; Surface Tension Driven Convection ; Evaporation

20020011174 National Defence Research Establishment , Avd. foer Vapen och Skydd , Tumba, Sweden
Modeling of Reacting Gas-Solid Flows: A Survey of the Literature ***Topical Report***
Berglund, M. ; December 2000 ; 50p ; In English
Report No.(s): PB2001-108428 ; FOA-R-99-01289-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In the present work a survey of the literature covering important aspects on modeling of reacting gas-solid flows has been compiled. Typical examples of this kind of flow are interior ballistics of guns and solid rockets, pneumatic transport, fluidization, gas-particle separation, etc. The aim of this study is to identify issues of relevance for building a computational capability for this type of flow.
NTIS
Reacting Flow ; Surveys ; Gas-Solid Interactions ; Two Phase Flow ; Computational Fluid Dynamics

20020011754 NASA Ames Research Center , Moffett Field, CA USA
High-End Computing for Incompressible Flows
Kwak, Dochan , NASA Ames Research Center , USA ; Kiris, Cetin , NASA Ames Research Center , USA ; [2001] ; 20p ; In English ; First MIT Conference on Computational and Solid Mechanics , 12-14 Jun. 2001 , Cambridge, MA , USA ; Sponsored by Massachusetts Inst. of Tech. , USA ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The objective of the First MIT Conference on Computational Fluid and Solid Mechanics (June 12-14, 2001) is to bring together industry and academia (and government) to nurture the next generation in computational mechanics. The objective of the current talk, 'High-End Computing for Incompressible Flows', is to discuss some of the current issues in large scale computing for mission-oriented tasks.
Derived from text
Computational Fluid Dynamics ; Space Shuttle Main Engine ; Incompressible Flow ; Viscous Flow ; Parallel Processing (Computers)

20020012220 National Petroleum Technology Office , Tulsa, OK USA
Optimization of Fluid Front Dynamics in Porous Media Using Rate Control , 1 , Equal Mobility Fluids
Sundaryanto, B. ; Yortsos, Y. C. ; Oct. 18, 1999 ; 51p ; In English
Report No.(s): DE2001-13828 ; DOE/BC/14994-19 ; No Copyright ; Avail: Department of Energy Information Bridge
In applications involving this injection of a fluid in a porous medium to displace another fluid, a main objective is the maximization of the displacement efficiency. For a fixed arrangement of injection and production points (sources and sinks), such optimization is possible by controlling the injection rate policy. Despite its practical relevance, however, this aspect has received scant attention in the literature. In this paper, a fundamental approach based on optimal control theory, for the case when the fluids are miscible, of equal viscosity and in the absence of dispersion and gravity effects. Both homogeneous and heterogeneous porous media are considered. From a fluid dynamics viewpoint, this is a problem in the deformation of material lines in porous media, as a function of time-varying injection rates.
NTIS
Control Theory ; Viscosity ; Optimization ; Fluid Dynamics ; Porous Materials

20020012428 NASA Glenn Research Center , Cleveland, OH USA
CAP: A Computer Code for Generating Tabular Thermodynamic Functions from NASA Lewis Coefficients
Zehe, Michael J. , NASA Glenn Research Center , USA ; Gordon, Sanford , NASA Glenn Research Center , USA ; McBride, Bonnie J. , NASA Glenn Research Center , USA ; October 2001 ; 84p ; In English

Contract(s)/Grant(s): RTOP 708-87-13
Report No.(s): NASA/TP-2001-210959 ; NAS 1.60:210959 ; E-12814 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

For several decades the NASA Glenn Research Center has been providing a file of thermodynamic data for use in several computer programs. These data are in the form of least-squares coefficients that have been calculated from tabular thermodynamic data by means of the NASA Properties and Coefficients (PAC) program. The source thermodynamic data are obtained from the literature or from standard compilations. Most gas-phase thermodynamic functions are calculated by the authors from molecular constant data using ideal gas partition functions. The Coefficients and Properties (CAP) program described in this report permits the generation of tabulated thermodynamic functions from the NASA least-squares coefficients. CAP provides considerable flexibility in the output format, the number of temperatures to be tabulated, and the energy units of the calculated properties. This report provides a detailed description of input preparation, examples of input and output for several species, and a listing of all species in the current NASA Glenn thermodynamic data file.
Author
Coefficients ; Computer Programs ; Thermodynamics ; Thermodynamic Properties

20020012430 NASA Ames Research Center , Moffett Field, CA USA
The Lag Model, a Turbulence Model for Wall Bounded Flows Including Separation
Olsen, Michael E. , NASA Ames Research Center , USA ; Coakley, Thomas J. , NASA Ames Research Center , USA ; [2001] ; 12p ; In English ; 15th AIAA Fluid Dynamics Conference , 11-14 Jun. 2001 , Anaheim, CA , USA
Report No.(s): AIAA Paper 2001-2564 ; Copyright Waived ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A new class of turbulence model is described for wall bounded, high Reynolds number flows. A specific turbulence model is demonstrated, with results for favorable and adverse pressure gradient flowfields. Separation predictions are as good or better than either Spalart Almaras or SST models, do not require specification of wall distance, and have similar or reduced computational effort compared with these models.
Author
Flow Distribution ; Turbulence Models ; High Reynolds Number ; Wall Flow

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20020006095 NASA Goddard Space Flight Center , Greenbelt, MD USA
Large Aperture Scanning Lidar Based on Holographic Optical Elements
Schwemmer, Geary K. , NASA Goddard Space Flight Center , USA ; Miller, David O. , NASA Goddard Space Flight Center , USA ; Wilkerson, Thomas D. , NASA Goddard Space Flight Center , USA ; Andrus, Ionio , NASA Goddard Space Flight Center , USA ; Guerra, David V. , NASA Goddard Space Flight Center , USA ; [2001] ; 2p ; In English ; IEEE IGARSS 2001 Meeting , 9-13 Jul. 2001 , Sydney , Australia ; Sponsored by Institute of Electrical and Electronics Engineers , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Lidar remote sensing instruments can make a significant contribution to satisfying many of the required measurements of atmospheric and surface parameters for future spaceborne platforms, including topographic altimeters, atmospheric profiles of, wind, humidity, temperature, trace molecules, aerosols, and clouds. It is highly desirable to have wide measurement swaths for rapid coverage rather than just the narrow ribbon of data that is obtained with a nadir only observation. For most applications global coverage is required, and for wind measurements scanning or pointing is required in order to retrieve the full 3-D wind vector from multiple line-of-sight Doppler measurements. Conventional lidar receivers make up a substantial portion of the instrument's size and weight. Wide angle scanning typically requires a large scanning mirror in front of the receiver telescope, or pointing the entire telescope and aft optics assembly, Either of these methods entails the use of large bearings, motors, gearing and their associated electronics. Spaceborne instruments also need reaction wheels to counter the torque applied to the spacecraft by these motions. NASA has developed simplified conical scanning telescopes using Holographic Optical Elements (HOEs) to reduce the size, mass, angular momentum, and cost of scanning lidar systems. NASA has developed two operating lidar systems based on 40 cm diameter HOEs. The first such system, named Prototype Holographic Atmospheric Scanner for Environmental Remote Sensing (PHASERS) was a joint development between NASA Goddard Space Flight Center (GSFC) and the University of

Maryland College Park. PHASERS is based on a reflection HOE for use at the doubled Nd:YAG laser wavelength of 532 nm and has recently undergone a number of design changes in a collaborative effort between GSFC and Saint Anselm College in New Hampshire. The next step was to develop IR transmission HOEs for use with the Nd:YAG fundamental in the Holographic Airborne Rotating Lidar Instrument Experiment (HARLIE). The HOE spins like a compact disk in a large ring ball bearing. In an aircraft the HOE faces down, looking out through a window at an angle of 45 degrees off-nadir. The HOE diffracts 85% of the incident 532 nm light into a 160 micron spot at a focal length of 1 meter. HARLIE is a field deployable lidar measuring aerosol, cloud, and boundary layer backscatter for atmospheric research. It has flown several times and is also used from a ground-based trailer in an upward-looking mode. The HOE generates a 45 degree conical scan pattern by rotating at speeds up to 30 rpm. Like PHASERS, the HOE in HARLIE serves both as the laser collimating lens as well as the receiver telescope primary optic. The telescope is coupled to the receiver package via fiber optic. The transmitter is a diode pumped Nd:YAG laser operating at 1064 nm, delivering 1 mJ pulses at a 5 KHz rep-rate. The receiver has a 200 microradian field-of-view and a 0.5 nm optical bandpass. The photon counting data system utilizes a single Geiger-mode silicon avalanche photodiode detector, This new technology has also presented us with new data visualization challenges as well as new measurement techniques. The backscatter data obtained from a stationary (i.e. ground-based) scanning HOE lidar is on the surface of a cone, which when viewed over many consecutive scans can reveal atmospheric motions on this surface over time as the atmosphere advects over the site. In a moving platform such as an airplane or satellite, the data from consecutive scans cover different areas under the flight path, revealing atmospheric structure in 3-dimensions. An example of a visualization of HARLIE ground-based data is presented, showing aerosol backscatter on a 90 degree conical surface generated from one 360 degree scan of the lidar during the HOLO-1 field campaign on the afternoon of 10 March 1999. Higher backscatter levels are rendered as lighter signal against a dark background. Breaking Kelvin-Helmholtz waves are evident on the north side of the scan at an altitude of 10-11 km. Time series of successive scans made at regular intervals render unique views of atmospheric motions, from which vertical profiles of atmospheric wind vectors can be obtained using a unique data analysis approach. Wind vectors obtained from the lidar were compared with co-located radiosonde wind profiles during an intensive operating period in September-October 2000 at the Atmospheric Radiation Measurement Program's Southern Great Plains Central Facility.

Author

Apertures ; Optical Radar ; Holographic Optical Elements ; Remote Sensing ; Swath Width ; Wind Profiles

20020006188 OptiMetrics, Inc. , Ann Arbor, MI USA

Visual Performance Model Analysis of Human Performance in IR Target Recognition for Third Generation FLIR ***Final Report , May 1998-Jun. 1999***

Dunkel, Michael D. ; Smith, Frederick G. ; Dunstan, Allyn W. ; Jun. 1999 ; 28p ; In English ; Original contains color images

Contract(s)/Grant(s): F41624-94-D-6000 ; Proj-7184

Report No.(s): AD-A395596 ; AFRL-HE-WP-TR-2000-0157 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The eventual goal of this research is to develop a method that emulates human vision and hence is consistently able to predict human performance in target detection/recognition/identification tasks. The model used for simulating human visual performance is the OptiMetrics' developed Visual Performance Model (VPM). With the inclusion of proper calibration parameters, any visual or thermal spectrum sensor can be modeled with VPM. This modeling capability will yield a design tool, which economically allows comparison of various types of sensors and displays, and eliminates the need for many operator tests of prototype devices. This will result in better system designs and may shorten the acquisition cycle for target acquisition systems. A previous research effort compared detectability (d(sup 1)) values resulting from laboratory target detection experiments with those predicted by VPM for first generation (1st Gen) FLIR (forward looking infrared) imagery. Good correlation between VPM predictions and human operator experiments was obtained. This report documents VPM's d(sup 1) predictions for third generation (3rd Gen) FLIR imagery. Laboratory d(sup 1) results for the 3rd Gen imagery were not available at the time main text was written, however, those experimental values are documented in an appendix. The d(sup 1) values calculated by VPM agree well with the 3rd Gen experimental values. Based on that comparison, it appears that VPM is a valuable tool for prediction sensor and display performance.

DTIC

FLIR Detectors ; Infrared Imagery ; Target Recognition ; Human Performance

20020006234 Yale Univ. , Dept. of Applied Physics , New Haven, CT USA

Detection of Biological and Non-Biological Aerosols via Fluorescence and Surfactant on Droplets via Harmonic Generations ***Final Report , 1 Aug. 1997-31 May 2001***

Chang, Richard K. ; Jun. 28, 2001 ; 11p ; In English

Contract(s)/Grant(s): DAAG55-97-1-0349

Report No.(s): AD-A395360 ; ARO-36605.12-EV ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

For the entire grant period, the objective has been to use optical diagnostic techniques to characterize the airborne particles. Ideally, the particles in the ambient, with or without deliberate disbursement, need to be classified and, if possible, be identified. Conditioned on the classification of particles, that randomly transit through the sample volume, the particles would or would not be deflected to another location where the particles would be subject to series of biochemical-related identification. Our challenge is to develop optical techniques that could serve as the preliminary screener of every airborne particle that randomly transits (at 1 - 10 m/s) through the sample volume. The challenge is to discriminate the bio- from the non-bio-aerosols within a tune short enough to trigger the particle deflector and possibly to set off an alert alarm.

DTIC

Fluorescence ; Detection ; Air Pollution ; Biochemistry ; Aerosols

20020006312 Science Applications International Corp. , Moffett Field, CA USA

Review of the SAFARI 2000 RC-10 Aerial Photography

Myers, Jeff , Science Applications International Corp. , USA ; Shelton, Gary , Science Applications International Corp. , USA ; Annegarn, Harrold , Witwatersrand Univ. , South Africa ; Jan. 17, 2001 ; 1p ; In English ; SAFARI 2000 First Data Workshop , 28-31 Aug. 2001 , Siavonga , Zambia

Contract(s)/Grant(s): NAS2-99038 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This presentation will review the aerial photography collected by the NASA ER-2 aircraft during the SAFARI (Southern African Regional Science Initiative) year 2000 campaign. It will include specifications on the camera and film, and will show examples of the imagery. It will also detail the extent of coverage, and the procedures to obtain film products from the South African government. Also included will be some sample applications of aerial photography for various environmental applications, and its use in augmenting other SAFARI data sets.

Author

Aerial Photography ; Africa

20020006515 Colorado School of Mines , Dept. of Metallurgical Engineering , Golden, CO USA

Hall and Seebeck Measurement System for the Evaluation of Alloy Phase Stability, Microstructure, and Properties ***Final Report , 20 Apr. 2000-19 Apr 2001***

Olson, David L. ; Ohno, Timothy R. ; Sep. 12, 2001 ; 7p ; In English

Contract(s)/Grant(s): DAAD19-00-1-0149

Report No.(s): AD-A395851 ; MT-CWJCR-001-020 ; ARO-40863.1-MS-RIP ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Hall and Seebeck measurement systems have been specified, purchased, facilitated and calibrated. These systems are assisting in research efforts to develop new analytical approaches, based on electronic tools which have served the electronic industry well, to assess structural materials used in defense assemblies and structures. These electronic systems will develop multiple measurements techniques to assess alloy phase stability, aging, microstructure and properties. Seebeck coefficient measurements have already been correlated with the diffusible hydrogen content in alloy with high transition metal element contents. These results show promise for assessment of hydrogen effects in gun barrel steel, naval nickel aluminum bronze fasteners, and high strength steel welds. Hall and Seebeck measurements have been used to characterize the microstructure in alloy thin films. Research is in progress to develop electronic techniques to determine the susceptibility of sigma formation in superalloys. These electronic techniques will offer rapid non destructive micro structural assessment with quantitative data acquisition for easy long term storage of product quality assurance.

DTIC

Electrical Measurement ; Alloys

20020006758 Army Research Lab. , Human Research and Engineering Directorate , Aberdeen Proving Ground, MD USA
Distributed Sensor Network for Retargeting one of two Army Research Laboratory parcels of Multi-Role Armament and Ammunition Suite ATD
Costanza, John ; Jun. 20, 2001 ; 23p ; In English ; Proceedings from Armaments for the Army Transformation Conference, 18-20 June 2001. Sponsored by NDIA
Report No.(s): AD-A394821 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This presentation of viewgraphs describes the sensor network for retargeting for mult-role armament and ammunitions. The objective is to conceive, model, and asses approaches to dynamic re-targeting within a simulation framework that permits a virtual experimentation. The technical approach is to develop simulation framework that integrates digital map data, sensor models, target models, networking, communication, and battlefield dynamics. The benefit is to permit trailing of notional networks of sensors and assessment of enabling capability of ”at least one shot...at least one kill.”
DTIC
Ammunition ; Detectors ; Targets ; Simulation

20020006890 Naval Research Lab. , Washington, DC USA
Two and Three Color Processing of Fort A P Hill Multiband Imagery
Warren, P. ; Scribner, D. ; Schuler, J. ; Kruer, M. ; Feb. 01, 1999 ; 14p ; In English ; Original contains color images
Report No.(s): AD-A394909 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Advanced Navy sensors will operate simultaneously in multiple spectral bands to achieve target detection, discrimination, and identification. Color image processing is necessary to guide the development of integrated imaging sensors using multi-spectral focal plane arrays and to demonstrate the capabilities of these emerging sensors. This paper discusses human visualization techniques which best transfer multi-spectral information to the observer for critical search, surveillance, and targeting decisions. Fused two- and three-band color video is presented from data gathered at Fort AP Hill using bore-sighted cameras (LMIRIS uncooled 320*240 long wave infrared, Amber Radiance 256*256 mid-wave infrared, and Fairchild image intensified CCD cameras).
DTIC
Image Processing ; Integrated Circuits ; Color Photography ; Target Acquisition ; Imaging Techniques ; Target Recognition

20020006907 Department of Defense , Office of the Inspector General , Arlington, VA USA
Acquisition of the Joint Helmet Mounted Cueing System
Apr. 18, 2001 ; 43p ; In English
Report No.(s): AD-A395571 ; IG/DOD-D-2001-103 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The audit objective was to evaluate the overall management of the Joint Helmet Mounted Cueing System. Specifically, the audit determined whether the Air Force is cost-effectively readying the system for the production phase of the acquisition process. We also evaluated the management control program as it related to the overall objectives. This report addresses testing and evaluation and contracting. A later report will address requirement evolution and affordability and joint management.
DTIC
Cues ; Helmet Mounted Displays ; Management Planning

20020008016 NASA Ames Research Center , Moffett Field, CA USA
Integrated Neural Flight and Propulsion Control System
Kaneshige, John , NASA Ames Research Center , USA ; Gundy-Burlet, Karen , NASA Ames Research Center , USA ; [2001] ; 6p ; In English
Contract(s)/Grant(s): RTOP 704-30-12
Report No.(s): AIAA Paper 2001-4386 ; Copyright Waived ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
This paper describes an integrated neural flight and propulsion control system. which uses a neural network based approach for applying alternate sources of control power in the presence of damage or failures. Under normal operating conditions, the system utilizes conventional flight control surfaces. Neural networks are used to provide consistent handling qualities across flight conditions and for different aircraft configurations. Under damage or failure conditions, the system may utilize unconventional flight control surface allocations, along with integrated propulsion control, when additional control power is necessary for achieving desired flight control performance. In this case, neural networks are used to adapt to changes in aircraft dynamics and control allocation schemes. of significant importance here is the fact that this system can operate without emergency or backup flight control mode operations. An additional advantage is that this system can utilize, but does not require, fault detection and isolation information or explicit parameter identification. Piloted simulation studies were performed on a commercial transport

aircraft simulator. Subjects included both NASA test pilots and commercial airline crews. Results demonstrate the potential for improving handing qualities and significantly increasing survivability rates under various simulated failure conditions.
Author
Aerodynamic Characteristics ; Control Surfaces ; Controllability ; Dynamic Control ; Flight Control ; Propulsion

20020008094 Research Inst. of National Defence , Weapons and Protection Div. , Tumba, Sweden
SEM 2000; Scanning Electron Microscopy: Imaging and Microanalysis
Petersson, J. ; Pettersson, A. ; Dec. 2000 ; 31p ; In English
Report No.(s): PB2001-107746 ; FOA-R-00-01744-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The title of this report is also the title of a three-day SEM (Scanning Electron Microscopy) course held October 17-19, 2000 in Gothenburg. The course was arranged by the Microscopy and Microanalysis group at the department of Experimental Physics at Chalmers University of Technology. The contents of the course was a mixture of lectures on SEM theory and demonstrations. Some fifty participants from various companies, around twenty representatives for manufacturers and a couple of lecturers from different universities participated in the course. This report contains a summary of the lectures given.
NTIS
Conferences ; Scanning Electron Microscopy ; Lectures

20020008146 Norwegian Defence Research Establishment , Kjeller, Norway
Conceptual Solutions for Underwater Surveillance ***Konseptlosninger for Undervannsovervaking***
Synnes, Stig Asle , Norwegian Defence Research Establishment , Norway ; Tveit, Bjorn , Norwegian Defence Research Establishment , Norway ; Berger, Tor , Norwegian Defence Research Establishment , Norway ; Jun. 01, 2001 ; 70p ; In Norwegian ; Original contains color illustrations
Contract(s)/Grant(s): FFIBM Proj. 791/350
Report No.(s): FFI/RAPPORT-2001/03259 ; ISBN 82-464-0552-7 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
FFI-project 791 part 2, underwater surveillance, is concluded in this report by the proposal of generic concepts for underwater surveillance systems. Guidelines for how to choose among the proposals are also included. The strengths and the weaknesses of each underwater sensor technology are identified. The results are used to identify independent concepts for detection, classification and verification, exploiting the best features of each sensor technology. Known weaknesses are compensated for by applying additional sensors. Finally, these concepts are used for constructing the generic conceptual solutions for underwater solution.
Author
Surveillance ; Sensors

20020008156 Lawrence Livermore National Lab. , Livermore, CA USA
Automation for on-line remote-control in-situ electron microscopy
O'Keefe, M. A. ; Parvin, B. ; Owen, D. ; Taylor, J. ; Westmacott, K. H. ; May 18, 1996 ; 12p ; In English
Report No.(s): DE2001-775085 ; LBNL-39206 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We have developed and tested a multimedia system for remote operation of transmission electron microscopes and used it to control the Kratos 1500 keV microscope in Berkeley during in situ experiments.
NTIS
Electron Microscopes ; Remote Control ; Transmission Electron Microscopy

20020008216 Sandia National Labs. , Albuquerque, NM USA
Complete Fast Fourier Transform and Cascaded Transition-Band Filters to Reduce the Noise of Deconvolution
Patterson, P. E. ; Jan. 01, 2000 ; 44p ; In English
Report No.(s): DE2001-776348 ; SAND2000-1310 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A measurement system's components: cabling, delay line, waveform recorder, etc., degrade acquired signals and their respective bandlimited frequency responses. Compensation software corrects for this frequency-dependent spectral degradation by deconvolving the transfer function of the entire measurement system out of the measured signal spectra. This report describes methods to transfer the characteristics of a wide bandwidth repetitive sampling oscilloscope to a single-shot transient digitizer, characterize the measurement system, develop a cascaded transition-band filter, and compensate data acquired with the filtered, characterized measurement system. These procedures are easily implemented, execute quickly, and successfully compensate

waveforms possessing endpoint discontinuities. Waveforms possessing endpoint discontinuities are made to appear duration-limited and continuous. The spectra for these modified waveforms are correct, including at dc. The deconvolution process introduces unavoidable noise. Filtering is applied to reduce the deconvolution noise while minimally affecting compensated waveform risetime and amplitude. Resultant compensated data retains its initial dc baseline offset with improved waveform fidelity and low noise of deconvolution.
NTIS
Fourier Transformation ; Noise Reduction ; Signal to Noise Ratios

20020008640 Sandia National Labs. , Albuquerque, NM USA
Range-Gated LADAR Coherent Imaging Using Parametric Up-Conversion of IR and NIR Light for Imaging with a Visible-Range Fast-Shuttered Intensified Digital CCD Camera
Yates, ; McDonald, ; Bliss, ; Cameron, ; Zutavern, ; Dec. 20, 2000 ; 11p ; In English
Report No.(s): DE2001-772162 ; SAND2000-3203C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Research is presented on infrared (IR) and near infrared (NIR) sensitive sensor technologies for use in a high speed shuttered/intensified digital video camera system for range-gated imaging at eye-safe wavelengths in the region of 1.5 microns. The study is based upon nonlinear crystals used for second harmonic generation (SHG) in optical parametric oscillators (OPOS) for conversion of NIR and IR laser light to visible range light for detection with generic S-20 photocathodes. The intensifiers are stripline geometry 18-mm diameter microchannel plate intensifiers (MCPIIS), designed by Los Alamos National Laboratory and manufactured by Philips Photonics. The MCPIIS are designed for fast optical shattering with exposures in the 100-200 ps range, and are coupled to a fast readout CCD camera. Conversion efficiency and resolution for the wavelength conversion process are reported. Experimental set-ups for the wavelength shifting and the optical configurations for producing and transporting laser reflectance images are discussed.
NTIS
Sensors ; Cameras ; Optical Radar ; Imaging Techniques ; Infrared Radiation ; Near Infrared Radiation

20020008983 Ohio Univ. , Dept. of Chemistry , Athens, OH USA
Ethanol Detection Strategy with Multiple Digital Filtering of Passive FT-IR Interferograms ***Final Report, Oct. 1999-Dec. 2000***
Idwasi, Patrick O. ; Small, Gary W. ; Combs, Roger J. ; Knapp, Robert B. ; Kroutil, Robert T. ; Sep. 2001 ; 37p ; In English ; Prepared in collaboration with Ohio University, Athens, OH
Report No.(s): AD-A396011 ; ECBC-TR-209 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Digital filtering methods are evaluated for automated detection of ethanol using passive Fourier transform infrared (FT-IR) data collected during laboratory and open-air experiments. In applications where ethanol signals are overlapped by spectral interference signals (e.g., ammonia and acetone), the use of multiple digital filters is found to improve the sensitivity of the vapor analyte detection. The detection strategy applies bandpass digital filters to short interferogram segments that are acquired from the passive FT-IR spectrometer configuration. to implement the automated detection of the ethanol target analyte, the filtered interferogram segments are input into a piece-wise linear discriminant analysis. Through the use of a set of training data, discriminants are computed that are subsequently used for automated detection of ethanol vapor. A two-filter strategy with separate ethanol and ammonia filters is compared to a single ethanol filter approach. Bandpass parameters of the digital filters and the interferogram segment location are optimized with laboratory data. The laboratory data are generated for ethanol, ammonia, and acetone vapor mixtures in a gas cell, whose contents are viewed against various infrared background radiances. The optimized parameters, from the laboratory data, are subsequently tested with open-air remote sensing data. The open-air data consists of elevated temperature ethanol and ammonia plumes generated from a portable emission stack. The two-filter strategy outperforms the single-filter approach in laboratory and open-air scenarios, where the ammonia spectral interference dominates the ethanol spectral signature.
DTIC
Bandpass Filters ; Digital Filters ; Fourier Transformation ; Infrared Spectroscopy ; Infrared Spectrometers ; Interferometry ; Infrared Spectra ; Remote Sensing ; Spectral Signatures

20020008999 Air Force Research Lab. , Sensors Directorate , Rome, NY USA

Knowledge-Base Application to Ground Moving Target Detection

Adve, R. ; Antonik, P. ; Baldygo, W. ; Capraro, C. ; Capraro, G. ; Sep. 2001 ; 74p ; In English ; Original contains color images

Contract(s)/Grant(s): Proj-762R

Report No.(s): AD-A395956 ; AFRL-SN-RS-TR-2001-185 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report summarizes a multi-year in-house effort to apply knowledge base control techniques and advanced Space-Time Adaptive Processing algorithms to improve detection performance and false alarm control in Ground Moving Target Indication Airborne Radar.

DTIC

Airborne Radar ; Control Systems Design ; Target Acquisition ; Knowledge Based Systems ; Target Recognition

20020009064 Syracuse Research Corp. , NY USA

Knowledge Base Applications to Adative Space-Time Processing, Volume 2: Airborne Radar Filtering ***Final Report , Aug. 1995-Jul. 1999***

Schuman, Harvey ; Jul. 2001 ; 66p ; In English

Contract(s)/Grant(s): F30602-95-C-0041 ; Proj-4506

Report No.(s): AD-A396094 ; AFRL-SN-RS-TR-2001-146-VOL-2 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

There are many variations of space-time adaptive processing (STAP) that have been proposed since as far back as the 1960s. Practically all of the variations can be grouped into eight general methods. These methods are described in this report. An interesting discussion on the relative merits of the methods and of STAP in general is also included. Contentions are backed up by results from applying STAP to measured data. The merits identified in this report are used later (Volume III) to derive rules for a knowledge-based space-time adaptive processing system.

DTIC

Airborne Radar ; Radar Filters ; Knowledge Based Systems

20020009065 Syracuse Research Corp. , NY USA

Knowledge Base Applications to Adaptive Space-Time Processing, Volume 3: Radar Filtering Rule Book ***Final Report , Aug. 1995-Jul. 1999***

Schuman, Harvey ; Jul. 2001 ; 37p ; In English

Contract(s)/Grant(s): F30602-95-C-0041 ; Proj-4506

Report No.(s): AD-A396093 ; SRC-TD-97-1466 ; AFRL-SN-RS-TR-2001-146-VOL-3 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report describes potential radar filtering for a knowledge-based space-time adaptive processor. The description for each rule includes a brief discussion, a list of data sources required for decision making, a list of the filter parameters that must be specified by the knowledge base controller, and the decision process.

DTIC

Knowledge Based Systems ; Radar Filters ; Adaptive Control

20020009151 Army Engineer Research and Development Center , Geotechnical and Structures Lab. , Vicksburg, MS USA

Use of Ground Penetrating Radar for Locating Contraband Aboard Ocean Going Vessels: Feasibility Study ***Final Report***

Llopis, Jose L. ; Simms, Janet ; August 2001 ; 151p ; In English

Report No.(s): AD-A395692 ; ERDC/GSL-TR-01-12 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

Ground Penetrating Radar (GPR) surveys were conducted over various stockpiled materials at the Alabama State Docks located in Mobile, AL, to determine whether GPR is a viable method for rapidly detecting contraband materials buried in the cargo holds of ocean going vessels. The surveys were conducted by burying various objects including a contraband simulant (a bundle of four 10-lb bags of sugar duct-taped together) in stockpiled materials available at the site. The stockpiled materials tested were crystal gypsum, powdered gypsum, crushed pumice, coarse coal, fine coal, and bauxite. Two GPR systems, the pulseEKKO 1000 and the Noggin Plus systems, manufactured by Sensors & Software, Inc., were used to conduct the surveys. GPR surveys were run over the stockpiled materials using a suite of antenna frequencies ranging between 225 and 900 MHz to determine the effects of material type on depth of penetration and target resolution. All of the antennas tested were successful in detecting the location of the contraband simulant in at least one of the stockpiled materials. The 225 and 250 MHz antennas had the highest percentage of detecting the simulant in the stockpiled materials (60 and 90 percent, respectively) whereas the 900 MHz antenna had the lowest (30 percent). All antennas tested have penetration depths of greater than 1.5 in. The GPR surveys run on the different stockpiled

materials at the Alabama State Docks demonstrate that GPR is a feasible means of locating contraband buried to depths of at least 1 to 2 in (limit of testing). However, the probability of success of locating contraband with GPR on board ships depends on the size and depth of the target as well as the magnetic and electrical properties of the target and the material in which it is hidden.
DTIC
Ships ; Feasibility ; Ground Penetrating Radar ; Radar Detection

20020009180 Villanova Univ. , Dept. of Electrical and Computer Engineering , PA USA
Blind Time-Frequency Analysis for Source Discrimination in Multisensor Array Processing ***Final Report , 15 Nov. 1997-30 Sep. 2001***
Amin, Moeness G. ; Oct. 2001 ; 232p ; In English
Contract(s)/Grant(s): N00014-98-1-0176
Report No.(s): AD-A395852 ; Rept-527616 ; No Copyright ; Avail: CASI ; A11 , Hardcopy ; A03 , Microfiche
The project has focused on advancing the theory of time-varying spectrum analysis and its applications to the important area of sensor array processing. We pioneered the development of multi-sensor receivers based on quadratic time-frequency and joint-variable distributions, and have provided the theoretical framework for solving direction finding and blind source separation problems using bilinear transforms. Time-frequency signatures of signal arrivals have been, for the first time, utilized for improved detection, angle-of-arrival estimation, and blind signal recovery. Time-frequency distributions have been elevated from a purely temporal processing tool to a more powerful spatio-temporal processing technique. Our work has shown that time-frequency distributions represent the natural mechanism to process narrowband signals in broadband communication platforms, stationary signals in a dominating nonstationary environment, and spread spectrum communication signals contaminated by powerful jammers.
DTIC
Frequency Distribution ; Multisensor Applications ; Direction Finding ; Signal Processing ; Spectrum Analysis ; Maximum Likelihood Estimates ; Spread Spectrum Transmission

20020009204 Corps of Engineers , Engineer Research and Development Center , Vicksburg, MS USA
Advanced UXO Detection/Discrimination Technology Demonstration-US Army Jefferson Proving Ground, Madison, Indiana ***Final Report***
Cespedes, Ernesto R. ; Sep. 2001 ; 100p ; In English ; Original contains color images
Contract(s)/Grant(s): Proj-20054
Report No.(s): AD-A396147 ; ERDC/EL TR-01-20 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A02 , Microfiche
The Environmental Security Technology Certification program (ESTCP) funded the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) (lead agency), the U.S. Army Engineer Research and Development Center (ERDC), and the U.S. Environmental Center (AEC) to design and conduct controlled technology demonstrations at the U.S. Army Jefferson Proving Ground (JPG) in Madison, Indiana. These technology demonstrations were conducted during the period June to November 2000 at three 1-hectare areas within JPG. The demonstrations were designed to assess the capabilities of state-of-the-art technologies to detect, discriminate, and identify unexploded ordnance (UXO) in areas containing natural (magnetic rocks/soils) and man-made (munitions fragments) clutter. In addition, cost and production rates for each of the systems were documented and compared with standard ”mag and flag” operations. This report documents the metrics developed for evaluating field performance, summarizes the performance of each of the systems, and identifies areas where improvements are needed. The results of these demonstrations are intended to aid the Government in selecting effective and efficient UXO detection and discrimination systems for difficult magnetic clutter sites such as those encountered in Kaho’olawe, Hawaii.
DTIC
Explosives Detection ; Ammunition ; Clutter ; Detection

20020009572 National Renewable Energy Lab. , Golden, CO USA
Miniature, Inexpensive, Amperometric Oxygen Sensor: Inventions and Innovation Sensors and Controls Project Fact Sheet
Wogsland, J. ; Jan. 25, 2001 ; 2p ; In English
Report No.(s): DE2001-781630 ; DOE/GO-102001-0849 ; NREL/FS-810-26733 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Project fact sheet written for the Inventions and Innovation Program about a new miniature oxygen sensor that costs less that conventional sensors.
NTIS
Gas Detectors ; Oxygen ; Electrical Measurement

20020009614 Lawrence Livermore National Lab. , Livermore, CA USA
DeepView: A collaborative framework for distributed microscopy
Parvin, B. ; Taylor, J. ; Cong, G. ; Aug. 10, 1998 ; 14p ; In English
Report No.(s): DE2001-779707 ; LBNL-42150 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper outlines the motivation, requirements, and architecture of a collaborative framework for distributed virtual microscopy. In this context, the requirements are specified in terms of (1) functionality, (2) scalability, (3) interactivity, and (4) safety and security. Functionality refers to what and how an instrument does something. Scalability refers to the number of instruments, vendor-specific desktop workstations, analysis programs, and collaborators that can be accessed. Interactivity refers to how well the system can be steered either for static or dynamic experiments. Safety and security refers to safe operation of an instrument coupled with user authentication, privacy, and integrity of data communication. to meet these requirements, we introduce three types of services in the architecture: Instrument Services (IS), Exchange Services (ES), and Computational Services (CS). These services may reside on any host in the distributed system. The IS provide an abstraction for manipulating different types of microscopes; the ES provide common services that are required between different resources; and the CS provide analytical capabilities for data analysis and simulation. These services are brought together through CORBA and its enabling services, e.g., Event Services, Time Services, Naming Services, and Security Services. Two unique applications have been introduced into the CS for analyzing scientific images either for instrument control or recovery of a model for objects of interest. These include: in-situ electron microscopy and recovery of 3D shape from holographic microscopy. The first application provides a near real-time processing of the video-stream for on-line quantitative analysis and the use of that information for closed-loop servo control. The second application reconstructs a 3D representation of an inclusion (a crystal structure in a matrix) from multiple views through holographic electron microscopy. These application require steering external stimuli or computational parameters for a particular result. In a sense, ”computational instruments” (symmetric multiprocessors) interact closely with data generated from ”experimental instruments” (unique microscopes) to conduct new experiments and bring new functionalities to these instruments. Both of these features exploit high-performance computing and low-latency networks to bring novel functionalities to unique scientific imaging instruments.
NTIS
Microscopy ; Crystal Structure ; Imaging Techniques

20020009674 North Carolina State Univ. , Dept. of Electrical and Computer Engineering , Raleigh, NC USA
Technology Options for Multi-Spectral Infrared Cameras ***Final Report , 1 Sep. 2000-28 Feb. 2001***
Bilbro, Griff ; Oct. 23, 2001 ; 39p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0498
Report No.(s): AD-A396058 ; ARO-41627.1-CI-II ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Use of multispectral capability in imaging devices provides us with spectral characteristics of the objects being viewed. This helps in ’recognizing’ the object without any knowledge of the geometry or shape of the desired target. Until recently, multispectral images were obtained using multiple filters placed in front of the imaging devices or by using prism based beam-splitting technologies. With the advent of Digital Still Color Cameras, a whole new field of imaging has emerged, which consists of a monolithic array of color filters overlaid on a CCD (charge coupled device) array such that each pixel samples one spectral band. The resulting mosaic of spectral samples is processed to produce a high resolution color image where the values of the spectral bands not sampled at a certain location are estimated from its neighbors. This process is often referred to as de-mosaicking. This paper proposes the use of this technology as a general imaging modality for robust robot vision and compares several de-mosaicking algorithms.
DTIC
Computer Vision ; Multispectral Photography ; Infrared Imagery ; CCD Cameras

20020010158 NASA Glenn Research Center , Cleveland, OH USA
Thin Film Sensors for Surface Measurements
Martin, Lisa C. , NASA Glenn Research Center , USA ; Wrbanek, John D. , NASA Glenn Research Center , USA ; Fralick, Gustave C. , NASA Glenn Research Center , USA ; September 2001 ; 10p ; In English ; 2001 19th International Congress on Instrumentation in Aerospace Simulation Facilities , 27-30 Aug. 2001 , Cleveland, OH , USA ; Sponsored by Institute of Electrical

and Electronics Engineers , USA
Contract(s)/Grant(s): RTOP 708-72-45
Report No.(s): NASA/TM-2001-211149 ; E-13001 ; NAS 1.15:211149 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Advanced thin film sensors that can provide accurate surface temperature, strain, and heat flux measurements have been developed at NASA Glenn Research Center. These sensors provide minimally intrusive characterization of advanced propulsion materials and components in hostile, high-temperature environments as well as validation of propulsion system design codes. The sensors are designed for applications on different material systems and engine components for testing in engine simulation facilities. Thin film thermocouples and strain gauges for the measurement of surface temperature and strain have been demonstrated on metals, ceramics and advanced ceramic-based composites of various component configurations. Test environments have included both air-breathing and space propulsion-based engine and burner rig environments at surface temperatures up to 1100 C and under high gas flow and pressure conditions. The technologies developed for these sensors as well as for a thin film heat flux gauge have been integrated into a single multifunctional gauge for the simultaneous real-time measurement of surface temperature, strain, and heat flux. This is the first step toward the development of smart sensors with integrated signal conditioning and high temperature electronics that would have the capability to provide feedback to the operating system in real-time. A description of the fabrication process for the thin film sensors and multifunctional gauge will be provided. In addition, the material systems on which the sensors have been demonstrated, the test facilities and the results of the tests to-date will be described. Finally, the results will be provided of the current effort to demonstrate the capabilities of the multifunctional gauge.

Author

Thin Films ; Strain Gages ; Surface Temperature ; Temperature Measurement ; Thermocouples ; Measuring Instruments

20020010201 Pacific Northwest National Lab. , Richland, WA USA

Predicted Performance of Neutron Spectrometers Using Scintillating Fibers

Craig, R. A. ; Bliss, M. ; Feb. 14, 2000 ; 27p ; In English
Report No.(s): DE2001-781047 ; No Copyright ; Avail: Department of Energy Information Bridge

One class of neutron spectrometers is devices that provide a measure of the neutron spectrum by using moderating and absorbing materials together with thermal-neutron detectors. Pacific Northwest National Laboratory has developed scintillating fibers that are sensitive to thermal neutrons. Because these fibers are thin, they present an enabling technology for several applications, including highly efficient neutron spectroscopy. The underlying concept is to arrange the fibers in an array of layers separated by materials whose characteristics have been chosen to optimize the instrument function for the application. Monte Carlo experiments have been performed to characterize the conceptual design and to determine the value of the concept as a tool for research and other applications.

NTIS

Neutron Spectrometers ; Neutron Spectra ; Scintillating Fibers

20020010262 ITT Systems and Sciences Corp. , Rome, NY USA

Knowledge Base Applications to Adaptive Space-Time Processing , Volume 1 , Summary

Salama, Yassar ; Senn, Roy ; July 2001 ; 69p ; In English
Contract(s)/Grant(s): F30602-95-C-0041 ; Proj-4506
Report No.(s): AD-A396095 ; AFRL-SN-RS-TR-2001-146-VOL-1 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report summarizes a three-year development of an innovative concept for coordinated adaptive radar processing using knowledge-based control. Under this approach, knowledge and expert rules about the operating theater are used to select algorithms and training data, thereby significantly improving the performance of modern adaptive array radars in dynamic and non-homogeneous environments.

DTIC

Radar ; Adaptive Control ; Knowledge Based Systems

20020010937 Sandia National Labs. , Albuquerque, NM USA

Novel interferometer spectrometer for sensitive stellar radial velocimetry

Erskine, D. ; Ge, J. ; May 20, 1999 ; 9p ; In English
Report No.(s): DE2001-8423 ; UCRL-JC-134314 ; Rept-98-ERD-054 ; No Copyright ; Avail: Department of Energy Information Bridge

We describe a new kind of stellar radial velocimeter based on the series combination of a wide angle Michelson interferometer and a disperser, and which we call a fringing spectrometer. The simplest instrument response of the interferometer produces smaller instrumental noise, and the low resolution requirements of the disperser allows high efficiency and creates an etendue capability which is two orders of magnitude larger than current radial velocimeters. The instrument is compact, inexpensive and portable. Benchtop tests of an open-air prototype shows the short term instrumental noise to be less than 0.76 m/s. A preliminary zero point drift of 4 m/s is already competitive with traditional instruments, in spite of the lack of obvious environmental controls and a known interferometer cavity length drift. We are currently installing cavity stabilization and other improvements that will lead to testing on starlight.
NTIS
Prototypes ; Sensitivity ; Stellar Luminosity ; Spectrometers ; Radial Velocity ; Michelson Interferometers

20020010964 Research Inst. of National Defence , Sensor Technology , Linkoeping, Sweden
Visit to Germany and the Netherlands ***Besoeksresa till Tyskland och Nederlaenderna***
Bolander, G. ; Wickstroem, S. ; Feb. 2001 ; 20p ; In Swedish
Report No.(s): PB2001-107733 ; FOI-R-0045-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
Delft Electronic Products B.V. in the Netherlands and Proxitronic in Germany, who manufacture image intensifiers, were visited 00-12-11-12 by Saab Dynamics and FOI. The aim was to get their view on development of gated viewing image intensifiers using pulsed laser with special interest in the eyesafe wavelength region at 1,5 um. The companies produce image intensifiers at GEN II (also extended) but have no intention to start with GEN III. Proxitronic has collaboration with the University of Munster who are working with a technique using a glow discharge in an array of cells and can handle a broad wavelength range in IR but at limited performance. The resolution is moderate 5-10 lp/mm which is no sufficient to resolve objects at long range (>10 km).
NTIS
Glow Discharges ; Image Intensifiers ; Pulsed Lasers

20020011025 NASA Glenn Research Center , Cleveland, OH USA
Two-Step Calibration of a Multiwavelength Pyrometer for High Temperature Measurement Using a Quartz Lamp
Ng, Daniel , NASA Glenn Research Center , USA ; September 2001 ; 14p ; In English
Contract(s)/Grant(s): RTOP 728-30-20
Report No.(s): NASA/TM-2001-211124 ; E-12973 ; NAS 1.15:211124 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
There is no theoretical upper temperature limit for pyrometer application in temperature measurements. NASA Glenn's multiwavelength pyrometer can make measurements over wide temperature ranges. However, the radiation spectral response of the pyrometer's detector must be calibrated before any temperature measurement is attempted, and it is recommended that calibration be done at temperatures close to those for which measurements will be made. Calibration is a determination of the constants of proportionality at all wavelengths between the detector's output (voltage) and its input signals (usually from a blackbody radiation source) in order to convert detector output into radiation intensity. To measure high temperatures, the detectors are chosen to be sensitive in the spectral range from 0.4 to 2.5 micrometers. A blackbody furnace equilibrated at around 1000 C is often used for this calibration. Though the detector may respond sensitively to short wavelengths radiation, a blackbody furnace at 1000 C emits only feebly at very short wavelengths. As a consequence, the calibration constants that result may not be the most accurate. For pyrometry calibration, a radiation source emitting strongly at the short wavelengths is preferred. We have chosen a quartz halogen lamp for this purpose.
Author
Calibrating ; Pyrometers ; Quartz Lamps ; High Temperature ; Wavelengths ; Luminaires

20020011210 Lawrence Livermore National Lab. , Livermore, CA USA
Gamma-Ray Camera for Arms Control Applications
Chevnov, M. ; Ignoytev, G. ; Morgan, J. F. ; Seminov, D. ; Jun. 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9650 ; UCRL-JC-134557 ; GJ1200000 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Research Institute of Pulse Techniques, in collaboration with the Proliferation Prevention and Arms Control Program at Lawrence Livermore National Laboratory (LLNL), has constructed a gamma-ray camera for use in arms control agreements such as Mutual Reciprocal Inspections and Warhead Dismantlement Transparency. The camera is designed to have high efficiency (in order to reduce inspection times), moderate resolution (to decrease the intrusiveness of the measurements), and sturdy construction (to allow operation in the types of conditions that might be met during shipment and use at various forward weapons

sites). The imaging element consists of a honeycomb or soda-straw lead collimator and a 312-mm-diameter NaI(Tl) scintillator viewed by an array of phototubes. Software was developed to display two- and three-dimensional views of the data and to analyze shape and peak areas.The first model was tuned for plutonium radiation in the 375- to 415-keV energy range. Images from various arrays of point sources were obtained and are presented.
NTIS
Cameras ; Gamma Rays

20020011226 Bechtel Nevada Corp. , Las Vegas, NV USA
Large Format Radiographic Imaging
Rohrer, J. S. ; Stewart, L. ; Wilke, M. D. ; King, N. S. ; Baker, S. A. ; Aug. 01, 1999 ; 8p ; In English
Report No.(s): DE2001-9759 ; DOE/NV/11718-357 ; No Copyright ; Avail: Department of Energy Information Bridge
Radiographic imaging continues to be a key diagnostic in many areas at Los Alamos National Laboratory (LANL). Radiographic recording systems have taken on many forms, from high repetition rate, gated systems to film recording and storage phosphors. Some systems are designed for synchronization to an accelerator while others may be single shot or may record a frame sequence in a dynamic radiography experiment. While film recording remains a reliable standby in the radiographic community, there is growing interest in investigating electronic recording for many applications. The advantages of real time access to remote data acquisition are highly attractive. Cooled CCD (charge coupled device) camera systems are capable of providing greater sensitivity with improved signal-to-noise ratio. This paper begins with a review of performance characteristics of the Bechtel Nevada large format imaging system, a gated system capable of viewing scintillators up to 300 mm in diameter. We then examine configuration alternatives in lens coupled and fiber optically coupled electro-optical recording systems. Areas of investigation include tradeoffs between fiber optic and lens coupling, methods of image magnification, and spectral matching from scintillator to CCD camera. Key performance features discussed include field of view, resolution, sensitivity, dynamic range, and system noise characteristics.
NTIS
Image Processing ; Radiography ; Imaging Techniques ; Recording Instruments ; Electro-Optics

20020011676 Smithsonian Astrophysical Observatory , Cambridge, MA USA
Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe ***Annual Report, 1 Feb. 2001 - 31 Jan. 2002***
Reid, Mark J. , Smithsonian Astrophysical Observatory , USA ; December 2001 ; 2p ; In English
Contract(s)/Grant(s): NAG5-10311 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
We proposed a program to measure distances directly with accuracies of 5% to three anchor points in the Local Universe. We planned to accomplish this by conducting Very Long Baseline Interferometry (VLBI) observations of NGC 4258, M 33, and Sgr A*. These distance estimates should have a minimum of systematic uncertainty and can be used to re-calibrate several 'standard candles,' such as Cepheid and RR Lyrae variables. This will place the Galactic and extragalactic distance scales on much firmer ground. The primary contribution of our program will be to provide crucial independent checks and calibrations of extragalactic distance measurements. This will contribute to the ultimate success and impact of the HST Key Project on Extragalactic Distances and the Full-Sky Astrometric Mapping Explorer (FAME). Additionally, since distances are fundamental to astrophysics, our results will affect a large number of general projects on NASA facilities such as the Hubble Space Telescope, Chandra X-ray Observatory, and Next Generation Space Telescope.
Author
Calibrating ; Distance ; Estimates ; Astronomical Coordinates

20020011867 Bureau of Reclamation , Washington, DC USA
Water Measurement Manual: A Guide to Effective Water Measurement Practices for Better Water Management
2001 ; 464p ; In English
Report No.(s): PB2002-100323 ; No Copyright ; Avail: CASI ; A20 , Hardcopy ; A04 , Microfiche
Contents include the following: Introduction; Basic Concepts Related to Flowing Water and Measurement; Measurement Accuracy; Selection of Water Measuring Devices; Inspection of Water Measurement Systems; Measuring and Recording Water Stage or Head; Weirs; Flumes; Submerged Orifices; Current Meters; and Measurements in Pressure Conduits.
NTIS
Water Resources ; Flow Measurement ; Manuals

20020012009 General Sciences Corp. , Beltsville, MD USA

Characteristics of the SIMBIOS Atmospheric Instruments , Chapter 2

Pietras, Christophe , General Sciences Corp. , USA ; Miller, Mark , Brookhaven National Lab. , USA ; Frouin, Robert , Scripps Institution of Oceanography , USA ; Welton, Ellsworth J. , Maryland Univ. Baltimore County , USA ; Slutsker, Ilya , Science Systems and Applications, Inc. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 3-10 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A02 , Microfiche

The Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) pool of instruments is composed of three types of equipment. These instruments are used by the SIMBIOS Project and the SIMBIOS Science Team to enhance the overall quality of atmospheric aerosol validation data sets provided to the SeaBASS archive. The first type is composed of sun/sky photometers that measure the solar irradiance and the sky radiance. The second type is the shadow-band radiometer that measures the diffuse and global (upper hemispheric) sky radiance. The third type is the Micropulse Lidar (MPL), which measures the vertical and horizontal distribution of aerosol backscatter, extinction, and optical depth. The photometers and radiometers generally have several channels, with center wavelengths from 0.3 micrometers to 1.0 micrometers and with narrow bandwidths (0.01 micrometers). Their characteristics are briefly summarized. The instruments are deployed by SIMBIOS or NASA Principal Investigators on cruises and provide data to the SeaBASS archive for SIMBIOS ocean color validation research. Deployment policy and procedures are available on the SIMBIOS home page (http:// simbios.gsfc.nasa.gov). This chapter reviews each type of instrument, its characteristics, and its advantages for the project. A description of the protocols for the operation of these instruments and for their data analysis is given.

Author

Optical Radar ; Photometers ; Radiometers ; Data Processing ; Radiance

20020012010 NASA Goddard Space Flight Center , Greenbelt, MD USA

Calibration of of Sun Photometers and Sky Radiance Sensors , Chapter 3

Pietras, Christophe , General Sciences Corp. , USA ; Miller, Mark , Brookhaven National Lab. , USA ; Frouin, Robert , Scripps Institution of Oceanography , USA ; Eck, Tom , Raytheon Information Technology and Scientific Services , USA ; Holben, Brent , NASA Goddard Space Flight Center , USA ; Marketon, John , Raytheon Information Technology and Scientific Services , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 11-21 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A02 , Microfiche

The main source of error in retrieving aerosol optical thicknesses using sun photometry comes from the determination of the TOA voltages. The degradation of interference filters is the most important source of the long-term changes in the cross-calibrations. Although major improvements have been made in the design of the filters (interference filters fabricated using ion-assisted deposition), the filters remain the principal factor limiting performance of the sun photometers. Degradation of filters necessitates frequent calibration of sun photometers and frequent measurements of the filter transmission or the relative system response. The degradation of the filters mounted on the CIMEL sun photometers have been monitored since 1993 by the Aerosol Robotic Network (AERONET) project. The decay reported by Holben et al. for the first two years of a CIMEL#s operation is between 1 and 5%. Nevertheless, the filters mounted on CIMEL instruments are regularly replaced after two years of use. The cross-calibration technique consists of taking measurements concurrently with the uncalibrated and the reference sun photometers. While analyzing measurements, the quality of the calibration has to be checked, using the following considerations: (1) any cirrus clouds suspected to be masking the sun, during the calibration period, need to be reported and the corresponding data set removed; and (2) the stability of the day needs to be checked. This chapter will describe calibration techniques, facilities, and protocols used for calibrating sun photometers and sky radiometers.

Derived from text

Calibrating ; Photometers ; Protocol (Computers) ; Radiometers ; Instrument Errors

20020012438 Smithsonian Astrophysical Observatory , Cambridge, MA USA

VLA Imaging of Protoplanetary Environments ***Annual Report , 1 Feb. 2001 - 31 Jan. 2002***

Wilner, David J. , Smithsonian Astrophysical Observatory , USA ; December 2001 ; 4p ; In English

Contract(s)/Grant(s): NAG5-8195 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

We continue to use the Very Large Array (VLA) of the National Radio Astronomy Observatories (NRAO) to make high resolution images of thermal emission in the protoplanetary environment of nearby young stars. The VLA provides two unique capabilities. First, the angular resolution for imaging thermal emission is unmatched by any other facility. For the A array, the synthesized beam at a wavelength of 7 mm corresponds to a linear scale similar to the orbital radius of Jupiter at the distance of nearby dark clouds Eke Taurus. Second, the long millimeter wavelengths accessible to the VLA are particularly advantageous

at this high resolution since the emission is (almost) entirely optically thin and probes the full disk column, including the innermost regions that remain opaque to shorter wavelengths.
Derived from text
Imaging Techniques ; Radio Astronomy ; Thermal Emission ; Very Large Array (VLA) ; Protoplanetary Disks

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20020006075 Brookhaven National Lab. , Upton, NY USA
High gain harmonic generation UV to DUV free electron lasers at the NSLS
Wu, ; Yu, ; Jun. 18, 2001 ; 5p ; In English
Report No.(s): DE2001-785361 ; BNL-68544 ; No Copyright ; Avail: Department of Energy Information Bridge
In this paper, we present the calculation on the performance of High Gain Harmonic Generation (HGHG) UV to DUV Free Electron Lasers (FELSs) at the NSLS. Based on the beam quality and the available undulators at the NSLS, the calculation shows that it is possible to produce fully coherent DUV FEL down to 500 Angstrom, with a peak power of several hundred Mega Watts. One further attractive feature is the possibility to produce ultra short radiation pulse based on such HGHG scheme.
NTIS
Free Electron Lasers ; High Gain

20020006120 Argonne National Lab. , IL USA
LIGA-fabricated compact mm-wave linear accelerator cavities
Song, J. J. ; Bajikar, S. S. ; DeCarlo, F. ; Kang, Y. W. ; Kustom, R. L. ; Mar. 23, 1998 ; 5p ; In English
Report No.(s): DE2001-7843 ; ANL/ASD/CP-92655 ; No Copyright ; Avail: Department of Energy Information Bridge
Millimeter-wave rf cavities for use in linear accelerators, free-electron lasers, and mm-wave undulatory are under development at Argonne National Laboratory. Typical cavity dimensions are in the 1000 mm range, and the overall length of the accelerator structure, which consists of 30-100 cavities, is about 50-100 mm. An accuracy of 0.2% in the cavity dimensions is necessary in order to achieve a high Q-factor of the cavity. to achieve this these structures are being fabricated using deep X-ray lithography, electroforming, and assembly (LIGA). The first prototype cavity structures are designed for 108 GHz and 2p/3-mode operation. Input and output couplers are integrated with the cavity structures. The cavities are fabricated on copper substrates by electroforming copper into 1-mm-thick PMMA resists patterned by deep x-ray lithography and polishing the copper down to the desired thickness. These are fabricated separately and subsequently assembled with precision spacing and alignment using microspheres, optical fibers, or microfabricated spacers/alignment pieces. Details of the fabrication process, alignment, and assembly work are presented in here.
NTIS
Cavities ; Electroforming ; Fabrication ; Free Electron Lasers ; Linear Accelerators ; Lithography ; Microparticles ; Millimeter Waves ; Electrodeposition

20020006217 Rockwell International Corp. , Science Center , Thousand Oaks, CA USA
Laser-Based Ultrasound for Remote and Limited-Access Inspection Applications ***Final Report , 1 Apr. 1998-30 Nov. 2000***
Addison, Robert C., Jr. ; McKie, Andrew D. W. ; Dec. 2000 ; 112p ; In English ; Original contains color images
Contract(s)/Grant(s): F33615-97-D-5271 ; Proj-4349
Report No.(s): AD-A395414 ; 98-S437-0003-C1 ; AFRL-ML-WP-TR-2001-4061 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
The design, implementation, and proof-of-concept demonstration of a fiber-based Cassegrain optical scanning system was completed. Optical generation and detection with the fiber-based Cassegrain optical scanning system over 100-m lengths of optical fiber was demonstrated. High peak power, Q-switched Nd:YAG laser pulses (greater than 45 mJ/pulse at 532 nm) through optical fiber in a robust manner was successfully delivered. This program established the absolute thermoelastic generation efficiency for four different laser wavelengths and eight different material/boundary conditions.
DTIC
Optical Fibers ; Optical Scanners ; Ultrasonics ; Cassegrain Optics

20020006232 Florida Univ. , Dept. of Mechanical Engineering , Gainesville, FL USA

Online Sorting of Wood Treated with Chromated Copper Arsenate Using Laser Induced Breakdown Spectroscopy

Moskal, Thomas M. ; Jan. 2001 ; 109p ; In English

Report No.(s): AD-A395364 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

The use of the CCA chemical as a wood treatment to protect against insect and fungal deterioration has had commercial application for the past twenty-five to thirty years. While CCA treated wood has several benefits, with perhaps the most important being the saving of an estimated 225 million trees annually due to its longer service life, there are growing concerns that the handling and disposal of CCA treated wood may have negative impacts on human health and the environment. Because CCA treated wood has a service life of nearly thirty years, the amount of CCA treated wood that will be disposed of is expected to dramatically rise in the near future. The disposal of the metals contained within CCA treated wood by incineration, land applications as landscape mulch or disposal in a landfill will all fail to meet leaching protocols established by the EPA. While there is an exemption in place for CCA treated wood to be disposed of in unlined construction and demolition landfills, there is a need to detect and sort CCA treated lumber from untreated lumber quickly and accurately with an online method. Sorting would allow the continued disposal of untreated wood as landscape mulch and in biomass combustors while easing the burden on landfills. This work details the design and evaluation efforts to develop an online detector using laser induced breakdown spectroscopy (LIBS) technology. By forming a plasma on the surface of the wood, the detector analyzed the spectral emission from the plasma to identify the metals present in the wood sample. This analytical process was performed twice per second with the demonstrated potential to increase to ten times per second. In addition to this rapid sampling and analysis, the results of this work demonstrated accuracies approaching 100%. With the cost effective development of an online LIBS detector for CCA treated wood, regulators and industry have a useful tool to meet the challenges of CCA treated wood disposal.

DTIC

Computer Programs ; Spectroscopy ; Laser Applications ; Service Life ; Wood ; Surface Treatment

20020006850 Kansas City Plant , Kansas City, MO USA

Femtosecond Laser Manufacturing Experiments

Gillespie, L. K. ; Jan. 19, 2000 ; 28p ; In English

Report No.(s): DE2001-750300 ; KCP-613-6252 ; No Copyright ; Avail: Department of Energy Information Bridge

The femtosecond laser utilizes an unusually short laser pulse that results in little, if any, metallurgical damage in stainless steel and other materials. Studies of the process demonstrated high quality wall contours (metallurgically clean) when the laser was used to cut grooves in stainless steel discs. This study did prove the feasibility of the process as an alternate potential for the existing process for making burst discs. Significant additional work is required to increase groove reproducibility and produce three-dimensional cuts, requiring development of appropriate tooling and controllers.

NTIS

Pulsed Lasers ; Stainless Steels ; Manufacturing ; Tooling

20020006892 Phillips Lab. , Kirtland AFB, NM USA

High Average Power Active Tracker Laser Technology

Post, Stephen G. ; Mar. 1997 ; 8p ; In English ; Original contains color images

Report No.(s): AD-A394829 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Through the Phillips Laboratory's Active Tracker Laser (ATLAS) program, high average power, high pulse repetition frequency diode-pumped solid-state laser technology has been under development since 1992. A solid-state laser illuminator requirement was generated, in support of the Ground Based Laser Technology program, for closed loop tracking of actively illuminated low Earth orbit satellites. As a result of this laser technology development effort, high brightness laser sources at both 1.064 micrometers and 532 nanometers have been developed and demonstrated.

DTIC

Solid State Lasers ; High Power Lasers ; High Frequencies

20020007098 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden

Simulation of Erbium-Ytterbium Co-Doped Fiber Lasers. Scientific Report

Bertilsson, K. C. M. ; April 2000 ; 74p ; In English

Report No.(s): PB2001-108215 ; FOA-R-00-1493-408-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report summarizes erbium-doped fiber laser modeling and simulations performed at the Dept. of Laser Systems, FOA (Swedish Defense Research Establishment), Linkoping. Erbium-doped fiber lasers operate in the eye-safe spectral window around 1.5 micro which is an attractive feature for a number of applications: free space optical communication, fiber optic

communication, and laser radar. We have focused on erbium-ytterbium codoped silica as gain medium and fiber Bragg grating mirrors as wavelength selective feedback elements, due to the potential high output power. Co-doping with ytterbium facilitates output powers in excess of tens of Watts. The physical model of the erbium-ytterbium ion system and the interaction between the ion system and light is outlined in detail. The resulting simulation package of the actual fiber laser is covered to allow for novice users. We illustrate the simulation tool with some examples: the most important laser characteristics calculated for each single configuration; output power versus fiber length to maximize the output power; output power versus pump power to find the threshold pump power and the slope efficiency as well as optimum pump power. Finally, we discuss some potential improvements.
NTIS
Fiber Lasers ; Laser Materials ; Ytterbium ; Erbium ; Simulation

20020008095 National Defence Research Establishment , Linkoeping, Sweden
Waveform Simulation for 3-D Sensing Laser Radar ***Topical Report***
Steinvall, O. ; May 2000 ; 37p ; In English
Report No.(s): PB2001-107745 ; FOA-R-00-01530-612.408-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A model for simulating laser radar performance has been proposed. The model has been tested against some simple target shapes such as planes under different angle of incidence, corners, steps, and some rotational objects like spheres, cones and paraboloides. The model includes laser characteristics, target geometry and reflection, speckles, atmospheric attenuation turbulence and a direct detection receiver. The model generates waveforms on which simple range detection algorithms common in range finders, have been applied. These are peak detection and 50% leading edge detection. Examples of simulated signals have mainly been calculated to study the geometric spreading from a diffuse target. The influence on the combined effect of geometry and reflection characteristics (BRDF) on the impulse response was recently investigated in another report.
NTIS
Three Dimensional Models ; Waveforms ; Optical Radar ; Radar Detection

20020008137 Brookhaven National Lab. , Upton, NY USA
Harmonic inverse free electron laser micro-buncher
Pottorf, S. ; Wang, X. J. ; Oct. 15, 2000 ; 12p ; In English
Report No.(s): DE2001-773978 ; BNL-68013 ; KA0403011 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Inverse Free Electron (IFEL) and its applications are first briefly reviewed. The concept of harmonic IFEL was proposed for electron beam microbunching. A tightly microbunched electron beam could be used either as a laser accelerator injector or for femtosecond X ray generation by ultrahigh harmonic radiation. For a planar undulator, the electron beam is strongly coupled to both the fundamental and odd harmonic if the undulator parameter is greater than 1, K is greater than 1. The 1D (one dimensional) equation of motion for the IFEL was first extended to the third harmonic. 1D simulations were performed for both fundamental only IFEL and harmonic IFEL. Two configurations of harmonic IFEL were considered. First, a single undulator with both fundamental and third harmonic IFEL presented simultaneously was studied. Second, a configuration employing a fundamental IFEL followed by a third harmonic IFEL. Better and efficient bunching was achieved for both harmonic IFEL compared to the fundamental IFEL only.
NTIS
Free Electron Lasers ; Electron Bunching ; Harmonic Radiation

20020008171 Stanford Univ. , Dept. of Chemistry , Stanford, CA USA
Microwave Cavity Spectroscopy ***Final Report , 1 Dec. 1997-30 Nov. 2000***
Zare, Richard N. ; Feb. 26, 2001 ; 8p ; In English
Contract(s)/Grant(s): F49620-98-1-0040 ; Proj-2303
Report No.(s): AD-A395582 ; SPO-19340 ; AFRL-SR-BL-TR-01-0530 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The influence of vibrational and collision energy on ion-molecule reactions was investigated by measuring the cross sections for reactions of NH3(+) created with varying degrees of excitation in the umbrella bending and symmetric stretching modes. Under these conditions, the three major product channels for the NH3(+)/CD3NH2(+) system are CD3NH2(+), CD2=NH2(+) and CD3NH3(+). Two minor product channels correspond to NH3D(+) and NH4(+). This reaction is found to be mode selective based on the reactivity of two isoenergetic vibrational states having differing concerted atom motions. The reaction of state selected ammonia ions with CD4 produces two major products, deuterium abstraction (NH3D(+)) and collision induced

dissociation (NH2D(+)). The reaction was found not to be mod selective. In the NH3(+)/THF system, four products were identified: hydrogen abstraction (NH4(+)), charge transfer (C4H8O(+)), proton transfer (C4H9O(+)) and an endothermic product corresponding to charge transfer with loss of H (C4H7O(=)). The branching ratios show a dependence on ammonia ion vibrational state In separate experiments, it was demonstrated that the new class of quantum cascade lasers that produce tunable infrared coherent radiation are well suited to cavity ring-down detection of ammonia. A detection limit of less than one part per billion was achieved.
DTIC
Spectroscopy ; Microwave Spectra ; Ionic Reactions ; Molecular Interactions ; Vibrational States

20020008987 Saint Petersburg Technical Univ. , Russia
Theoretical Studies of Scaling Double Clad Fiber Lasers to High Power ***Final Report , 1 Apr. 2000-30 Jun. 2001***
Anan'ev, Yuri ; Jul. 24, 2001 ; 64p ; In English
Report No.(s): AD-A396001 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Ytterbium (Yb) - doped fiber lasers have demonstrated efficient optical-to-optical continuous-wave power conversion into a diffraction-limited laser beam. Power scaling these devices has benefited from recent dual-clad fiber designs that specifically allow improved coupling of diodelaser emission and interaction with the Yb-doped core. to realize efficient, kilowatt-scaleable, Ytterbium-doped fiber laser designs many limiting factors must be better understood. The research on this project will consist of the theoretical study of fiber lasers in general, and dual-clad Ytterbium-doped fiber lasers specifically, in order to provide a sound, comprehensive foundation for understanding these devices.
DTIC
Laser Beams ; Laser Materials ; Ytterbium ; Fiber Optics ; Fiber Lasers ; Cladding

20020008997 Logicon Technical Services, Inc. , Dayton, OH USA
The Effect of Eyepiece Focus on Visual Acuity Through ANVIS Night Vision Goggles During Short - and Long-Term Wear ***Final Report , Jul. 1996-Aug. 2000***
Gleason, Gerald A. ; Reigler, Joseph T. ; Jan. 2001 ; 24p ; In English
Contract(s)/Grant(s): F41624-94-D-6000 ; Proj-7184
Report No.(s): AD-A395960 ; AFRL-HE-WP-TR-2001-0033 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The eyepiece lenses of ANVIS (Aviator's Night Vision Imaging System) night vision goggle are ostensibly adjusted for optimum visual acuity (VA). Many users however do not adjust the eyepieces competently. This paper examines whether a single-focus eyepiece is capable of producing satisfactory VA while maintaining comfortable vision over extended periods. In a short term ANVIS wear study, a range of eyepiece focus produced comparable VA independent of luminance and contrast. The single best overall eyepiece focus produced vision equal to, or better than, that of subject adjusted eyepieces, producing VA within 2% of optimal. However, zero diopter eyepieces reduced VA by 10%. In a long term ANVIS wear study, - 1.5 diopter eyepieces caused half of the subjects to complain of blurred or uncomfortable vision. These studies indicate - 0.75 diopter eyepieces provide optically corrected ANVIS users with near optimal binocular VA and satisfactory visual comfort during extended ANVIS use.
DTIC
Visual Acuity ; Performance Tests ; Night Vision ; Goggles

20020009157 New Mexico Univ. , Albuquerque, NM USA
Raman Shifting High Power Near Infrared Laser Radiation ***Final Report , 27 Feb. 1998-31 May 2001***
Rudolph, Wolfgang ; McIver, Jack ; Jun. 10, 2001 ; 20p ; In English
Contract(s)/Grant(s): F29601-98-K-0038 ; Proj-3326
Report No.(s): AD-A395645 ; 2001-02 ; AFRL-DE-TR-2001-1041 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Raman scattering for efficient wavelength conversion of mid infrared radiation was investigated theoretically and experimentally. Conversion efficiencies as high as 70% were observed with stimulated Raman scattering in H2. Several conversion schemes were analyzed theoretically and their applicability for the conversion of iodine lasers was investigated. The most efficient configuration uses a synchronously pumped Raman laser. For this technique, the single pulse of the iodine laser must be converted into a train of short (ns) pulses.
DTIC
Iodine Lasers ; Raman Spectra ; Near Infrared Radiation ; Pulsed Lasers

20020010268 Scientific Council of the Saint Petersburg Association of Scientists and Scholars , Saint Petersburg, Russia
Nonresonant Laser-Matter Interaction (NLMI-10) ***Final Report***
Libenson, Mikhail N. ; Aug. 2000 ; 326p ; In English , 21-23 Aug. 2000 , Saint Petersburg-Pushkin , Russia
Contract(s)/Grant(s): F61775-00-W-F058
Report No.(s): AD-A396191 ; EOARD-CSP 00-5058 ; No Copyright ; Avail: CASI ; A15 , Hardcopy ; A03 , Microfiche
This report presents the Final Proceedings for Nonresonant Laser-Matter Interaction 10, 21 August 2000 - 23 August 2000 Proceedings of SPIE, Vol. 4423. This is an interdisciplinary conference. Topics include structural and phase transitions in condensed matter; laser damage of optical materials and elements; laser-induced surface phenomena; instabilities and self-organization under laser conditioning; and interaction of ultrashort pulses with matter.
DTIC
Condensed Matter Physics ; Conferences ; Electromagnetic Interactions ; Lasers ; Thermochemistry

20020010627 Lawrence Livermore National Lab. , Livermore, CA USA
Near field imaging of a saturated table top x-ray laser
Dunn, J. ; Li, Y. ; Nilsen, J. ; Osterheld, A. ; Shlyaptsev, V. N. ; Jun. 25, 1999 ; 9p ; In English
Report No.(s): DE2001-9352 ; UCRL-JC-134717 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
High resolution 2D imaging experiment on the saturated 18.9 nm Ni-like soft X-ray laser is presented. The imaging experiment allows measurement of the absolute output energy and intensity of the X-ray laser, while it gives detailed information on the spatial characteristics of the X-ray laser for understanding the physics and further improving the performance of the X-ray laser.
NTIS
X Ray Lasers ; Imaging Techniques

20020011216 Lawrence Livermore National Lab. , Livermore, CA USA
Ultrashort-pulse lasers machining
Banks, P. S. ; Feit, M. D. ; Nguyen, H. T. ; Stuart, M. D. ; Perry, B. C. ; Jan. 22, 1999 ; 24p ; In English
Report No.(s): DE2001-9660 ; UCRL-JC-132159-REV-1 ; DP0401047,REPT-98-ERD-068 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A new type of material processing is enabled with ultrashort (t < 10 psec) laser pulses. Cutting, drilling, sculpting of all materials (biologic materials, ceramics, sapphire, silicon carbide, diamond, metals) occurs by new mechanisms which eliminate thermal shock or collateral damage. High precision machining to submicron tolerances is enabled resulting in high surface quality and negligible heat affected zone.
NTIS
Machining ; Pulsed Lasers ; Ceramics

20020011721 Lawrence Livermore National Lab. , Livermore, CA USA
Laser Interferometer System for the Large Optics Diamond Turning Machine
Baird, E. D. ; Donaldson, R. R. ; Patterson, S. R. ; Jun. 29, 1999 ; 74p ; In English
Report No.(s): DE2001-9646 ; UCRL-ID-134693 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The purpose of this report is to describe the Laser Interferometer System designed for the Large Optics Diamond Turning Machine (LODTM). to better understand the laser interferometer system, it is useful to begin with an overview of the LODTM metrology system.
NTIS
Interferometers ; Lasers

20020012242 Lawrence Livermore National Lab. , Livermore, CA USA
Laser science and technology update, 1999
Chen, H. L. ; Powell, H. T. ; Sep. 23, 1999 ; 10p ; In English
Report No.(s): DE2001-13084 ; UCRL-ID-134972 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The NIF laser technology development effort was successfully completed in 1998. All key components required for deploying the NIF's 1.8-MJ laser system were developed and tested. These components include the optical pulse generator, main amplifier, power conditioning, plasma electrode Pockels cell (PEPC), beam control, and integrated computer control systems. The overall system performance was tested at full-scale aperture in the Beamlet facility. Data collected from Beamlet were subsequently used by the engineers to validate the design and cost of the NIF laser. Timely completion of this development effort

enabled the NIF Project to maintain its schedule to proceed toward the first-bundle operation and target experiment beginning in 2002.
NTIS
Lasers ; Laser Applications

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20020006307 NASA Goddard Space Flight Center , Greenbelt, MD USA
Experimental Comparison of Face-Milled and Face-Hobbed Spiral Bevel Gears
Handschuh, Robert F. , Army Research Lab. , USA ; Nanlawala, Michael , Illinois Inst. of Tech. , USA ; Hawkins, John M. , Rools-Royce Corp. , USA ; Mahan, Danny , Army Aviation and Missile Command , USA ; October 2001 ; 14p ; In English ; International Conference on Motion and Power Transmission , 15-17 Nov. 2001 , Fukuoka , Japan ; Sponsored by Japan Society of Mechanical Engineers , Japan
Contract(s)/Grant(s): RTOP 712-30-13 ; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/TM-2001-210940 ; NAS 1.15:210940 ; ARL-TR-1104 ; E-12793 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

An experimental comparison of face-milled and face-hobbed spiral bevel gears was accomplished. The two differently manufactured spiral bevel gear types were tested in a closed-loop facility at NASA Glenn Research Center. Strain, vibration, and noise testing were completed at various levels of rotational speed and load. Tests were conducted from static (slow-roll) to 12600 rpm and up to 269 N-m (2380 in.-lb) pinion speed and load conditions. The tests indicated that the maximum stress recorded at the root locations had nearly the same values, however the stress distribution was different from the toe to the heel. Also, the alternating stress measured was higher for the face-milled pinion than that attained for the face-hobbed pinion (larger minimum stress). The noise and vibration results indicated that the levels measured for the face-hobbed components were less than those attained for the face-milled gears tested.
Author
Stress Distribution ; Spiral Bevel Gears ; Vibration

20020006545 National Renewable Energy Lab. , Golden, CO USA
Minimize Boiler Short Cycling Losses
Papar, R. ; Dec. 04, 2000 ; 2p ; In English
Report No.(s): DE2001-775886 ; NREL/FS-810-28882 ; DOE/GO-102000-1116 ; No Copyright ; Avail: Department of Energy Information Bridge

BestPractices Steam tip sheet regarding ways to minimize short cycling losses in industrial boilers.
NTIS
Boilers ; Energy Technology ; Industries

20020006546 National Renewable Energy Lab. , Golden, CO USA
Install Removable Insulation on Uninsulated Valves and Fittings
Papar, R. ; Dec. 04, 2000 ; 2p ; In English
Report No.(s): DE2001-775887 ; NREL/FS-810-28883 ; DOE/GO-102000-1117 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

BestPractices Steam tip sheet regarding ways to improve plant steam system efficiency by installing removable insulation on uninsulated valves and fittings.
NTIS
Insulation ; Valves ; System Effectiveness ; Steam

20020006762 Brookhaven National Lab. , Upton, NY USA
Development of a refrigerant distribution section for ASHRAE standard 152
Andrews, ; Sep. 07, 2001 ; 48p ; In English

Report No.(s): DE2001-786621 ; BNL-68604 ; No Copyright ; Avail: Department of Energy Information Bridge

On the basis of benchmark calculations on refrigerant distribution systems, as described in an earlier report, the impacts on seven efficiency of refrigerant line length, sizing, and insulation are translated into a draft format compatible with ASHRAE Standard 152P, Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems. Refrigerant distribution systems use refrigerant (instead of ducts or pipes) to carry heat and/or cooling effect from the equipment to the spaces in the building in which it is used. Such systems would include so-called 'mini-splits' as well as more conventional systems that for one reason or another have the indoor and outdoor coils separated by more than 25 ft. The design and seasonal efficiencies of the distribution system are projected on the basis of design cooling capacity and refrigerant line characteristics.

NTIS

Refrigerants ; Standards ; Temperature Effects ; Cooling

20020006849 Kansas City Plant , Kansas City, MO USA

Dubose CRADA

Schuttler, G. L. ; Jan. 25, 2000 ; 9p ; In English

Report No.(s): DE2001-750403 ; KCP-613-6236 ; CRADA 96-KCP-1048 ; No Copyright ; Avail: Department of Energy Information Bridge

In phase one of this project, Mr. Dubose needed assistance to evaluate his Minimal Crevice Volume (MCV) Piston Ring concept to see if it showed enough technical merit to warrant the expenditure of time and money into patenting the concept and commercializing it. He initially enlisted the help of Texas Tech University, and subsequently Honeywell FM and T, to evaluate the concept for technical feasibility. This evaluation included engineering evaluations of the concept's functionality and manufacturability, along with design analysis and refinement through finite element analysis and other methods. The Principal Investigator at FM and T (Greg Schuttler) and Dr. Maxwell at Texas Tech provided feedback to Mr. Dubose on the functional feasibility of the concept, and the Principal Investigator at FM and T provided manufacturability guidance. Dr. Maxwell had engineering students and a graduate student at Texas Tech conduct static finite element studies to further evaluate the concept; and an extensive dynamic finite element evaluation of the concept, including design refinement, was carried out at FM and T by the Principal Investigator and Jim Mahoney. The results of the FM and T finite element analysis were used as a justification for Mr. Dubose to pursue patent application for this concept. The dynamic finite element study pushed the state-of-the-art for this type of study at FM and T. It also served as a vehicle to facilitate the familiarization of FM and T associates outside the Finite Elements group in Engineering with finite element techniques and capabilities, a plant goal. In phase two of this project, Mr. Dubose was attempting to prove the viability of his already patented 'Variable Orbital Aperture' concept. All three of the major US automotive corporations had expressed an interest in Mr. Dubose's multiple valve disc concept, if it could be proven that an effective sealing method could be found, since rotary valve engines have historically been nearly impossible to seal. to accomplish this, Mr. Dubose proposed to build a functional single-disc cylinder head to try different seal designs. Texas Tech had a Kawasaki single cylinder engine that was suitable for this use, and it was decided that a rotary valve cylinder head would be fabricated to fit this engine. to this end, Texas Tech provided assistance in creating the cylinder head design, assisted by Honeywell FM and T. Several design iterations were created, and both wax and stereolithography models were created at FM and T to assist the design process. The wax and stereolithography models were used for conceptual visualization of the designs, fit-up checks of the various components with the actual engine, and even flow testing of the intake and exhaust ports. When the design was finalized, two prototype cylinder head assemblies were machined, from aluminum and steel supplied by Texas Tech and Mr. Dubose, in the FM and T Model Shop. The engine was then to be assembled and tested at Texas Tech. At the time that this project was closed, the engine had not yet been completely assembled and tested.

NTIS

Design Analysis ; Engine Tests ; Internal Combustion Engines ; Pistons ; Fabrication ; Technology Assessment

20020006913 Kyushu Univ. , Faculty of Engineering , Fukuoka, Japan

Piezoelectric Micropump Using Active Valves Fabricated by Low-Cost Facilities

Ikuta, Tatsuya , Kyushu Univ. , Japan ; Takahashi, Koji , Kyushu Univ. , Japan ; Technology Reports of Kyushu University ; November 2001 ; ISSN 0023-2718 ; Volume 74 , No. 6 , pp. 659-668 ; In Japanese ; Copyright ; Avail: Issuing Activity

A membrane-actuated micropump is designed and fabricated based on the IC fabrication process. In order to activate the microfluidic researches in various fields, our design is intentionally restricted not to use the expensive instruments of the newest MEMS facilities. Instead of both-side etching, anisotropic wet-etching of silicon wafer is used for membrane fabrication, while isotropic one of Pyrex glass plate is for pumping chamber and channels of working liquid. Silicon wafer and Pyrex plate are assembled so as to form pumping chamber and inlet/outlet valves using piezoelectric disks on the silicon membranes. The valves

are normally open and the piezoelectric disks control them as well as the pumping chamber. Their operations have been confirmed but large leakage from the valves has occurred due to the imperfect contact of two solid surfaces, which lowers the total performance of this type of pump. The effect of switching sequence of pump and valve operations has been explored by changing the signal to the piezoelectric disks and the flow rate of water is attained up to 2.4 x 10(exp -3)ml/min.
Author
Piezoelectricity ; Microelectromechanical Systems ; Design Analysis ; Fabrication ; Pumps ; Membranes

20020008176 Department of Energy , National Energy Technology Lab. , Pittsburgh, PA USA
Minimization of no emissions from multi-burner coal-fired boilers. Semi-annual report, October 2000-March 2001
Eddings, E. G. ; Molina, A. ; Pershing, D. W. ; Sarofim, A. F. ; Davis, K. A. ; Jun. 01, 2001 ; 24p ; In English
Report No.(s): DE2001-786861 ; FG26-97FT97275-06 ; No Copyright ; Avail: Department of Energy Information Bridge
The focus of this program is to provide insight into the formation and minimization of NO-x in multi-burner arrays, such as those that would be found in a typical utility boiler. Most detailed studies are performed in single-burner test facilities, and may not capture significant burner-to-burner interactions that could influence NO-x emissions.
NTIS
Burners ; Boilers ; Test Facilities ; Coal

20020008683 National Renewable Energy Lab. , Golden, CO USA
PVMaT Cost Reductions in the EFG High-Volume PV Manufacturing Line ***Annual Report , Aug. 1998 - Dec. 2000***
Bathey, B. ; Brown, B. ; Cao, J. ; Ebers, S. ; Gonsiorawski, R. ; Feb. 22, 2001 ; 24p ; In English
Report No.(s): DE2001-777316 ; NREL/SR-520-29626 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The PVMaT 5A2 program at ASE Americas is a three-year program that addresses topics in the development of manufacturing systems, low-cost processing approaches, and flexible manufacturing methods. The three-year objectives are as follows: (1) implementation of computer-aided manufacturing systems, including Statistical Process Control, to aid in electrical and mechanical yield improvements of 10%; (2) development and implementation of ISO 9000 and ISO 14000; (3) deployment of wafer production from large-diameter (up to 1 m) EFG cylinders and wafer thicknesses down to 95 microns; (4) development of low-damage, high-yield laser-cutting methods for thin wafers; (5) cell designs for 15% cell efficiencies on 100-micron-thick EFG wafers; (6) development of Rapid Thermal Anneal processing for thin high-efficiency EFG cells; and (7) deployment of flexible manufacturing methods for diversification in wafer size and module design. In the second year of this program, the significant accomplishments in each of three tasks that cover these areas are as follows: Task 4 - Manufacturing systems, Task 5 - Low-cost processes, and Task 6 - Flexible manufacturing.
NTIS
Cost Reduction ; Manufacturing ; Wafers

20020008808 Pennsylvania State Univ. , Applied Research Lab. , University Park, PA USA
Sensorless Electric Drive for Integral Horsepower Permanent Magnet Synchronous Motor
Batzel, Todd D. ; Oct. 2001 ; 67p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-00-G-0058/007
Report No.(s): AD-A396039 ; TR-01-0005 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The permanent magnet synchronous motor (PMSM) is increasingly playing an important role in electric propulsion systems due to its many advantages over competing technologies. For successful implementation of the PMSM rotor position and speed information are required. A resolver or encoder attached to the shaft of the machine usually provides this information. Many applications, however, cannot tolerate the use of the position sensor due to space and weight limitations, reliability concerns, or packaging issues. Thus, there has been an intense interest in the development of a so-called position sensorless drive, where the PMSM stator itself is used as the rotor position sensor. In this work, a previously developed sensorless electric drive technique is applied to a high power permanent magnet machine. The sensorless drive hardware implementation is presented in detail. A set of experiments is used to quantify the performance of the sensorless drive approach under a wide variety of operating conditions, and implementation issues and results are discussed. The developed sensorless electric drive serves as a technology demonstrator for future naval applications
DTIC
Permanent Magnets ; Electric Propulsion ; Synchronous Motors

20020008882 Oak Ridge National Lab. , TN USA

Not-In-Kind Technologies for Residential and Commercial Unitary Equipment

Fischer, S. K. ; Jan. 11, 2001 ; 205p ; In English

Report No.(s): DE2001-777684 ; ORNL/CON-477 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This project was initiated by the Department of Energy in response to a request from the HVAC industry for consolidated information about alternative heating and cooling cycles and for objective comparisons of those cycles in space conditioning applications. Twenty-seven different heat pumping technologies are compared on energy use and operating costs using consistent operating conditions and assumptions about component efficiencies for all of them. This report provides a concise summary of the underlying principals of each technology, its advantages and disadvantages, obstacles to commercial development, and economic feasibility. Both positive and negative results in this study are valuable; the fact that many of the cycles investigated are not attractive for space conditioning avoids any additional investment of time or resources in evaluating them for this application. In other cases, negative results in terms of the cost of materials or in cycle efficiencies identify where significant progress needs to be made in order for a cycle to become commercially attractive. Specific conclusions are listed for many of the technologies being promoted as alternatives to electrically-driven vapor compression heat pumps using fluorocarbon refrigerants. Although reverse Rankine cycle heat pumps using hydrocarbons have similar energy use to conventional electric-driven heat pumps, there are no significant energy savings due to the minor differences in estimated steady-state performance; higher costs would be required to accommodate the use of a flammable refrigerant. Magnetic and compressor-driven metal hydride heat pumps may be able to achieve efficiencies comparable to reverse Rankine cycle heat pumps, but they are likely to have much higher life cycle costs because of high costs for materials and peripheral equipment. Both thermoacoustic and thermionic heat pumps could have lower life cycle costs than conventional electric heat pumps because of reduced equipment and maintenance costs although energy use would be higher. There are strong opportunities for gas-fired heat pumps to reduce both energy use and operating costs outside of the high cooling climates in the southeast, south central states, and the southwest. Diesel and IC (Otto) engine-driven heat pumps are commercially available and should be able to increase their market share relative to gas furnaces on a life cycle cost basis; the cost premiums associated with these products, however, make it difficult to achieve three or five year paybacks which adversely affects their use in the U.S. Stirling engine-driven and duplex Stirling heat pumps have been investigated in the past as potential gas-fired appliances that would have longer lives and lower maintenance costs than diesel and IC engine-driven heat pumps at slightly lower efficiencies. These potential advantages have not been demonstrated and there has been a low level of interest in Stirling engine-driven heat pumps since the late 1980s. GAX absorption heat pumps have high heating efficiencies relative to conventional gas furnaces and are viable alternatives to furnace/air conditioner combinations in all parts of the country outside of the southeast, south central states, and desert southwest. Adsorption heat pumps may be competitive with the GAX absorption system at a higher degree of mechanical complexity; insufficient information is available to be more precise in that assessment.

NTIS

Refrigerants ; Heat Pumps ; Air Conditioning Equipment ; Economic Analysis ; Energy Conservation

20020008897 Kansas City Plant , Kansas City, MO USA

Prevention of Reservoir Interior Discoloration

Arnold, K. F. ; Apr. 03, 2001 ; 26p ; In English

Report No.(s): DE2001-776967 ; KCP-613-6411 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Contamination is anathema in reservoir production. Some of the contamination is a result of welding and some appears after welding but existed before. Oxygen was documented to be a major contributor to discoloration in welding. This study demonstrates that it can be controlled and that some of the informal cleaning processes contribute to contamination.

NTIS

Oxygen ; Welding ; Cleaning ; Surface Finishing

20020009631 Oak Ridge National Lab. , TN USA

Heavy-Section Steel Irradiation (HSSI) Program (W6953) Monthly Letter Status Report - January 2001 - ORNL/HSSI (6953) MLSR-2001/4

Rosseel, T. M. ; Feb. 20, 2001 ; 41p ; In English

Report No.(s): DE2001-777776 ; ORNL/HSSI(6953)/MLSR-2001/4 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The primary goal of the Heavy-Section Steel Irradiation (HSSI) Program is to provide a thorough, quantitative assessment of the effects of neutron irradiation on the material behavior, and in particular the fracture toughness properties, of typical pressure

vessel steels as they relate to light-water reactor pressure vessel (RPV) integrity. The program includes studies of the effects of irradiation on the degradation of mechanical and fracture properties of vessel materials augmented by enhanced examinations and modeling of the accompanying microstructural changes. Effects of specimen size; material chemistry; product form and microstructure; irradiation fluence, flux, temperature, and spectrum; and post-irradiation mitigation are being examined on a wide range of fracture properties. This program will also maintain and upgrade computerized data bases, calculational procedures, and standards relating to RPV fluence-spectra determinations and embrittlement assessments. Results from the HSSI studies will be incorporated into codes and standards directly applicable to resolving major regulatory issues that involve RPV irradiation embrittlement such as pressurized-thermal shock, operating pressure-temperature limits, low-temperature overpressurization, and the specialized problems associated with low upper-shelf welds. Six technical tasks and one for program management are now contained in the HSSI Program.

NTIS

Degradation ; Fracture Strength ; Fracturing ; Mechanical Properties ; Neutron Irradiation ; Radiation Effects ; Pressure Vessels

20020009634 Oak Ridge National Lab. , TN USA

Heavy-Section Steel Irradiation (HSSI) Program (W6953) ***Monthly Report , Feb. 2001***

Rosseel, T. M. ; Mar. 26, 2001 ; 38p ; In English

Report No.(s): DE2001-777768 ; ORNL/HSSI(6953) ; MLSR-2001/5 ; No Copyright ; Avail: Department of Energy Information Bridge

The primary goal of the Heavy-Section Steel Irradiation (HSSI) Program is to provide a thorough, quantitative assessment of the effects of neutron irradiation on the material behavior, and in particular the fracture toughness properties, of typical pressure vessel steels as they relate to light-water reactor pressure vessel (RPV) integrity. The program includes studies of the effects of irradiation on the degradation of mechanical and fracture properties of vessel materials augmented by enhanced examinations and modeling of the accompanying microstructural changes. Effects of specimen size; material chemistry; product form and microstructure; irradiation fluence, flux, temperature, and spectrum; and post-irradiation mitigation are being examined on a wide range of fracture properties. This program will also maintain and upgrade computerized databases, calculational procedures, and standards relating to RPV fluence-spectra determinations and embrittlement assessments. Results from the HSSI studies will be incorporated into codes and standards directly applicable to resolving major regulatory issues that involve RPV irradiation embrittlement such as pressurized-thermal shock, operating pressure-temperature limits, low-temperature overpressurization, and the specialized problems associated with low upper-shelf welds. Six technical tasks and one for program management are now contained in the HSSI Program.

NTIS

Mechanical Properties ; Pressure Vessels ; Steels ; Neutron Irradiation ; Destructive Tests ; Cumulative Damage

20020009754 Oak Ridge National Lab. , TN USA

HSSI ***Monthly Report , Dec. 2000***

Rosseel, T. M. ; Feb. 01, 2001 ; 40p ; In English

Report No.(s): DE2001-777772 ; ORNL/HSSI/MLSR-2001/03 ; No Copyright ; Avail: Department of Energy Information Bridge

The primary goal of the Heavy-Section Steel Irradiation (HSSI) Program is to provide a thorough, quantitative assessment of the effects of neutron irradiation on the material behavior, and in particular the fracture toughness properties, of typical pressure vessel steels as they relate to light water reactor pressure vessel (RPV) integrity. The program includes studies of the effects of irradiation on the degradation of mechanical and fracture properties of vessel materials augmented by enhanced examinations and modeling of the accompanying microstructural changes. Effects of specimen size; material chemistry; product form and microstructure; irradiation fluence, flux, temperature, and spectrum; and post-irradiation mitigation are being examined on a wide range of fracture properties. This program will also maintain and upgrade computerized data bases, calculational procedures, and standards relating to RPV fluence-spectra determinations and embrittlement assessments. Results from the HSSI studies will be incorporated into codes and standards directly applicable to resolving major regulatory issues that involve RPV irradiation embrittlement such as pressurized thermal shock, operating pressure temperature limits, low temperature overpressurization, and the specialized problems associated with low upper shelf welds. Six technical tasks and one for program management are now contained in the HSSI Program.

NTIS

Neutron Irradiation ; Pressure Vessels ; Steels ; Destructive Tests ; Cumulative Damage ; Radiation Effects

20020010899 NASA Marshall Space Flight Center , Huntsville, AL USA

System for Measuring Capacitance

McNichol, Randal S. , Inventor , NASA Marshall Space Flight Center , USA ; May 08, 2001 ; 4p ; In English

Patent Info.: Filed 21 Sep. 1998 ; NASA-Case-MFS-31195-1 ; US-Patent-6,227,046 ; US-Patent-Appl-SN-162483 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

A system has been developed for detecting the level of a liquid in a tank wherein a capacitor positioned in the tank has spaced plates which are positioned such that the dielectric between the plates will be either air or the liquid, depending on the depth of the liquid in the tank. An oscillator supplies a sine wave current to the capacitor and a coaxial cable connects the capacitor to a measuring circuit outside the tank. If the cable is very long or the capacitance to be measured is low, the capacitance inherent in the coaxial cable will prevent an accurate reading. to avoid this problem, an inductor is connected across the cable to form with the capacitance of the cable a parallel resonant circuit. The impedance of the parallel resonant circuit is infinite, so that attenuation of the measurement signal by the stray cable capacitance is avoided.

Official Gazette of the U.S. Patent and Trademark Office

Capacitance ; Circuits ; Detection ; Liquid Levels

20020011237 Lawrence Livermore National Lab. , Livermore, CA USA

NIF small mirror mount

McCarville, T. ; Jul. 01, 1999 ; 10p ; In English

Report No.(s): DE2001-9808 ; UCRL-JC-134571 ; No Copyright ; Avail: Department of Energy Information Bridge

A number of small mirror mounts have been identified that meet the stringent stability, wave front, and cleanliness standards of the NIF. These requirements are similar to those required in other performance critical optical design applications. Future design teams would conserve time and effort if recognized standards were established for mirror mount design and performance characteristics. Standards for stability, physical features, wave front distortion, and cleanliness would simplify the qualification process considerably. At this point such standards are not difficult to define, as the technical support work has been performed repeatedly by mirror mount consumers and suppliers.

NTIS

Mirrors ; Design Analysis ; Optical Equipment ; Supports ; Wave Fronts

20020012235 Lawrence Livermore National Lab. , Livermore, CA USA

Empirical survey on the influence of machining parameters on tool wear in diamond turning of large single crystal silicon optics

Blaedel, K. L. ; Carr, J. W. ; Davis, P. J. ; Goodman, W. ; Haack, J. K. ; Jul. 01, 1999 ; 6p ; In English

Report No.(s): DE2001-13703 ; UCRL-JC-135246 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The research described in this paper is a continuation of the collaborative efforts by Lawrence Livermore National Laboratory (LLNL), Schafer Corporation and TRW to develop a process for single point diamond turning (SPDT) of large single crystal silicon (SCSi) optical substrates on the Large Optic Diamond Turning Machine (LODTM). The principal challenge to obtaining long track lengths in SCSi has been to identify a set of machining parameters which yield a process that provides both low and predictable tool wear. Identifying such a process for SCSi has proven to be a formidable task because multiple crystallographic orientations with a range of hardness values are encountered when machining conical and annular optical substrates. The LODTM cutting program can compensate for tool wear if it is predictable. However, if the tool wear is not predictable then the figured area of the optical substrate may have unacceptably high error that can not be removed by post-polishing. The emphasis of this survey was limited to elucidating the influence of cutting parameters on the tool wear. We present two preliminary models that can be used to predict tool wear over the parameter space investigated.

NTIS

Crystal Optics ; Silicon ; Machining

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20020006528 Los Alamos National Lab. , NM USA
Methodology for examining system aging due to interactions between chemically incompatible materials
Deninger, J. ; Tanski, J. ; Apr. 01, 1999 ; 7p ; In English
Report No.(s): DE2001-773892 ; LA-UR-99-3453 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We start with a stored and unused population of fielded engineered units that are composed of chemically incompatible materials. The units age primarily through heterogeneous chemical reactions between the materials resulting in possible degradation in performance. The engineered units are unused in storage, but may be called into actual service at any time. We sample several units from the population per year and perform a number of non-destructive evaluation (NDE) techniques, such as radiography, low-frequency vibration analysis, and ultrasonic imaging on the selected units. From those units, some are selected for destructive testing (D-test) involving disassembly and testing of internal parts and components. Chemical analyses, mechanical properties measurements and other tests are performed. All of the above steps provide information that is used in the system simulation mathematical model. The system simulation model incorporates chemical reactions and gas-solid transport processes, along with changes in both the surface and bulk properties of the solids. Model results are used to suggest improvements in NDE analyses of the units and improvements in component and material analyses. Model results give trending indications of individual component and overall system changes over time, plus some understanding of the mechanisms involved which allow science-based predictions of the aged state of the units in future times. The NDE, D-test, and model results can also be used to assess statistically the reliability and performance of the overall aging population of units.
NTIS
Chemical Reactions ; Aging (Materials) ; Systems Analysis

20020006847 Kansas City Plant , Kansas City, MO USA
Coordinate Standard Measurement Development
Hanshaw, R. A. ; Feb. 18, 2000 ; 33p ; In English
Report No.(s): DE2001-751342 ; KCP-613-6286 ; No Copyright ; Avail: Department of Energy Information Bridge
A Shelton Precision Interferometer Base, which is used for calibration of coordinate standards, was improved through hardware replacement, software geometry error correction, and reduction of vibration effects. Substantial increases in resolution and reliability, as well as reduction in sampling time, were achieved through hardware replacement; vibration effects were reduced substantially through modification of the machine component dampening and software routines; and the majority of the machine's geometry error was corrected through software geometry error correction. Because of these modifications, the uncertainty of coordinate standards calibrated on this device has been reduced dramatically.
NTIS
Calibrating ; Interferometers ; Computer Programs ; Error Analysis ; Standards ; Vibration Effects

20020008189 Department of Energy , Aiken, SC USA
Pressurized Vessel Slurry Pumping
Pound, C. R. ; Sep. 17, 2001 ; 40p ; In English
Report No.(s): DE2001-786667 ; DPST-82-836 ; No Copyright ; Avail: Department of Energy Information Bridge
This report summarizes testing of an alternate 'pressurized vessel slurry pumping' apparatus. The principle is similar to rural domestic water systems and 'eggs' used in chemical laboratories in that material is extruded by displacement with compressed air.
NTIS
Slurries ; Pressure Vessels ; Chemical Reactions

20020008194 Sandia National Labs. , Albuquerque, NM USA
Design-to-Analysis Process at Sandia National Laboratories Observations and Recommendations
Burns, ; Harrison, ; Dobranich, ; Aug. 01, 2001 ; 37p ; In English
Report No.(s): DE2001-786638 ; SAND2001-2505 ; No Copyright ; Avail: Department of Energy Information Bridge
The efficiency of the design-to-analysis process for translating solid-model-based design data to computational analysis model data plays a central role in the application of computational analysis to engineering design and certification. A review of the literature from within Sandia as well as from industry shows that the design-to-analysis process involves a number of complex

organizational and technological issues. This study focuses on the design-to-analysis process from a business standpoint and is intended to generate discussion regarding this important issue. Observations obtained from Sandia staff member and management interviews suggest that the current Sandia design-to-analysis process is not mature and that this cross-organizational issue requires committed high-level ownership. A key recommendation of the study is that additional resources should be provided to the computer aided design organizations to support design-to-analysis. A robust community of practice is also needed to continuously improve the design-to-analysis process and to provide a corporate perspective.
NTIS
Analysis (Mathematics) ; Computer Aided Design ; Analyzing

20020008991 Sandia Labs. , Albuquerque, NM USA
Shock-Testing Methods
Brooks, R. O. ; Sep. 1963 ; 59p ; In English
Report No.(s): AD-A395970 ; SCTM-172A-62(73) ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This memorandum discusses various problems and conditions that occur in mechanical shock testing in the areas of inadequate test specifications, shaping of shock pulses, instrumentation, and shock-pulse interpretation. Techniques which can be utilized to alleviate these problems are also discussed.
DTIC
Mechanical Shock ; Shock Tests

20020010193 Los Alamos National Lab. , NM USA
Applying the LANL Statistical Pattern Recognition Paradigm for Structural Health Monitoring to Data from a Surface-Effect Fast Patrol Boat
Sohn, H. ; Farrar, C. ; Hunter, N. ; Worden, K. ; Jan. 01, 2001 ; 79p ; In English
Report No.(s): DE2001-780916 ; LA-13761-MS ; No Copyright ; Avail: Department of Energy Information Bridge
This report summarizes the analysis of fiber-optic strain gauge data obtained from a surface-effect fast patrol boat being studied by the staff at the Norwegian Defense Research Establishment (NDRE) in Norway and the Naval Research Laboratory (NRL) in Washington D.C. Data from two different structural conditions were provided to the staff at Los Alamos National Laboratory. The problem was then approached from a statistical pattern recognition paradigm. This paradigm can be described as a four-part process: (1) operational evaluation, (2) data acquisition & cleansing, (3) feature extraction and data reduction, and (4) statistical model development for feature discrimination. Given that the first two portions of this paradigm were mostly completed by the NDRE and NRL staff, this study focused on data normalization, feature extraction, and statistical modeling for feature discrimination. The feature extraction process began by looking at relatively simple statistics of the signals and progressed to using the residual errors from auto-regressive (AR) models fit to the measured data as the damage-sensitive features. Data normalization proved to be the most challenging portion of this investigation. A novel approach to data normalization, where the residual errors in the AR model are considered to be an unmeasured input and an auto-regressive model with exogenous inputs (ARX) is then fit to portions of the data exhibiting similar waveforms, was successfully applied to this problem. With this normalization procedure, a clear distinction between the two different structural conditions was obtained. A false-positive study was also run, and the procedure developed herein did not yield any false-positive indications of damage. Finally, the results must be qualified by the fact that this procedure has only been applied to very limited data samples. A more complete analysis of additional data taken under various operational and environmental conditions as well as other structural conditions is necessary before one can definitively state that the procedure is robust enough to be used in practice.
NTIS
Pattern Recognition ; Statistical Analysis ; Systems Health Monitoring ; Mathematical Models ; Strain Gages ; Data Acquisition ; Navy

20020010605 Lawrence Livermore National Lab. , Livermore, CA USA
Techniques for enhancing laser ultrasonic nondestructive evaluation
Candy, J. ; Chinn, D. ; Huber, R. ; Spicer, J. ; Thomas, G. ; Feb. 16, 1999 ; 18p ; In English
Report No.(s): DE2001-9625 ; UCRL-ID-133160 ; REPT-97-ERD-083 ; No Copyright ; Avail: Department of Energy Information Bridge
Ultrasonic nondestructive evaluation is an extremely powerful tool for characterizing materials and detecting defects. A majority of the ultrasonic nondestructive evaluation is performed with piezoelectric transducers that generate and detect high frequency acoustic energy. The liquid needed to couple the high frequency acoustic energy from the piezoelectric transducers restricts the applicability of ultrasonics. For example, traditional ultrasonics cannot evaluate parts at elevated temperatures or

components that would be damaged by contact with a fluid. They are developing a technology that remotely generates and detects the ultrasonic pulses with lasers and consequently there is no requirement for liquids. Thus the research in laser-based ultrasound allows them to solve inspection problems with ultrasonics that could not be done before. This technology has wide application in many Lawrence Livermore National Laboratory programs, especially when remote and/or non-contact sensing is necessary.
NTIS
Nondestructive Tests ; Ultrasonics ; Lasers

20020010615 Sandia National Labs. , Albuquerque, NM USA
Eddy-Current Testing of Welded Stainless Steel Storage Containers to Verify Integrity and Identity
Tolk, K. M. ; Stoker, G. C. ; Jul. 20, 1999 ; 8p ; In English
Report No.(s): DE2001-9588 ; SAND99-1829C ; No Copyright ; Avail: Department of Energy Information Bridge
An eddy-current scanning system is being developed to allow the International Atomic Energy Agency (IAEA) to verify the integrity of nuclear material storage containers. Such a system is necessary to detect attempts to remove material from the containers in facilities where continuous surveillance of the containers is not practical. Initial tests have shown that the eddy-current system is also capable of verifying the identity of each container using the electromagnetic signature of its welds. The DOE-3013 containers proposed for use in some US facilities are made of an austenitic stainless steel alloy, which is nonmagnetic in its normal condition. When the material is cold worked by forming or by local stresses experienced in welding, it loses its austenitic grain structure and its magnetic permeability increases. This change in magnetic permeability can be measured using an eddy-current probe specifically designed for this purpose. Initial tests have shown that variations of magnetic permeability and material conductivity in and around welds can be detected, and form a pattern unique to the container. The changes in conductivity that are present around a mechanically inserted plug can also be detected. Further development of the system is currently underway to adapt the system to verifying the integrity and identity of sealable, tamper-indicating enclosures designed to prevent unauthorized access to measurement equipment used to verify international agreements.
NTIS
Eddy Currents ; Welded Joints ; Austenitic Stainless Steels

20020010925 Argonne National Lab. , IL USA
Computed tomography of bridge pins, cast aluminum automotive components and human joints
Martz, H. E. ; Apr. 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9106 ; UCRL-JC-133573 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
X-ray computed tomography (CT) imaging techniques in nondestructive evaluation (NDE) have seen increasing use in an array of industrial, environmental, military, and medical applications (Goebbels, et al., 1999). A brief overview and three diverse application studies of x-ray CT at the Lawrence Livermore National Laboratory (LLNL) will be discussed. (1) Bridge pins are fracture critical elements for some multi-span steel bridges. Recently, pins were removed from their hanger pin assemblies. These pins were selected for further examination by laboratory NDE techniques. High-energy x-ray radiography and CT were used to characterize these pins. (2) Cast light metals, aluminum and magnesium, are being used in an ever increasing number of applications to reduce automobile weight for improved gas mileage and lower emissions. After mechanical testing, the damage in notched Al-tensile test specimens was first determined using CT and subsequently by metallography analysis intended to benchmark the CT technique. (3) A computational approach to normal joint kinematics and prosthetic joint analysis offers an opportunity to evaluate and improve prosthetic joint replacements before they are manufactured or surgically implanted. Computed tomography data are combined with computational analysis to reveal regions where the joint design can be improved for better performance and longevity, prior to expensive manufacturing, laboratory tests, and clinical evaluation.
NTIS
Nondestructive Tests ; Computer Aided Tomography

20020011612 Prairie View Agricultural and Mechanical Coll. , TX USA
Power Quality and Reliability Project ***Final Report , 24 Aug. 1999 - 23 Aug. 2001***
Attia, John O. , Prairie View Agricultural and Mechanical Coll. , USA ; Nov. 21, 2001 ; 14p ; In English ; Original contains color illustrations
Contract(s)/Grant(s): NAG9-1136 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
One area where universities and industry can link is in the area of power systems reliability and quality - key concepts in the commercial, industrial and public sector engineering environments. Prairie View A&M University (PVAMU) has established a collaborative relationship with the University of'Texas at Arlington (UTA), NASA/Johnson Space Center (JSC), and EP&C Engineering and Technology Group (EP&C) a small disadvantage business that specializes in power quality and engineering

services. The primary goal of this collaboration is to facilitate the development and implementation of a Strategic Integrated power/Systems Reliability and Curriculum Enhancement Program. The objectives of first phase of this work are: (a) to develop a course in power quality and reliability, (b) to use the campus of Prairie View A&M University as a laboratory for the study of systems reliability and quality issues, (c) to provide students with NASA/EPC shadowing and Internship experience. In this work, a course, titled ”Reliability Analysis of Electrical Facilities” was developed and taught for two semesters. About thirty seven has benefited directly from this course. A laboratory accompanying the course was also developed. Four facilities at Prairie View A&M University were surveyed. Some tests that were performed are (i) earth-ground testing, (ii) voltage, amperage and harmonics of various panels in the buildings, (iii) checking the wire sizes to see if they were the right size for the load that they were carrying, (iv) vibration tests to test the status of the engines or chillers and water pumps, (v) infrared testing to the test arcing or misfiring of electrical or mechanical systems.
Author
Augmentation ; Cooling Systems ; Electric Current ; Electric Potential ; Reliability ; Quality

20020011621 Department of Energy , Richland, WA USA
Maintenance of the Hanford cone penetrometer platform during fiscal year 1999
Iwatate, D. F. ; Nov. 30, 1998 ; 14p ; In English
Report No.(s): DE2001-11261 ; HNF-3561-REV-0 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This SOW describes services requested of Applied Research and Associates, Inc. (ARA), as a commercial provider of cone penetrometer equipment and services, to provide routine inspection and minimum preventive maintenance on the Hanford CP P1atform (CPP) during Fiscal Year 1999. This SOW specifically pertains to the maintenance of the CPP and associated support equipment and is 1imited in scope to routine preventive maintenance and identification of any deficiencies. ARA is the original manufacturer of the CPP and will conduct this work fol1owing the vendor- prepared maintenance schedule.
NTIS
Penetrometers ; Preventive Maintenance

20020012288 Houston Univ. , Dept. of Electrical and Computer engineering , TX USA
Development of a Radar System for the Non-Destructive Measurement of Concrete Thickness ***Final Report , 1 Apr. - 31 Aug. 2000***
Liu, R. ; Chen, X. ; Li, J. ; Xing, H. ; Liang, R. ; February 2001 ; 44p ; In English
Report No.(s): PB2002-100536 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This project is based on the previous research (0-1828 ’Feasibility Study on Non-destructive Testing Technique to Measure PCC Pavement Thickness’), which provided information and a rudimentary radar system that may be able to be used to measure concrete pavement thickness during the curing stage. The technique utilizes a ground couple, pulse wave radar system. However, the system needs further improvement to be useful in the field. In this study, new pulse generator and new antennas are developed. The software of information extraction and thickness calculation is established. Concrete slabs of different thickness are constructed and used to testify the system. The experimental results on the slabs in the lab and on the field are presented. The tested results show that the thickness of concrete slabs can be determined non-destructively in a few milliseconds with an accuracy of 0.5 inches. The range of the thickness measurement reaches 16.5 inches without steel rebars. The developed technology can also be applied to the asphalt pavement for thickness measurement.
NTIS
Concretes ; Nondestructive Tests ; Slabs ; Pulse Generators ; Dielectrics ; Pulse Radar

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STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20020006219 Naval Applied Science Lab., Brooklyn, NY USA
Polaris FBM Program Navigation Subsystem MK 2 MOD 3 SINS, System 2305; Performance Characteristics with G7B GYROS Under Forced Vibration
Sep. 1965; 25p; In English
Report No.(s): AD-A395403; NASL-TM-36; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Naval Applied Science Laboratory is presently investigating the operational and structural vibration characteristics of the MK 2 MOD 3 SINS binnacle and stable platform assembly. This report details the forced vibration exploratory and performance runs using Autonetics G7B gyros in the system.
DTIC
Structural Vibration; Forced Vibration

20020006542 Los Alamos National Lab. , NM USA
How does a system respond when driven away from thermal equilibrium?
Jarzynski, C. ; Mar. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-775573 ; LA-UR-01-1196 ; No Copyright ; Avail: Department of Energy Information Bridge
It is widely appreciated that our understanding of non-equilibrium phenomena has not kept pace with its equilibrium counterpart. In recent years, however, consideration of the above question, posed at the microscopic level of statistical mechanics, has yielded some intriguing theoretical results distinguished by two common features. First, they remain valid far from equilibrium, that is, even if the system is disturbed violently from its initial equilibrium state. Second, they incorporate information about the history of the system over some span of time: effectively, these are statistical predictions about what we would see if we could watch a movie of the system filmed at the atomic level, rather than predictions about individual snapshots. to date, this work has been theoretical, though supplemented with numerical simulations. However, in the current issue of PNAS, Hummer and Szabo (1) show how to combine these theoretical advances with single molecule manipulation experiments, so as to extract useful equilibrium information from non-equilibrium laboratory data. What these authors propose amounts to a novel method of deducing the equilibrium mechanical properties of individual molecules.
NTIS
Thermodynamic Equilibrium ; Mechanical Properties ; Computerized Simulation ; Statistical Mechanics

20020006786 Southwest Research Inst. , San Antonio, TX USA
A Manual for the Prediction of Blast and Fragment Loadings on Structures ***Final Report , 30 Jan. 1979-30 Sep. 1980***
Baker, W. E. ; Kulesz, J. J. ; Westine, P. S. ; Cox, P. A. ; Wilbeck, J. S. ; Nov. 1980 ; 33p ; In English
Contract(s)/Grant(s): DACA87-79-C-0091
Report No.(s): AD-A395543 ; SWRI-02-5594 ; DOE/TIC-11268 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This manual was prepared to provide Architect-Engineer (AE) firms guidance for the prediction of air blast, ground shock, and fragment loadings of structures as a result of accidental explosions in or near these structures. The manual is complementary to existing structural design manuals and can be used in combination with other manuals by AE firms to design new buildings which are resistant to blast and fragmentation effects of an accidental explosion. Another objective was to aid in the assessment of the explosion-resistant capabilities of existing buildings at the Pantex Plant near Amarillo, Texas. The manual is specific for new or existing facilities at the Pantex Plant. However, most data and prediction methods are presented in general terms and can be applied to other high explosive facilities if proper modifying factors are used.
DTIC
Buildings ; Explosions ; Damage Assessment ; Prediction Analysis Techniques ; Structural Design

20020006869 National Defence Research Establishment , Weapons and Protection Div. , Tumba, Sweden
Model for Rigid Projectile Perforation of Brittle Targets
Wijk, G. ; September 2000 ; 30p ; In English
Report No.(s): PB2001-108217 ; FOA-R-00-01588-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A model to predict rigid, sharp-nosed as well as blunt-nosed projectile perforation of homogeneous target plates has been proposed. The target materials were assumed to be perfectly elastic-plastic so that their deformation can be characterized by the yield strength (Y SUB T). However, the experimental results were obtained for more or less brittle target materials, namely steel armor and dural. Despite this difference, the agreement between the model predictions and the experimental results is satisfactory.
NTIS
Mathematical Models ; Perforating ; Predictions ; Projectiles

20020006870 Research Inst. of National Defence , Weapons and Protection Div. , Tumba, Sweden
Discussion of Rilbe's Models of Fragment Perforation
Wijk, G. ; September 2000 ; 26p ; In English
Report No.(s): PB2001-108216 ; FOA-R-00-01599-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Rilbe's empirical formulas for the penetration/perforation capacity of fragments into target materials are examined. The relations between the coefficients in these formulas and the natural force coefficients in several cases of Newton's equation for the retardation of the fragments are worked out. It is concluded that Rilbe's formulas are probably of limited value, which means that they are restricted to the particular experimental circumstances under which they were obtained and possible 'interpolations' between these; large 'extrapolations' of the results are not to be recommended. Alternative formulas derived from much more physical starting points, namely 'strength' and 'drag', the latter being proportional to either the velocity or the square thereof, were suggested in a previous paper. In this paper further models are suggested, in which the retarding forces are proportional to the velocity raised to integer as well as half-integer powers up to two (less than or = 2). These models yield physically reasonable results but there are no natural interpretations of the coefficients, for instance how these depend on the fragment diameter. With these formulas both 'interpolations' between and large 'extrapolations' from experimental results should be rather safe. Other alternatives in which the retarding forces are proportional to integer values larger than two (greater than 2) are shown to yield 'non-physical' results since the penetration depths remain finite when the impact velocity becomes infinitely large.
NTIS
Weapons ; Projectiles ; Fragments ; Models

20020006885 Sandia National Labs. , Albuquerque, NM USA
Isentropic Compression of Iron with the Z Accelerator
Asay, J. R. ; Bernard, M. A. ; Hall, C. A. ; Hayes, D. B. ; Holland, K. G. ; Jun. 10, 1999 ; 6p ; In English
Report No.(s): DE2001-7877 ; SAND99-0929C ; No Copyright ; Avail: Department of Energy Information Bridge
Development of isentropic loading techniques is a long standing goal of the shock physics community. The authors have used the Sandia Z Accelerator to produce smoothly increasing pressure loading on planar iron specimens over time durations of 100 ns and for pressures to 300 Mbar. Free surface velocity measurements on the rear surface of the continuously loaded specimens were made on specimens 0.5-mm and 0.8-mm thick and clearly show the effects of wave evolution into the well known two-wave structure resulting from the (alpha)-(var-epsilon) phase transition beginning at 125 kbar. The resulting wave profiles are analyzed with a rate-dependent, phase transition model to extract information on phase transformation kinetics for isentropic compression of iron. Comparison of the experiments and calculations demonstrate the value of isentropic loading for studying phase transition kinetics.
NTIS
Iron ; Phase Transformations ; Compressing

20020007097 Sandia National Labs. , Albuquerque, NM USA
Isentropic Compression Experiments on the Z Accelerator
Asay, J. R. ; Jun. 16, 1999 ; 8p ; In English
Report No.(s): DE2001-7876 ; SAND99-0689C ; No Copyright ; Avail: Department of Energy Information Bridge
This paper provides a brief review of experimental techniques for producing dynamic isentropic compression of samples to pressures of several hundred GPa. Traditional gun launch techniques include use of buffer plates, such as fused silica, that exhibit negative curvature to their stress-strain response and graded-density impactors. Graded-density impactors have been used to study isentropic compression of specimens to pressures exceeding 2 Mbar on high-impedance materials. A recent development includes the use of the Sandia Z Accelerator to produce magnetic compression in planar specimens to pressures of a few hundred kbar over time scales of 100 ns. These techniques have been successfully applied to isentropic compression of iron to 300 kbar and copper to 130 kbar. The iron results indicate that it is possible to study the polymorphic phase change that occurs at 130 kbar and also the kinetic properties of the transformation. The copper results indicate that with further improvements in progress it should be possible to measure continuous isentropic compression curves in materials of interest to pressures exceeding 1 Mbar. The Z accelerator is limited to peak currents of about 20 MA. by reconfiguring the anode-cathode geometry it should be possible to obtain constant current density and thus driving pressure to about 3 Mbar. The next generation accelerator referred to as ZX, which is being proposed will have the capability to generate currents to 50 MA and resulting peak pressures to 15 Mbar.
NTIS
Magnetic Compression ; Accelerators ; Launching

20020007100 Oak Ridge National Lab. , TN USA
Criteria for Determining Element Size and Time Step for Thermal Shock Simulation
Zheng, J. ; Feb. 13, 2001 ; 8p ; In English
Report No.(s): DE2001-775415 ; P01-110053 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Rapid energy deposition into spallation source targets can lead to their temperature rise at enormous rates, giving rise to dynamic thermoelastic stresses. Understanding and predicting the resulting stress waves are crucial for robust design and safe operation of such devices. to simulate the thermal shock phenomenon accurately, many factors should be carefully considered, such as geometry, surface condition, energy deposition profile, equation of state, possible cavitation, viscous damping, rate-dependent constitutive equation, element size, and time step. In this paper a closed form expression for the induced stress in slender bars with distributed energy deposition has been directly derived; it is then used to test the accuracy of computed results with FEA codes. It was found that significant errors can occur unless care is taken to restrict element size and time step depending on the boundary conditions, steepness of temperature profiles and rise rate. Criteria have been proposed for determining the above two parameters. Numerical simulation with the well-established ANSYS5.5 code system showed that excellent results could be achieved if the proposed criteria are met.
NTIS
Computerized Simulation ; Thermal Shock ; Thermoelasticity ; Stress Analysis ; Stress Waves ; Energy Transfer

20020008017 NASA Langley Research Center , Hampton, VA USA
Metallic Thermal Protection System Technology Development: Concepts, Requirements and Assessment Overview
Dorsey, John T. , NASA Langley Research Center , USA ; Poteet, Carl C. , NASA Langley Research Center , USA ; Chen, Roger R. , Lockheed Martin Corp. , USA ; Wurster, Kathryn E. , NASA Langley Research Center , USA ; [2002] ; 24p ; In English ; 40th Aerospace Sciences Meeting and Exhibit , 14-17 Jan. 2002 , Reno, NV , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA ; Original contains color illustrations
Report No.(s): AIAA Paper 2002-0502 ; Copyright Waived ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A technology development program was conducted to evolve an earlier metallic thermal protection system (TPS) panel design, with the goals of: improving operations features, increasing adaptability (ease of attaching to a variety of tank shapes and structural concepts), and reducing weight. The resulting Adaptable Robust Metallic Operable Reusable (ARMOR) TPS system incorporates a high degree of design flexibility (allowing weight and operability to be traded and balanced) and can also be easily integrated with a large variety of tank shapes, airframe structural arrangements and airframe structure/material concepts. An initial attempt has been made to establish a set of performance based TPS design requirements. A set of general (FARtype) requirements have been proposed, focusing on defining categories that must be included for a comprehensive design. Load cases required for TPS design must reflect the full flight envelope, including a comprehensive set of limit loads, However, including additional loads. such as ascent abort trajectories, as ultimate load cases, and on-orbit debris/micro-meteoroid hypervelocity impact, as one of the discrete -source -damage load cases, will have a significant impact on system design and resulting performance, reliability and operability. Although these load cases have not been established, they are of paramount importance for reusable vehicles, and until properly included, all sizing results and assessments of reliability and operability must be considered optimistic at a minimum.
Author
Structural Design ; Thermal Protection ; Technology Assessment

20020008087 Argonne National Lab. , IL USA
Fundamental Studies of Ceramic/Metal Interfacial Reactions at Elevated Temperatures
McDeavitt, S. M. ; Billings, G. W. ; Indacochea, J. E. ; Dec. 14, 2000 ; 7p ; In English
Report No.(s): DE2001-772104 ; ANL/CMT/CP-102575 ; No Copyright ; Avail: Department of Energy Information Bridge
This work characterizes the interfaces resulting from exposing oxide and non-oxide ceramic substrates to zirconium metal and stainless steel-zirconium containing alloys. The ceramic/metal systems together were preheated at about 600 C and then the temperatures were increased to the test maximum temperature, which exceeded 1800 C, in an atmosphere of high purity argon. Metal samples were placed onto ceramic substrates, and the system was heated to elevated temperatures past the melting point of the metallic specimen. After a short stay at the peak temperature, the system was cooled to room temperature and examined. The chemical changes across the interface and other microstructural developments were analyzed with energy dispersive spectroscopy (EDS). This paper reports on the condition of the interfaces in the different systems studied and describes possible mechanisms influencing the microstructure.
NTIS
Ceramics ; Microstructure ; Substrates ; Zirconium ; Liquid-Liquid Interfaces

20020008093 National Defence Research Establishment , Tumba, Sweden
Overview of Adiabatic Shearing
Pettersson, A. ; Petersson, J. ; Dec. 2000 ; 20p ; In English
Report No.(s): PB2001-107747 ; FOA-R-00-01743-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Adiabatic shear has been the subject of study for many years mainly because it plays an important role in a number of dynamic phenomena, e.g. fragmentation, erosion, armor penetration and high speed machining. In this report an overview of the theory of adiabatic shear banding as found in a number of papers on the subject is presented. AN adiabatic shear band is a strain-localization phenomenon generally attributed to a plastic instability arising from thermal softening during adiabatic or quasi-adiabatic plastic deformation. The main conclusions of this overview are that virtually any material can exhibit shear band formation if the work hardening is appropriately depressed, and that modeling of shear banding is near impossible due to the non-linear thermomechanical coupling of the governing equations and the non-linearity of commonly used constitutive equations. to study this phenomenon the best approach thus seems to be to combine experimental, analytical, and numerical techniques.
NTIS
Adiabatic Conditions ; Shear Stress ; Shearing

20020008887 Oak Ridge National Lab. , TN USA
Nonlinear Crack Growth Monitoring
Welch, D. E. ; Mar. 27, 2001 ; 14p ; In English
Report No.(s): DE2001-777664 ; ORNL/TM-2001/44 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Oak Ridge National Laboratory has developed a new technique to monitor the growth of cracks in structural members, and to predict when failure due to this damage is imminent. This technique requires the measurement of global loadings and local deflections/strains at critical locations to indicate the increasing growth of hidden cracks with sufficient warning time prior to failure to take preventative action to correct the problem or retire the structure before failure. The techniques, as described in the referenced report have been proven on a laboratory scale to successfully detect the onset of failure due to fatigue cracking (including cracking of corroded samples), stress corrosion cracking, and low temperature creep crack growth, with a reasonable degree of warning before failure.
NTIS
Crack Propagation ; Stress Corrosion Cracking ; Low Temperature

20020009002 Cassino Univ. , Italy
Advanced Modeling for Ductile Behavior of Materials Under High Strain Rates and Temperature Using Continuum Damage Mechanics and Solid State Equations ***Final Report , 14 Jul. 2000-14 Jul 2001***
Bonora, Nicola ; Jul. 2001 ; 70p ; In English
Contract(s)/Grant(s): F61775-00-WE029
Report No.(s): AD-A395941 ; EOARD-SPC-00-4029 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report results from a contract tasking University of Cassino as follows: The contractor shall investigate the behavior of ductile metals under high strain rates at various temperatures. The contractor shall produce a new advanced model for predicting ductile failure in metals using continuum mechanics and solid state equations.
DTIC
Continuum Mechanics ; Damage ; Ductility ; Mathematical Models ; Strain Rate ; Metals

20020009006 ACTA, Inc. , Torrance, CA USA
Cumulative Damage to Window Panes ***Interim Report , Feb. 1991-Jul. 1995***
Haber, Jerold M. ; Jul. 1995 ; 108p ; In English ; Prepared in cooperation with BBN Acoustic Technologies, Canoga Park, CA
Contract(s)/Grant(s): F33615-90-D-0653 ; Proj-7757
Report No.(s): AD-A395906 ; BBN-8087 ; AFRL-HE-WP-TR-2001-0093 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

Three types of tests were employed: static tests, fatigue tests, and tests inside the Sonic Boom Test Facility (SBTF). Uniform loads across the glass surface were applied to glass panes in all tests. In the static tests, the panes were subjected to increasing pressure until they failed (typically between 30 and 90 sec loading). Fatigue tests sinusoidally loaded the panes at 3 Hz frequency until they failed or 24 hrs had elapsed (259,200 cycles). SBTF tests involved exposing the panes to up to 5000 sonic booms or until failure, Static tests were used to establish the strength of panes under a variety of conditions and to assess the variation of the glass strength for any particular condition. This included assessing the strength of new glass, after aging, with different edge conditions, flawed glass, and after other tests. Fatigue tests allowed testing at a significant fraction of the anticipated breaking strength and loading the panes more slowly than in the SBTF. These two factors increased the chance of breaking and, thus, of

detecting glass fatigue behavior. The SBTF provided the most realistic simulation of repetitive sonic booms and, thus, the most credible demonstration of the importance of cumulative damage to the assessment of sonic boom damage to glass.
DTIC
Cumulative Damage ; Damage Assessment ; Fatigue Tests ; Sonic Booms ; Static Tests ; Windows (Apertures)

20020009089 Research Inst. of National Defence , Tumba, Sweden
Approximate Solutions for Explosion Created Vibration and Permanent Deformation of Beams and Plates ***Topical Report***
Wijk, G. , Research Inst. of National Defence , Sweden ; Jan. 2000 ; 52p ; In English
Report No.(s): PB2001-108077 ; FOA-R-00-01413-310-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
A method for the calculation of the maximum stress in an elastic member, which can be a beam or a plate, subjected to a pressure wave in air created by an explosion not too close is suggested. The pressure on the member is characterized by an initial value and a time constant, both of which are measurable. Practical applications of the results concern walls, windows and doors in buildings, and structural surfaces of aeroplanes and ships. A particular problem, which initiated the investigation, concerns ear drums, which from the point of view of rupture must be treated as thin hinged circular plates rather than membranes. The reason for this is that in membrane theory the surface tension is constant.
NTIS
Explosions ; Plates (Structural Members) ; Beams (Supports) ; Structural Analysis ; Eardrums

20020009514 American Society of Civil Engineers , New York, NY USA
An Engineering Approach to Blast Resistant Design
Newmark, N. M. ; American Society of Civil Engineers Proceedings ; Oct. 1953 ; Volume 79 , No. 306 , pp. 306-1 - 306-16 ; In English , 19-22 Oct. 1953 , New York, NY , USA
Report No.(s): AD-A395967 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The field of structural dynamics is relatively new. It is therefore understandable why practically all of the work that has been done to date on the subject of the resistance of structures to atomic blast has been concerned primarily with the analysis of the response (i.e., deflection) of a particular structure subjected to a given loading. This approach is mathematically very attractive, and the writer has contributed a number of methods of his own. However there are two important reasons why the calculation of deflection of a given structure, subjected to a given blast, is not very satisfying from an engineering point of view: (1) There structure to be designed does not yet exist, therefore needless complication in the analysis merely lengthens the time it takes to select a structure for analytical trial; and (2) Even minor variations and uncertainties in the details of the blast loading or in the properties of the structure cause major changes in the computed structural response.
Derived from text
Blast Loads ; Dynamic Response ; Dynamic Structural Analysis ; Structural Engineering

20020009515 United Research Services , Burlingame, CA USA
The Air-Blast-Induced Environment Within Civil Defense Blast-Slanted Shelters ***Final Report***
Melichar, Joseph F. ; November 1969 ; 240p ; In English
Contract(s)/Grant(s): DAHC20-67-C-0136
Report No.(s): AD-A395957 ; URS-755-3 ; No Copyright ; Avail: CASI ; A11 , Hardcopy ; A03 , Microfiche
The objective of this work unit was to review and discuss the application of hydrodynamic codes in the Office of Civil Defense (OCD) shelter research program, and then consider the development of a conceptual model of the flow into and through blast-slanted basement shelters. The review selected a two-dimensional Eulerian code which numerically simulated inviscid, compressible flow without heat transfer. This form of code was shown to be the most suitable form of code for OCD needs on a cost-effectiveness basis. The Eulerian equations were discussed, linked to their numerical form, and a complete set of numerical equations was appended for the reader's convenience. to provide the basis for the evaluation of this approach to future OCD problems a brief review of the internal workings of this form of code was undertaken. A bibliography was provided which will allow the reader to expand the brief review provided by this work unit.
DTIC
Civil Defense ; Shelters ; Defense Program ; Hydrodynamics ; Numerical Analysis

20020009606 Sandia National Labs. , Albuquerque, NM USA
Initial Overview of Iwan Modeling for Mechanical Joints
Segalman, D. J. ; Mar. 01, 2001 ; 54p ; In English
Report No.(s): DE2001-780307 ; SAND2001-0811 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The structural dynamics modeling of engineering structures must accommodate the energy dissipation due to microslip in mechanical joints. Given the nature of current hardware and software environments, this will require the development of constitutive models for joints that both adequately reproduce the important physics and lend themselves to efficient computational processes. The exploration of the properties of mechanical joints--either through fine resolution finite element modeling or through experiment--is itself an area of research, but some qualitative behavior appears to be established. The work presented here is the presentation of a formulation of idealized elements due to Iwan, that appears capable of reproducing the important joint properties as they are now understood. Further, methods for selecting parameters for that model by joining the results from experiments in regimes of small and large load are developed. The significance of this work is that a reduced order model is presented that is capable of reproducing the important qualitative properties of mechanical joints using only a small number of parameters.

NTIS
Mathematical Models ; Mechanical Devices ; Joints (Junctions) ; Structural Analysis

20020010258 Stanford Research Inst. , Facilities and Housing Research Group , Menlo Park, CA USA
Slanting for Combined Nuclear Weapons Effects: Examples with Estimates, and Air Blast Room Filling
Murphy, H. L. ; Beck, J. E. ; June 1973 ; 232p ; In English
Contract(s)/Grant(s): DAHC20-71-C-0292
Report No.(s): AD-A395920 ; No Copyright ; Avail: CASI ; A11 , Hardcopy ; A03 , Microfiche

This report provides updated and expanded versions of, and thus replacements for, Chapter 8 (Slanting and Building) and Appendix E (Room Filling from Air Blast) in the latest of a series of feasibility studies on slanting (design modification) of basements in new buildings, to provide shelter against combined nuclear weapon effects - air blast and initial nuclear, thermal, and fallout radiation. As in the overall feasibility study, the two parts of this report were written solely for the guidance of building design professionals (architects and engineers). The first part of this report, entitled Chapter 8 (Slanting and Building) uses the study Scope and Stipulations sections, plus weapons effects data and such data and guidance to slanting four buildings in a total of eighteen modifications from the buildings as originally designed. The second part of the report, entitled Appendix E (Room Filling from Air Blast), provides the theory, equations, and practical simplifications necessary to solve the problem of estimating the behavior of air blast inside shelters.

Author
Aerial Explosions ; Architecture ; Buildings ; Feasibility Analysis ; Shelters

20020010259 American Society of Civil Engineers , New York, NY USA
Response of Wall Panels Subjected to Blast Loading
Gabrielsen, B. L. ; Apr. 23, 1971 ; 32p ; In English
Report No.(s): AD-A395969 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Since the development of nuclear weapons, voluminous information has been documented from weapons tests, bombing surveys, and theoretical work on the effects of these weapons on buildings and their structural elements. A review of much of this material reveals an almost complete lack of certain types of information which was needed to make refined structural damage predictions required by OCD for a variety of purposes, including casualty and injury predictions, debris predictions, predictions of blast effects on fire development and spread, prediction of damage to equipment and property in structures, and guidance in construction for protection from all weapon effects.

Author
Blast Loads ; Buildings ; Damage ; Panels

20020010570 NASA Kennedy Space Center , Cocoa Beach, FL USA
Overall Thermal Performance of Flexible Piping Under Simulated Bending Conditions
Fesmire, James E. , NASA Kennedy Space Center , USA ; Augustynowicz, S. D. , DYNACS Engineering Co., Inc. , USA ; Demko, J. A. , Oak Ridge National Lab. , USA ; [2001] ; 12p ; In English ; Joint CEC and ICMC Meeting , 16-20 Jul. 2001 , Madison, WI , USA
Contract(s)/Grant(s): NAS10-98001 ; DE-AI05-00OR-22814 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Flexible, vacuum-insulated transfer lines for low-temperature applications have higher thermal losses than comparable rigid lines. Typical flexible piping construction uses corrugated tubes, inner and outer, with a multilayer insulation (MLI) system in the annular space. Experiments on vacuum insulation systems in a flexible geometry were conducted at the Cryogenics Test Laboratory of NASA Kennedy Space Center. The effects of bending were simulated by causing the inner tube to be eccentric with the outer tube. The effects of spacers were simulated in a controlled way by inserting spacer tubes for the length of the cylindrical test articles. Two material systems, standard MLI and a layered composite insulation (LCI), were tested under the full range of vacuum levels using a liquid nitrogen boiloff calorimeter to determine the apparent thermal conductivity (k-value). The results indicate that the flexible piping under simulated bending conditions significantly degrades the thermal performance of the insulation system. These data are compared to standard MLI for both straight and flexible piping configurations. The definition of an overall k-value for actual field installations (k(sub oafi)) is described for use in design and analysis of cryogenic piping systems.
Author
Thermal Conductivity ; Temperature Effects ; Pipes (Tubes) ; Bending Moments ; Multilayer Insulation ; Cryogenics

20020011027 Florida Atlantic Univ. , Dept. of Mechanical Engineering , Boca Raton, FL USA
Interrelation Between Safety Factors and Reliability ***Final Report***
Elishakoff, Isaac , Florida Atlantic Univ. , USA ; November 2001 ; 78p ; In English
Contract(s)/Grant(s): NAS3-98008 ; RTOP 910-30-11
Report No.(s): NASA/CR-2001-211309 ; E-13111 ; NAS 1.26:211309 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
An evaluation was performed to establish relationships between safety factors and reliability relationships. Results obtained show that the use of the safety factor is not contradictory to the employment of the probabilistic methods. In many cases the safety factors can be directly expressed by the required reliability levels. However, there is a major difference that must be emphasized: whereas the safety factors are allocated in an ad hoc manner, the probabilistic approach offers a unified mathematical framework. The establishment of the interrelation between the concepts opens an avenue to specify safety factors based on reliability. In cases where there are several forms of failure, then the allocation of safety factors should he based on having the same reliability associated with each failure mode. This immediately suggests that by the probabilistic methods the existing over-design or under-design can be eliminated. The report includes three parts: Part 1-Random Actual Stress and Deterministic Yield Stress; Part 2-Deterministic Actual Stress and Random Yield Stress; Part 3-Both Actual Stress and Yield Stress Are Random.
Author
Mathematical Models ; Reliability ; Stress Analysis ; Probability Theory ; Safety Factors ; Mechanical Properties

20020011375 Sandia National Labs. , Albuquerque, NM USA
Intermediate Strain-Rate Loading: Techniques and Applications
Chhabildas, L. C. ; Reinhart, W. D. ; Holland, K. G. ; Jul. 22, 1999 ; 6p ; In English
Report No.(s): DE2001-9510 ; SAND99-0537C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A new test methodology is described which allows access to loading rates that lie between split Hopkinson bar and shock-loading techniques. Gas gun experiments combined with velocity interferometry techniques have been used to experimentally determine the intermediate strain-rate loading behavior of Coors AD995 alumina and Cercom silicon-carbide rods. Graded-density materials have been used as impactors; thereby eliminating the tension states generated by the radial stress components during the loading phase. Results of these experiments demonstrate that the time-dependent stress pulse generated during impact allows an efficient transition from the initial uniaxial strain loading to a uniaxial stress state as the stress pulse propagates through the rod. This allows access to intermediate loading rates over 5 x 10(exp 3)/s to a few times 10(exp 4)/s.
NTIS
Interferometry ; Strain Rate ; Loading Rate

20020011705 Swedish Defence Research Establishment , Weapons and Protection Div. , Tumba, Sweden
OpenMP-Version of DYNA3D
Helte, A. , Swedish Defence Research Establishment , Sweden ; Dec. 2000 ; 20p ; In English
Report No.(s): PB2001-108423 ; FOA-R-00-01793-310-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A parallel version of the finite element computer code DYNA3D have been developed using the shared memory parallel application interface OpenMP. The parallel version runs on shared memory architectures such as the SGI Origin 2000. The

speedup scales well up to four processors, after which the speedup begins to saturate due to effects from non-parallel section and increased memory access times.
NTIS
Architecture (Computers) ; Computer Programs ; Finite Element Method ; Dynamic Structural Analysis ; Parallel Processing (Computers)

20020012259 National Aerospace Lab. , Structures and Materials Div. , Amsterdam, Netherlands
Development of an Analysis and Design Environment for Hybrid Damping ***Final Report***
deBoer, A. ; Veul, R. P. G. ; Arendsen, P. ; Bakker, M. ; Jan. 27, 2000 ; 12p ; In English
Report No.(s): PB2001-108693 ; NLR-TP-2000-029 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Vibration reduction by adding damping to the structure is mostly carried out when the structure has been built. Rapid developments in computer technology have made it possible to perform more complex analyses in which damping can be included in the design process. At NLR (Amsterdam's National Aerospace Laboratory), research is carried out on the integration of advanced analysis tools in design environments. In this paper the tools developed for the analysis of passive and active damping in structures are presented. The backbone of the design environment is an optimization algorithm which helps the designer to come up with optimal designs of structures. In the case of active damping the optimal design of controllers is a new aspect. This means that in addition to the optimization of the locations of sensors and actuators the control parameters have to be optimized. In this paper a method is proposed to optimize locations and control parameters at once with the standard finite element representation of the equations of motion as a base.
NTIS
Computer Aided Design ; Design Analysis ; Vibration Damping ; Structural Vibration ; Design Optimization ; Structural Analysis

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GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20020006101 California Inst. of Tech. , Pasadena, CA USA
Isotope Trace Studies of Diffusion in Silicates and of Geological Transport Processes Using Actinide Elements
Wasserburg, G. J. ; Jan. 19, 2001 ; 3p ; In English
Report No.(s): DE2001-773358 ; DOE/ER13851-3 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Over the past year we have competed two studies of Os concentration and isotopic composition in rivers from the Himalayan uplift and in hydrothermal fluids from the Juan de Fuca Ridge. Both of these studies have been published. We have completed a study of paleo-climate in Soreq Cave, Israel, and have expanded our studies of the transport of U-Th through riverine and estuarine environments. We are completing two studies of weathering and transport in the vadose in two very different environments--one a tropical regime with a deep laterite profile and the other a northern arboreal forest with only a thin weathering zone. We have begun a new study of U-Th in aquifers with low water velocity.
NTIS
Actinide Series ; Diffusion ; Isotopes ; Silicates ; Planetary Geology ; Oceanography

20020006238 Los Alamos National Lab. , NM USA
Remediation of nitrate-contaminated groundwater using a biobarrier
Strietelmeier, B. ; Espinosa, M. ; Jan. 01, 2001 ; 17p ; In English
Report No.(s): DE2001-772985 ; LA-UR-01-55 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A biobarrier system has been developed for use in remediating shallow alluvial groundwater. This barrier is made from highly porous materials that are relatively long-lasting, carbon-based (to supply a limiting nutrient in nitrate destruction, in most cases), extremely inexpensive, and easy to replace. In a series of laboratory studies, we have determined the effectiveness of this barrier at destroying nitrate and perchlorate in groundwater from Mortandad Canyon at Los Alamos National Laboratory (LANL). This groundwater was obtained from a monitoring well, MCO-5, which is located in the flowpath of the discharge waters from the LANL Radioactive Liquid Waste Treatment Facility (RLWTF). Water with elevated nitrate levels was discharged from this plant for many years. Recently, the nitrate levels have been brought under the discharge limits. However, the historical discharge has resulted in a nitrate plume in the alluvial groundwater in this canyon. The LANL Multi-Barrier project was initiated in 1999 to

develop a system of barriers that would prevent the transport of radionuclides, metals, colloids and other contaminants, including nitrate and perchlorate, further down the canyon in order to protect populations down-gradient. The biobarrier will be part of this Multi-Barrier system. We have demonstrated the destruction of nitrate at levels up to 6.5-9.7 mM nitrate (400-600 mg/L), and that of perchlorate at levels of about 4.3 (micro)M perchlorate (350 ppb). We have quantified the populations of microorganisms present in the biofilm that develops on the biobarrier. The results of this research will be discussed along with other potential applications of this system.
NTIS
Nitrates ; Perchlorates ; Ground Water ; Waste Treatment

20020006533 Los Alamos National Lab. , NM USA
Observation and analysis of a pronounced permeability and porosity scale-effect in unsaturated fractured tuff
Vesselinov, V. ; Jan. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-774340 ; LA-UR-01-648 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Over 270 single-hole and 44 cross-hole pneumatic injection tests have been conducted at the Apache Leap Research Site (ALRS) near Superior, Arizona. They have shown that the pneumatic pressure behavior of fractured tuff at the site is amenable to analysis by methods which treat the rock as a continuum on scales ranging from meters to tens of meters, and that this continuum is representative primarily of interconnected fractures. Both the single-hole and cross-hole test results are free of skin effect. Single-hole tests have yielded estimates of air permeability at various locations throughout the tested rock volume, on a nominal support scale of about 1 m. The corresponding log permeability data exhibit spatial behavior characteristic of a random fractal and yield a kriged estimate of how these 1-m scale log permeabilities vary in three-dimensional space. Cross-hole tests have been analyzed by means of a three-dimensional inverse model in two ways: (a) by interpreting pressure records from individual borehole monitoring intervals, one at a time, while treating the rock as if it was spatially uniform; and (b) by using the inverse model to interpret pressure records from multiple tests and borehole monitoring intervals simultaneously, while treating the rock as a random fractal characterized by a power variogram. The first approach has yielded equivalent air permeabilities and air-filled porosities for a rock volume characterized by a length-scale of several tens of meters. Comparable results have been obtained by means of type-curves. The second approach amounts to three-dimensional pneumatic tomography, or stochastic imaging, of the rock. It has yielded a high-resolution geostatistical estimate of how air permeability and air-filled porosity, defined over grid blocks having a length-scale of 1 m, vary throughout the modeled rock volume. These tomographic images are comparable to those obtained by the kriging of 1-m scale log permeability data from single-hole tests. The results reveal a highly pronounced scale effect in permeability and porosity at the ALRS. We analyze the scaling of permeability at the site on the basis of a recent theory, which is consistent with our representation of the rock as a random fractal.
NTIS
Permeability ; Porosity ; Rock Mechanics ; Pressure Effects

20020006774 National Renewable Energy Lab. , Golden, CO USA
Forest Products: Industry of the Future
Nov. 20, 2000 ; 8p ; In English
Report No.(s): DE2001-775913 ; DOE/GO-102000-1146 ; NREL/BR-810-29329 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This 8-page brochure describes the partnership between the forest products industry and DOEs Office of Industrial Technologies. It highlights the benefits to industry of working with the Forest Products Industry of the Future Team to reduce energy consumption and lower costs.
NTIS
Energy Consumption ; Forests

20020006831 Bechtel Nevada Corp. , Las Vegas, NV USA
Completion Report for Well ER-EC-1
Townsend, M. J. ; Dec. 01, 2000 ; 115p ; In English
Report No.(s): DE2001-775387 ; DOE/NV/11718-381 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Well ER-EC-1 was drilled for the U.S. Department of Energy, Nevada Operations Office in support of the Nevada Environmental Restoration Project at the Nevada Test Site, Nye County, Nevada. This well was drilled in the spring of 1999 as part of the U.S. Department of Energy's hydrogeologic investigation well program in the Western Pahute Mesa - Oasis Valley region just west of the Test Site. A 44.5-centimeter surface hole was drilled and cased off to the depth 675.1 meters below the

surface. The hole diameter was then decreased to 31.1 centimeters for drilling to a total depth of 1,524.0 meters. A preliminary composite, static, water level was measured at the depth of approximately 566.3 meters prior to installation of the completion string. One completion string with three isolated, slotted intervals was installed in the well. Detailed lithologic descriptions with preliminary stratigraphic assignments are included in the report. These are based on composite drill cuttings collected every 3 meters and 31 sidewall samples taken at various depths below 680 meters, supplemented by geophysical log data. Detailed chemical and mineralogical studies of rock samples are in progress. The well penetrated Tertiary-age lava and tuff of the Timber Mountain Group, the Paintbrush Group, the Calico Hills Formation, the Crater Flat Group, and the Volcanics of Quartz Mountain. The preliminary geologic interpretation of data from Well ER-EC-1 indicates the presence of a structural trough or bench filled with a thick section of post-Rainier Mesa lava. These data also suggest that this site is located on a buried structural ridge that may separate the Silent Canyon and Timber Mountain caldera complexes.
NTIS
Wells ; Drilling ; Geophysics ; Holes (Mechanics) ; Petrology

20020006854 Federal Energy Technology Center , Morgantown, WV USA
In-situ permeability measurements with the Cone Permeameter(Trade Name) measurement system
Jul. 30, 1998 ; 112p ; In English
Report No.(s): DE2001-772546 ; DE-AC21-96MC33124-02 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The permeability of soil to fluid flow defines the magnitude of soil gas and groundwater flow under imposed pressure gradients. Pressure gradients exist due to natural effects such as hydraulic gradients (in the case of groundwater) and barometrically imposed gradients (in the case of soil gas). Unnatural gradients are imposed by soil vapor extraction air sparging, active venting, pump-and-treat, and other remediation processes requiring the active movement of fluids through the soil. The design of these processes requires knowledge of the flow characteristics of the soil. The most variable of the soils flow characteristics is its permeability, which can vary by several orders of magnitude in a given geologic and hydrologic setting. Knowledge of soil gas permeability is needed to design soil vapor extraction systems and predict the general movement of gas in soil. Saturated hydraulic conductivity, or the soils permeability to liquid flow, is required to predict movement of groundwater in saturated soils. The variability of permeability is illustrated by the range of values for different media in a table. It is not uncommon for permeabilities to vary by several orders of magnitude at a given site.
NTIS
Fluid Flow ; Permeability ; Soils

20020006861 Forest Service , Pacific Northwest Research Station , Portland, OR USA
Proceedings of IUFRO Division 5 Research Group 5.12 (2nd) Sustainable Production of Forest Products 2000
Barbour, R. J. ; Wong, A. H. H. ; June 2001 ; 74p ; In English ; 21st ; IUFRO Division 5 Research Group 5.12 (2nd) Sustainable Production of Forest Products 2000 , 7-12 Aug. 2000 , Kuala Lumpur , Malaysia ; Prepared in cooperation with the Forest Research Inst., Kepong, Malaysia
Report No.(s): PB2001-108520 ; FSGTR-PNW-520 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The concept of sustainability in the context of forest management holds a different meaning to almost every group that espouses it. Many of these differences arise because of the varying goals and objectives of those who promote the idea of sustainable forest management. When discussing this topic, the question of 'sustainability of what' must be answered before reaching a common understanding of goals and objectives. In general, a sustainable approach to forest management uses innovative strategies to conserve biodiversity, improve the balance among alternative forest values, and maintain healthy ecosystems. It is often also expected to retain the aesthetic, historical, spiritual and other quality of the land. Various silvicultural techniques may be used to alter the developmental trajectory of existing forests to provide this range of values.
NTIS
Forest Management ; Conferences ; Forests ; Silviculture

20020008175 Department of Energy , Aiken, SC USA
Data Quality Objectives Summary Report for Assessing Carbon Tetrachloride Concentrations in the Vadose Zone/Groundwater at the Plutonium Finishing Plant and Disposition of Waste Material
Byrnes, M. E. ; Aug. 14, 2001 ; 152p ; In English
Report No.(s): DE2001-786878 ; BHI-01524-REV-0 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of data quality objective Step 1 is to use the information gathered from the DQO scoping process, as well as other relevant information, to clearly and concisely state the problem to be resolved. This section defines the task objectives and

assumptions, presents the task issues, summarizes the site background information, and provides a concise statement of the problem.
NTIS
Carbon Tetrachloride ; Ground Water

20020008204 National Energy Technology Lab. , Pittsburgh, PA USA
Riverton dome gas exploration and stimulation technology demonstration, wind river basin, wyoming
Surdam, R. C. ; Feb. 01, 1999 ; 11p ; In English
Report No.(s): DE2001-786170 ; FC26-97FT34181-05 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

During the fourth quarter, we continued to work on (1) the determination and three-dimensional visualization of regional pressure surface boundaries between normal and anomalous pressure regimes, and the detection and delineation of areas with enhanced deliverability below this boundary; and (2) tests of the validity and universality of the newly developed exploration paradigm, technology, and tools specifically designed to exploit anomalously pressured, unconventional gas accumulations. The seismic velocity uncertainties have been checked. More faults and formation tops were introduced into the three dimensional anomalous velocity model. An updated three-dimensional model for the Riverton Dome 3-D survey has been constructed.
NTIS
Delineation ; Stimulation ; Natural Gas Exploration

20020008645 Brookhaven National Lab. , Upton, NY USA
Characterization of geological materials using ion and photon beams
Torok, Z. B. ; Jones, ; Tuniz, ; Nov. 01, 1998 ; 34p ; In English
Report No.(s): DE2000-754975 ; BNL-66081 ; No Copyright ; Avail: Department of Energy Information Bridge

Geological specimens are often complex materials that require different analytical methods for their characterization. The parameters of interest may include the chemical composition of major, minor and trace elements. The chemical compounds incorporated in the minerals, the crystal structure and isotopic composition need to be considered. Specimens may be highly heterogeneous thus necessitating analytical methods capable of measurements on small sample volumes with high spatial resolution and sensitivity. Much essential information on geological materials can be obtained by using ion or photon beams. In this chapter the authors describe the principal analytical techniques based on particle accelerators, showing some applications that are hardly possible with conventional methods. In particular, the following techniques will be discussed: (1) Synchrotron radiation (SR) induced X-ray emission (SRIXE) and particle-induced X-ray emission (PEE) and other ion beam techniques for trace element analysis; and (2) Accelerator mass spectrometry (AMS) for ultra sensitive analysis of stable nuclides and long-lived radionuclides. In most of the cases also the possibilities of elemental and isotopic analysis with high resolution will be discussed.
NTIS
Chemical Analysis ; Crystal Structure ; Chemical Elements

20020009609 Sandia National Labs. , Albuquerque, NM USA
Integrating Monitoring and Decision Modeling within a Cooperative Framework: Promoting Transboundary Water Management and Avoiding Regional Conflict
Tidwell, V. C. ; Salerno, R. M. ; Passell, H. D. ; Larson, K. L. ; Kalinina, E. A. ; Mar. 01, 2001 ; 36p ; In English
Report No.(s): DE2001-780302 ; SAND2001-0756 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Surface and groundwater resources do not recognize political boundaries. Where nature and boundary cross, tension over shared water resources can erupt. Such tension is exacerbated in regions where demand approaches or exceeds sustainable supplies of water. Establishing equitable management strategies can help prevent and resolve conflict over shared water resources. This paper describes a methodology for addressing transboundary water issues predicated on the integration of monitoring and modeling within a framework of cooperation. Cooperative monitoring begins with agreement by international scientists and/or policy makers on transboundary monitoring goals and strategies; it leads to the process of obtaining and sharing agreed-upon information among parties with the purpose of providing verifiable and secure data. Cooperative modeling is the process by which the parties jointly interpret the data, forecast future events and trends, and quantify cause and effect relationships. Together, cooperative monitoring and modeling allow for the development and assessment of alternative management and remediation

strategies that could form the basis of regional watershed agreements or treaties. An example of how this multifaceted approach might be used to manage a shared water resource is presented for the Kura River basin in the Caucasus.
NTIS
Water Management ; Mathematical Models ; Decision Making ; Regions ; River Basins

20020009650 Geological Survey , Honolulu, HI USA
Water Resources Data for Hawaii and other Pacific Areas Water Year 2000 , Volume 1 , Hawaii ***Annual Report , 1 Oct. 1999 - 30 Sept. 2000***
Taogoshi, R. I. , Geological Survey , USA ; Nishimoto, D. C. , Geological Survey , USA ; Fontaine, R. A. , Geological Survey , USA ; Wong, M. F. , Geological Survey , USA ; Hill, B. R. , Geological Survey , USA ; Jul. 09, 2001 ; 412p ; In English
Report No.(s): PB2001-109059 ; USGS/WDR/HI-00/1 ; No Copyright ; Avail: CASI ; A18 , Hardcopy ; A04 , Microfiche
Water resources data for the 2000 water year for Hawaii consist of records of stage, discharge, and water quality of streams and springs; and water levels and quality of water wells. Water discharge for 72 gaging stations on streams, springs, and ditches; Discharge data for 92 crest-stage partial-record stations; Water-quality data for 5 streams, 24 partial record stations, and 103 wells; Water levels for 87 observation wells; and Rainfall data for 37 rainfall stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal, State, and other local agencies in Hawaii.
NTIS
Hawaii ; Water Quality ; Surface Water ; Hydrology ; Ground Water

20020009689 Department of Energy , Richland, WA USA
Description of Work for FY 2001 Well Decommissioning Release 3
Wright, C. S. ; Apr. 24, 2001 ; 112p ; In English
Report No.(s): DE2001-781213 ; BHI-01505-REV-0 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This document presents specific techniques, plans, and procedures necessary to accomplish the various tasks necessary to decommission 69 wells during FY 2001.
NTIS
Decommissioning ; Wells

20020010889 Northeastern Forest Experiment Station , Publications Group , Delaware, OH USA
Effect of Harvesting Regime on Beech Root Sprouts and Seedlings in a North-Central Maine Forest Long Affected by Beech Bark Disease
Houston, D. R. ; August 2001 ; 30p ; In English
Report No.(s): PB2002-100523 ; FSRP-NE-717 ; NRS/01-13 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Forests in Maine often contain many trees severely damaged by the disease. Methods are needed to reduce numbers of susceptible and increase numbers of resistant trees. This paper describes how commonly-used harvesting systems affect the incidence and growth of beech root sprouts and seedlings. Harvest treatments were clear cutting and thinning in winter and summer, 1991. Interactions occurred between the amount of root disturbance (leading to root sprouts) and amount of light available for growth. More sprouts developed after clearcuts than thinnings, and around resistant than susceptible trees. Sprout growth was best around resistant trees left standing, poorest around diseased trees that were cut. Summer clearcuts reduced existing seedling and prevented 'recruits'; seedling growth was related to amount of light received-a consequence of the harvests or disease-caused crown thinning.
NTIS
Diseases ; Forests ; Trees (Plants) ; Plant Roots ; Maine

20020010936 Lawrence Livermore National Lab. , Livermore, CA USA
Enabling computational technologies for subsurface simulations
Falgout, R. D. ; Feb. 22, 1999 ; 11p ; In English
Report No.(s): DE2001-8432 ; UCRL-ID-133255 ; REPT-97-ERD-035 ; No Copyright ; Avail: Department of Energy Information Bridge
We collaborated with Environmental Programs to develop and apply advanced computational methodologies for simulating multiphase flow through heterogeneous porous media. The primary focus was on developing a fast accurate advection scheme using a new temporal subcycling technique and on the scalable and efficient solution of the nonlinear Richards' equation used to model two-phase (variably saturated) flow. The resulting algorithms can be orders-of-magnitude faster than existing methods.

Our computational technologies were applied to the simulation of subsurface fluid flow and chemical transport in the context of two important applications: water resource management and groundwater remediation.
NTIS
Computerized Simulation ; Algorithms ; Fluid Flow ; Water Resources ; Nonlinear Equations

20020011355 Sandia National Labs. , Albuquerque, NM USA
Transient Analysis for the Multimechanism-Deformation Parameters of Several Domal Salts
Munson, D. E. ; Aug. 16, 1999 ; 27p ; In English
Report No.(s): DE2001-9758 ; SAND99-2117C ; No Copyright ; Avail: Department of Energy Information Bridge
Use of Gulf Coast salt domes for construction of very large storage caverns by solution mining has grown significantly in the last several decades. In fact, a nationally important Strategic Petroleum Reserve (SPR) storage occurs in large cavern arrays in some of these domes. Although caverns have been operated economically for these many years, these caverns have a range of relatively poorly understood behaviors, involving creep closure fluid loss and damage from salt falls. It is certainly possible to postulate that many of these behaviors stem from geomechanical or deformational aspects of the salt response. As a result, a method of correlating the cavern response to mechanical creep behavior as determined in the laboratory could be of considerable importance. Recently, detailed study of the creep response of domal salts has cast some insight into the influence of different salt origins on cavern behavior. The study used a simple graphical analysis of the limited non-steady state data to give a bound, or an approach to steady state, as an estimate of the steady state behavior of a given domal salt. This permitted the analysis of sparse creep databases for domal salts. It appears that a shortcoming of the steady state analysis was in masking some of the salt material differences. In an attempt to overcome the steady state analysis shortcomings, a method was developed based on the integration of the Multimechanism-Deformation (M-D) creep constitutive model to fit the transient response. This integration process essentially permits definition of the material sensitive parameters of the model, while those parameters that are either constants or material insensitive parameters are fixed independently. The transient analysis method has proven more sensitive to differences in the creep characteristics and has provided a way of defining different behaviors within a given dome. Creep characteristics, as defined by the transient analysis of the creep rate, are related quantitatively to the volume loss creep rate of the caverns. This type of understanding of the domal material creep response already has pointed to the possibility of establishing various distinct material spines within a given dome. Furthermore, if the creep databases for domal salts can be expanded, one could expect additional definition of domal geology and structure.
NTIS
Deformation ; Landforms ; Structural Properties (Geology) ; Salt Beds ; Underground Structures

20020011368 Oak Ridge National Lab. , TN USA
Assessing the Long-Term Hydrologic Impact of Land Use Change Using a GIS-NPS Model and the World Wide Web
Bhaduri, B. ; Engel, B. ; Harbor, J. ; Jones, D. ; Lim, K. J. ; Sep. 22, 1999 ; 23p ; In English
Report No.(s): DE2001-9847 ; ORNL/CP-104304 ; No Copyright ; Avail: Department of Energy Information Bridge
Assessment of the long-term hydrologic impacts of land use change is important for optimizing management practices to control runoff and non-point source (NPS) pollution associated with watershed development. Land use change, dominated by an increase in urban/impervious areas, can have a significant impact on water resources. Non-point source (NPS) pollution is the leading cause of degraded water quality in the US and urban areas are an important source of NPS pollution. Despite widespread concern over the environmental impacts of land use changes such as urban sprawl, most planners, government agencies and consultants lack access to simple impact-assessment tools that can be used with readily available data. Before investing in sophisticated analyses and customized data collection, it is desirable to be able to run initial screening analyses using data that are already available. In response to this need, we developed a long-term hydrologic impact assessment technique (L-THIA) using the popular Curve Number (CN) method that makes use of basic land use, soils and long-term rainfall data. Initially developed as a spreadsheet application, the technique allows a user to compare the hydrologic impacts of past, present and any future land use change. Consequently, a NPS pollution module was incorporated to develop the L-THWNPS model. Long-term daily rainfall records are used in combination with soils and land use information to calculate average annual runoff and NPS pollution at a watershed scale. Because of the geospatial nature of land use and soils data, and the increasingly widespread use of GE by planners, government agencies and consultants, the model is linked to a Geographic Information System (GIS) that allows convenient generation and management of model input and output data, and provides advanced visualization of the model results. Manipulation of the land use layer, or provision of multiple land use layers (for different scenarios), allows for rapid and simple comparison of impacts. to increase access to L-THIA, we have begun development of a WWW-accessible version of the method. Using databases housed on our computers, the user can select any location in the US and perform L-THIAINPS analyses. In this paper we present applications of the WWW-based L-THIA/NPS and L-THIA/NPS GIS model on the Little Eagle Creek (LEC)

watershed near Indianapolis, Indiana. Three historical land use scenarios for 1973, 1984, and 1991 were analyzed to track land use change in the watershed and to assess the impacts of land use change on annual average runoff and NPS pollution from the watershed and its five sub-basins. Comparison of the two methods highlights the effectiveness of the L-THIA approach in assessing the long-term hydrologic impact of urban sprawl. The L-THIA/NPS GIS model is a powerful tool for identifying environmentally sensitive areas in terms of NPS pollution potential and for evaluating alternative land use scenarios to enhance NPS pollution management. Access to the model via the WWW enhances the usability and effectiveness of the technique significantly. Recommendations can be made to community decision makers, based on this analysis, concerning how development can be controlled within the watershed to minimize the long-term impacts of increased stormwater runoff and NPS pollution for better management of water resources.
NTIS
Environment Effects ; Land Use ; Watersheds

20020011615 Lawrence Livermore National Lab. , Livermore, CA USA
Analysis, comparison, and modeling of radar interferometry, date of surface deformation signals associated with underground explosions, mine collapses and earthquakes. Phase I: underground explosions, Nevada Test Site
Foxall, W. ; Vincent, P. ; Walter, W. ; Jul. 23, 1999 ; 12p ; In English
Report No.(s): DE2001-13067 ; UCRL-JC-135131 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We have previously presented simple elastic deformation modeling results for three classes of seismic events of concern in monitoring the CTBT underground explosions, mine collapses and earthquakes. Those results explored the theoretical detectability of each event type using synthetic aperture radar interferometry (InSAR) based on commercially available satellite data. In those studies we identified and compared the characteristics of synthetic interferograms that distinguish each event type, as well the ability of the interferograms to constrain source parameters. These idealized modeling results, together with preliminary analysis of InSAR data for the 1995 mb 5.2 Solvay mine collapse in southwestern Wyoming, suggested that InSAR data used in conjunction with regional seismic monitoring holds great potential for CTBT discrimination and seismic source analysis, as well as providing accurate ground truth parameters for regional calibration events. In this paper we further examine the detectability and discriminating power of InSAR by presenting results from InSAR data processing, analysis and modeling of the surface deformation signals associated with underground explosions. Specifically, we present results of a detailed study of coseismic and postseismic surface deformation signals associated with underground nuclear and chemical explosion tests at the Nevada Test Site (NTS). Several interferograms were formed from raw ERS-1/2 radar data covering different time spans and epochs beginning just prior to the last U.S. nuclear tests in 1992 and ending in 1996. These interferograms have yielded information about the nature and duration of the source processes that produced the surface deformations associated with these events. A critical result of this study is that significant post-event surface deformation associated with underground nuclear explosions detonated at depths in excess of 600 meters can be detected using differential radar interferometry. An immediate implication of this finding is that underground nuclear explosions may not need to be captured coseismically by radar images acquired before and after an event in order to be detectable. This has obvious advantages in CTBT monitoring since suspect seismic events-which usually can be located within a 100 km x 100 km area of an ERS-1/2 satellite frame by established seismic methods-can be imaged after the event has been identified and located by existing regional seismic networks.
NTIS
Underground Explosions ; Earthquakes ; Data Processing ; Discriminant Analysis (Statistics) ; Radar Imagery ; Synthetic Aperture Radar ; Elastic Deformation

20020011623 Department of Energy , Operations Office , Richland, WA USA
Analysis of the effects of corrosion probe on riser 241-AN-102-WST-16 during seismic event
Ziada, H. H. ; Nov. 06, 1998 ; 28p ; In English
Report No.(s): DE2001-11241 ; HNF-3162-Rev-0 ; No Copyright ; Avail: Department of Energy Information Bridge
This analysis supports the installation activity of the corrosion probe in Tank 241-AN-102. The probe is scheduled to be installed in Riser 241-AN-102-WST-16 (formerly known as Riser 15B). The purpose of this analysis is to evaluate the potential effect of the corrosion probe on the riser during a credible seismic event. The previous analysis (HNF 1997a) considered only pump jet impingement loading.
NTIS
Corrosion ; Seismology ; Storage Tanks

20020011742 State Univ. of New York , Multidisciplinary Center for Earthquake Engineering Research , Buffalo, NY USA

Proceedings of the Second MCEER Workshop on Mitigation of Earthquake Disaster by Advanced Technologies (MEDAT-2)

Bruneau, M. ; Inman, D. J. ; Jul. 23, 2001 ; 346p ; In English

Report No.(s): PB2002-100434 ; MCEER-01-0002 ; No Copyright ; Avail: CASI ; A15 , Hardcopy ; A03 , Microfiche

This workshop on Mitigation of Earthquake Disaster by Advanced Technologies was held in Las Vegas, 11/30-12/01, 2000. The workshop consisted of all plenary two-day sessions and was the second in a new series of MCEER workshops on advanced technologies. The workshop gathered 35 experts to explore the state-of-the-art and practice in advanced technologies for the seismic evaluation/retrofit of health care facilities with a particular emphasis on material and technologies for mitigating the risk of soil liquefaction, structural damage and non-structural damage. Separate technical sessions each offered (1) An overview presentation of the desirable seismic performance objectives of hospitals and retrofit strategies currently under investigation by MCEER; (2) Presentations illustrating examples of research conducted within that framework; (3) Presentations highlighting technologies that are or could meet the criteria stated in (1) and how they are used in non-earthquake engineering applications; (4) a broader overview of state-of-the-art in various technologies applicable to the earthquake engineering problem at hand; (5) Panel sessions for the researchers assigned to one of the three specified topics, where participants discussed how new technologies could be implemented; and (6) A summary session to report findings and recommendations reached during the workshop for each technical block.

NTIS

Conferences ; Disasters ; Earthquakes ; Liquefaction

20020011860 Forest Service , North Central Research Station , Saint Paul, MN USA

Forest Communities in the Third Millennium: Linking Research, Business, and Policy Toward a Sustainable Non-Timber Forest Product Sector

Davidson-Hunta, I. , Editor , Manitoba Univ. , Canada ; Duchesne, L. C. , Editor , Canadian Forestry Service , Canada ; Zasada, J. C. , Editor , Forest Service , USA ; 2001 ; 164p ; In English ; Proceedings of a meeting held in Kenora, Ontario, Canada, October 1-4, 1999 , 1-4 Oct. 1999 , Kenora, Ontario , Canada

Report No.(s): PB2002-100278 ; FSGTR-NC-217 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

This document contains a wide variety of papers given at the first international conference on non-timber forest products (NTFP) in cold temperate and boreal forests. Focuses on many facets of NTFPs: economics, society, biology, resource management, business development, and others.

NTIS

Forest Management ; Communities ; Economic Analysis ; Resources Management ; Forests

20020011876 Rhode Island Univ. , Dept. of Natural Resources Science , Kingston, RI USA

Greenwich Bay and Its Watershed: Spatial Data for Planning and Environmental Management

August, P. ; Hutchinson, M. ; Barrette, J. ; Pilaro, M. ; Stevens, J. ; 2001 ; 14p ; In English ; Original contains color illustrations ; Sponsored in part by the Rhode Island AquaFund, the City of Warwick, and the URI Partnership for the Coastal Environment

Report No.(s): PB2002-100747 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

It is impossible to make responsible land management decisions without current and accurate data about the environment. In a municipal planning context, the fundamental unit of land management is the individual parcel of property defined by plat and lot boundaries. Land use activities on individual parcels can collectively cause significant impact to the environment. For example, leachate emanating from failed septic systems on individual parcels contributes to the nutrient enrichment of Greenwich Bay. The slow incursion of development on individual parcels nibbles away at forest and wetland habitats that support biodiversity. For informed and effective decision-making, the land manager must have an integrated picture of how individual parcels of land are used, their geomorphological setting (soil, slope, aspect), and the legal and environmental constraints to potential land uses. The information management technology that is used to integrate and assess spatial (map) data are geographic information systems (GIS). The baseline data required to develop a land management system of parcel-level accuracy are not, however, readily available. The objectives of our project were to (1) design and develop a prototype GIS database that would give planners, environmental scientists, and engineers information with sufficient breadth and detail to make informed decisions for land use management; and (2) assess the strengths and weaknesses of the prototype database and recommend a data system that could be implemented for the city of Warwick, R.I.

NTIS

Watersheds ; Information Management ; Geomorphology ; Environment Management ; Bays (Topographic Features)

20020011877 Geological Survey , Water Resources Div. , Cheyenne, WY USA

Element Concentrations in Bed Sediment of the Yellowstone River Basin, Montana, North Dakota, and Wyoming: A Retrospective Analysis. National Water-Quality Assessment Program ***Final Report***

Peterson, D. A. ; Zelt, R. B. ; 1999 ; 34p ; In English

Report No.(s): PB2002-100765 ; USGS-WRI-99-4185 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Chemical data for bed sediment were analyzed as part of the U.S. Geological Survey National Water-Quality Assessment Program investigation of the Yellowstone River Basin in parts of Montana, North Dakota, and Wyoming. The primary data set consisted of about 13,000 samples collected during 1974-79 for the National Uranium Resource Evaluation program. Data were available for 50 elements, although not all samples were analyzed for all elements. Descriptive statistics are presented to serve as a baseline for element concentrations in bed sediment associated with eight geologic settings or ecoregions in the study unit. NTIS

Geological Surveys ; River Basins ; Sediments ; Water Quality ; Chemical Analysis

20020011878 Geological Survey , Water Resources Div. , Columbia, SC USA

Field Testing of Passive Diffusion Bag Samplers for Volatile Organic Compound Concentrations in Ground Water, Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota, November 1999 and May 2000 ***Final Report***

Vroblesky, D. A. ; Petkewich, M. D. ; 2000 ; 20p ; In English

Report No.(s): PB2002-100767 ; USGS-00-4246 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Volatile organic compound concentrations from passive diffusion bag samplers were compared with concentrations from conventional purge (three or more casing volumes) sampling and low-flow purge sampling in side-by-side tests in 17 wells at the Naval Industrial Reserve Ordnance Plant, in Fridley, Minnesota. An initial comparison of 1,2-dichloroethene and trichloroethene concentrations obtained by using passive diffusion bag samplers and the conventional purge method in wells where one passive diffusion bag sampler was deployed showed good agreement at several wells but poor agreement at others. Collection of data from multiple diffusion samplers during the conventional purge sampling and during the low-flow sampling, however, suggests that the volatile organic compound concentrations from the passive diffusion bag samplers accurately reflect the volatile organic compound distribution in the screened interval, whereas the conventional purge and low-flow purge samples reflect mixing during pumping. The data also show that contaminant stratification was present in some wells.
NTIS

Diffusion ; Field Tests ; Ground Water ; Industrial Plants ; Volatile Organic Compounds ; Navy

20020012287 Geological Survey , Reston, VA USA

Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data

Koterba, M. T. ; Wilde, F. D. ; Lapham, W. W. ; 1995 ; 128p ; In English

Report No.(s): PB2002-100759 ; USGS-OFR-95-399 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

Protocols for ground-water sampling are described in a report written in 1989 as part of the pilot program for the National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey (USGS). These protocols have been reviewed and revised to address the needs of the full-scale implementation of the NAWQA Program that began in 1991. This report, which is a collaborative effort between the NAWQA Program and the USGS Office of Water Quality, is the result of that review and revision. This report describes protocols and recommended procedures for the collection of water quality samples and related data from wells for the NAWQA Program. Protocols and recommended procedures discussed include (1) equipment setup and other preparations for data collection; (2) well purging and field measurements; (3) collecting and processing ground-water quality samples; (4) equipment decontamination; (5) quality-control sampling; and (6) sample handling and shipping.
NTIS

Data Acquisition ; Geological Surveys ; Ground Water ; Protocol (Computers) ; Water Quality

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20020006157 Oak Ridge National Lab. , TN USA
Remote Metrology, Mapping, and Motion Sensing of Plasma Facing Components Using FM Coherent Laser Radar
Menon, M. M. ; Barry, R. E. ; Slotwinsky, A. ; Kugel, H. W. ; Skinner, C. H. ; Sep. 11, 2000 ; 15p ; In English
Report No.(s): DE2001-772470 ; P00-108391 ; No Copyright ; Avail: Department of Energy Information Bridge

Metrology inside a D/T burning fusion reactor must necessarily be conducted remotely since the in-vessel environment would be highly radioactive due to neutron activation of the torus walls. A technique based on frequency modulated coherent laser radar (FM CLR) for such remote metrology is described. Since the FM CLR relies on frequency shift to measure distances, the results are largely insensitive to surface reflectance characteristics. Results of measurements in TFTR and NSTX fusion devices using a prototype FM CLR unit, capable of remotely measuring distances (range) up to 22 m with better than 0.1-mm precision, are provided. These results illustrate that the FM CLR can be used for precision remote metrology as well as viewing. It is also shown that by conducting Doppler corrected range measurements using the CLR, the motion of objects can be tracked. Thus, the FM CLR has the potential to remotely measure the motion of plasma facing components (PFCs) during plasma disruptions.
NTIS
Lasers ; Radar ; Metrology ; Mapping ; Remote Sensing

20020006882 Sandia National Labs. , Albuquerque, NM USA
Potential Uses of Commercial Satellite Imagery in the Middle East
Vannoni, M. G. ; Jun. 08, 1999 ; 49p ; In English
Report No.(s): DE2001-7885 ; SAND99-1441C ; No Copyright ; Avail: Department of Energy Information Bridge

It became clear during the workshop that the applicability of commercial satellite imagery to the verification of future regional arms control agreements is limited at this time. Non-traditional security topics such as environmental protection, natural resource management, and the development of infrastructure offer the more promising applications for commercial satellite imagery in the short-term. Many problems and opportunities in these topics are regional, or at least multilateral, in nature. A further advantage is that, unlike arms control and nonproliferation applications, cooperative use of imagery in these topics can be done independently of the formal Middle East Peace Process. The value of commercial satellite imagery to regional arms control and nonproliferation, however, will increase during the next three years as new, more capable satellite systems are launched. Aerial imagery, such as that used in the Open Skies Treaty, can also make significant contributions to both traditional and non-traditional security applications but has the disadvantage of requiring access to national airspace and potentially higher cost. There was general consensus that commercial satellite imagery is under-utilized in the Middle East and resources for remote sensing, both human and institutional, are limited. This relative scarcity, however, provides a natural motivation for collaboration in non-traditional security topics. Collaborations between scientists, businesses, universities, and non-governmental organizations can work at the grass-roots level and yield contributions to confidence building as well as scientific and economic results. Joint analysis projects would benefit the region as well as establish precedents for cooperation.
NTIS
Aerial Photography ; Artificial Satellites ; Satellite Imagery ; Remote Sensing ; Middle East

20020008149 Los Alamos National Lab. , NM USA
Mti science, data product and ground data processing overview
Szymanski, J. ; Jan. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-776128 ; LA-UR-01-0397 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The mission of the Multispectral Thermal Imager (MTI) satellite is to demonstrate the efficacy of highly accurate multispectral imaging for passive characterization of urban and industrial areas, as well as sites of environmental interest. The satellite makes top-of-atmosphere radiance measurements that are subsequently processed into estimates of surface properties such as vegetation health, temperatures, material composition and others. The MTI satellite also provides simultaneous data for atmospheric characterization at high spatial resolution. to utilize these data the MTI science program has several coordinated components, including modeling, comprehensive ground-truth measurements, image acquisition planning, data processing and data interpretation and analysis. Algorithms have been developed to retrieve a multitude of physical quantities and these algorithms are integrated in a processing pipeline architecture that emphasizes automation, flexibility and programmability. In

addition, the MTI science team has produced detailed site, system and atmospheric models to aid in system design and data analysis. This paper provides an overview of the MTI research objectives, data products and ground data processing.
NTIS
Data Processing ; Surface Properties ; Spatial Resolution

20020008151 Los Alamos National Lab. , NM USA
Comparison of four methods for determining precipitable water vapor content from multi-spectral data
Hirsch, K. ; Mar. 01, 2001 ; 13p ; In English
Report No.(s): DE2001-776108 ; LA-UR-01-1404 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Determining columnar water vapor is a fundamental problem in remote sensing. This measurement is important both for understanding atmospheric variability and also from removing atmospheric effects from remotely sensed data. Therefore discovering a reliable and if possible automated method for determining water vapor column abundance is important. There are two standard methods for determining precipitable water vapor during the daytime from multi-spectral data. The first method is the Continuum Interpolated Band Ratio (CIBR) (see for example King et al. 1996). This method assumes a baseline and measures the depth of a water vapor feature as compared to this baseline. The second method is the Atmospheric Pre-corrected Differential Absorption technique (APDA) (see Schlaepfer et al. 1998); this method accounts for the path radiance contribution to the top of atmosphere radiance measurement which is increasingly important at lower and lower reflectance values. We have also developed two methods of modifying CIBR. We use a simple curve fitting procedure to account for and remove any systematic errors due to low reflectance while still preserving the random spread of the CIBR values as a function of surface reflectance. We also have developed a two-dimensional look-up table for CIBR; CIBR using this technique is a function of both water vapor (as with all CIBR techniques) and surface reflectance. Here we use data recently acquired with the Multi-spectral Thermal Imager spacecraft (MTI) to compare these four methods of determining columnar water vapor content.
NTIS
Anisotropy ; Atmospheric Effects ; Surface Properties ; Systematic Errors ; Spectral Reflectance

20020008210 NASA Goddard Space Flight Center , Greenbelt, MD USA
Validation of MODIS Aerosol Retrieval Over Ocean
Remer, Lorraine A. , NASA Goddard Space Flight Center , USA ; Tanre, Didier , Centre National de la Recherche Scientifique , France ; Kaufman, Yoram J. , NASA Goddard Space Flight Center , USA ; Ichoku, Charles , Science Systems and Applications, Inc. , USA ; Mattoo, Shana , Science Systems and Applications, Inc. , USA ; Levy, Robert , Science Systems and Applications, Inc. , USA ; Chu, D. Allen , Science Systems and Applications, Inc. , USA ; Holben, Brent N. , NASA Goddard Space Flight Center , USA ; Dubovik, Oleg , Science Systems and Applications, Inc. , USA ; Ahmad, Ziauddin , Science and Data Systems , USA ; [2001] ; 14p ; In English ; Original contains color illustrations ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The MODerate resolution Imaging Spectroradiometer (MODIS) algorithm for determining aerosol characteristics over ocean is performing with remarkable accuracy. A two-month data set of MODIS retrievals co-located with observations from the AErosol RObotic NETwork (AERONET) ground-based sunphotometer network provides the necessary validation. Spectral radiation measured by MODIS (in the range 550 - 2100 nm) is used to retrieve the aerosol optical thickness, effective particle radius and ratio between the submicron and micron size particles. MODIS-retrieved aerosol optical thickness at 660 nm and 870 nm fall within the expected uncertainty, with the ensemble average at 660 nm differing by only 2% from the AERONET observations and having virtually no offset. MODIS retrievals of aerosol effective radius agree with AERONET retrievals to within +/- 0.10 micrometers, while MODIS-derived ratios between large and small mode aerosol show definite correlation with ratios derived from AERONET data.
Author
Imaging Spectrometers ; Spectroradiometers ; Aerosols ; Algorithms ; Oceans

20020008217 Los Alamos National Lab. , NM USA
Multiscale thermal-infrared measurements of the mauna loa caldera, hawaii
Balick, L. ; Gillespie, A. ; Mar. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-776327 ; LA-UR-01-1570 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Until recently, most thermal infrared measurements of natural scenes have been made at disparate scales, typically 10(exp -3)-10(exp -2) m (spectra) and 10(exp 2)-10(exp 3) m (satellite images), with occasional airborne images (10 m) filling the gap. Temperature and emissivity fields are spatially heterogeneous over a similar range of scales, depending on scene composition. A common problem for the land surface, therefore, has been relating field spectral and temperature measurements to satellite data, yet in many cases this is necessary if satellite data are to be interpreted to yield meaningful information about the land surface.

Recently, three new satellites with thermal imaging capability at the 10-10(exp 2) m scale have been launched: MTI, TERRA, and LANDSAT 7. MTI acquires multispectral images in the mid-infrared (3-5 micrometers) and longwave infrared (8-10 micrometers) with 20m resolution. ASTER and MODIS aboard TERRA acquire multispectral longwave images at 90m and 500-1000m, respectively, and MODIS also acquires multispectral mid-infrared images. LANDSAT 7 acquires broadband longwave images at 60m. As part of an experiment to validate the temperature and thermal emissivity values calculated from MTI and ASTER images, we have targeted the summit region of Mauna Loa for field characterization and near-simultaneous satellite imaging, both on daytime and nighttime overpasses, and compare the results to previously acquired 10(exp -1) m airborne images, ground-level multispectral FLIR images, and the field spectra. Mauna Loa was chosen in large part because the 4x6km summit caldera, flooded with fresh basalt in 1984, appears to be spectrally homogeneous at scales between 10(exp -1) and 10(exp 2) m, facilitating the comparison of sensed temperature. The validation results suggest that, with careful atmospheric compensation, it is possible to match ground measurements with measurements from space, and to use the Mauna Loa validation site for cross-comparison of thermal infrared sensors and temperature/emissivity extraction algorithms.
NTIS
Night ; Thermal Mapping ; Infrared Detectors

20020008651 Environmental Protection Agency , Las Vegas, NV USA
EPA Geospatial Quality Council Strategy Plan FY-02
Brilis, G. M. ; Chem, B. ; August 2001 ; 22p ; In English
Report No.(s): PB2001-108483 ; EPA/600/R-01/063 ; NERL/LV-ESD-01-097 ; No Copyright ; Avail: National Technical Information Service (NTIS)

The EPA Geospatial Quality Council (GQC), previously known as the EPA GIS-QA Team-EPA/600R-00/009, was created to fill the gap between the EPA Quality Assurance (QA) and Geospatial communities. All EPA Offices and Regions were invited to participate. Currently, the EPA Geospatial Quality Council consists of members from the EPA Regional Offices; the Office of Enforcement and Compliance Assurance (OECA); the Office of Prevention, Pesticides and Toxic Substances (OPPTS); the Office of Water (OW); the new Office of Environmental Information (OEI); and the Office of Research and Development (ORD). The GQC was established by the Environmental Sciences Division of ORD's National Exposure Research Laboratory, but operates independent of any EPA Region or Program Office. The EPA GQC Strategy Plan is a product of the EPA GQC. It builds upon the framework presented at various conference during FY99 and was the first attempt to chart a course for the development of the Agency's Geospatial-QA activities. This Strategy Plan defines the mission of GQC throughout EPA, and articulates the strategic vision of the EPA GQC. It identifies the short- and long-term goals, objectives, and activities necessary to accomplish the mission defined by the vision. As the GQC develops, this Strategy Plan will change to adapt to new technology and changing requirements.
NTIS
Environment Protection ; Remote Sensing ; Geographic Information Systems

20020008676 Los Alamos National Lab. , NM USA
Support vector machines for broad area feature classification in remotely sensed images
Perkins, S. ; Harvey, N. ; Mar. 01, 2001 ; 11p ; In English
Report No.(s): DE2001-776688 ; LA-UR-01-1689 ; No Copyright ; Avail: Department of Energy Information Bridge

Classification of broad area features in satellite imagery is one of the most important applications of remote sensing. It is often difficult and time-consuming to develop classifiers by hand, so many researchers have turned to techniques from the fields of statistics and machine learning to automatically generate classifiers. Common techniques include maximum likelihood classifiers, neural networks and genetic algorithms. We present a new system called Afreet, which uses a recently developed machine learning paradigm called Support Vector Machines (SVMs). In contrast to other techniques, SVMs offer a solid mathematical foundation that provides a probabilistic guarantee on how well the classifier will generalize to unseen data. In addition the SVM training algorithm is guaranteed to converge to the globally optimal SVM classifier, can learn highly non-linear discrimination functions, copes extremely well with high-dimensional feature spaces (such as hype spectral data), and scales well to large problem sizes. Afreet combines an SVM with a sophisticated spatio-spectral feature construction mechanism that allows it to classify spectrally ambiguous pixels. We demonstrate the effectiveness of the system by applying Afreet to several broad area classification problems in remote sensing, and provide a comparison with conventional maximum likelihood classification.
NTIS
Remote Sensing ; Satellite Imagery ; Image Classification

20020008878 Los Alamos National Lab. , NM USA

Multispectral thermal imager science, data product and ground data processing overview

Szymanski, J. ; Balick, L. ; Apr. 01, 2001 ; 5p ; In English

Report No.(s): DE2001-777755 ; LA-UR-01-1941 ; No Copyright ; Avail: Department of Energy Information Bridge

The mission of the Multispectral Thermal Imager (MTI) satellite is to demonstrate the efficacy of highly accurate multispectral imaging for passive characterization of urban and industrial areas, as well as sites of environmental interest. The satellite makes top-of-atmosphere radiance measurements that are subsequently processed into estimates of surface properties such as vegetation health, temperatures, material composition and others. The system also provides simultaneous data for atmospheric characterization at high spatial resolution. to utilize these data the MTI science program has several coordinated components, including modeling, comprehensive ground-truth measurements, image acquisition planning, data processing and data analysis and interpretation. Algorithms have been developed to retrieve a multitude of physical quantities and these algorithms are integrated in a processing pipeline architecture that emphasizes automation, flexibility and programmability. This paper describes the MTI data products and ground processing, as well as the 'how to' aspects of starting a data center from scratch.

NTIS

Multispectral Photography ; Imaging Techniques ; Data Processing ; Satellite Observation

20020008889 Los Alamos National Lab. , NM USA

Evaluating the Hydrogeochemical Response of Springs Using Phase-Plane Plots and Singular Spectrum Analysis

Newman, B. ; Duffy, C. ; Hickmott, D. ; Apr. 01, 2001 ; 6p ; In English

Report No.(s): DE2001-777453 ; LA-UR-01-1922 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An ongoing study is focused on understanding the hydrology and geochemistry of three contaminated, perennial, semi-arid zone springs at a high explosives production facility at Los Alamos National Laboratory, in northern New Mexico, USA. Springflow time series were examined using singular spectrum analysis (SSA) to identify the important time-scales affecting flow in the springs. SSA results suggest that springflow has two dominant patterns: a series of low-frequency modes which follow the seasonal and longer-term climate conditions at the site, and a large number of higher frequency modes which display the characteristic 'red noise' spectrum related to local, short-term weather conditions. Phase-plane plots of (delta-18)O and spring discharge suggest that high flow conditions are dominated by snowmelt and summer monsoon inputs while low flow conditions can be affected by mixing of fast and slow flow components causing wide variations in (delta-18)O values. The analysis is being used for development of an efficient strategy for sampling design for environmental monitoring of contaminants that respond to multiple time scales.

NTIS

Contamination ; Environmental Monitoring ; Geochemistry ; Hydrogeology

20020008892 Bechtel Nevada Corp. , Las Vegas, NV USA

Aerial Radiological Survey of the Sandia National Laboratories/New Mexico and Surrounding Areas

Hendricks, T. J. ; Prout, D. L. ; Mar. 01, 2001 ; 40p ; In English

Report No.(s): DE2001-777364 ; DOE/NV/11718-546 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A team from the US Department of Energy Remote Sensing Laboratory conducted an aerial radiological survey of the area surrounding the Sandia National Laboratories/New Mexico and Kirtland Air Force Base in Albuquerque, New Mexico, during the months of April and May 2000. The survey team measured the terrestrial gamma radiation at the site to determine the levels of natural and man-made radiation. The current survey includes the areas covered by a previous survey that was performed in 1993. The results of the aerial survey show a background exposure rate that varies between 5 and 18 microRoentgens per hour plus an appropriate 6 microRoenthens contribution from cosmic rays. The major radioactive isotopes found in this survey were potassium-40, thallium-208, bismuth-214, and actinium-228, which are all naturally occurring isotopes, and cobalt-60, cesium-137, and excess amounts of thallium-208 and actinium-228, which are due to human activity in the survey area. In regions away from the man-made activity, the exposure rates inferred from this survey agree well with the exposure rates inferred from the 1993 survey. In addition to the aerial measurements, a series of ground-based pressurized ion chamber (PIC) measurements were acquired at four sites within the survey area. These ground-based PIC measurements ranged from 5.4 to 9.5 microRoentgens and were 13 to 21% lower than the inferred aerial exposure-rate results.

NTIS

Cosmic Rays ; Exposure ; Radioactive Isotopes ; Radiology ; Surveys ; Terrestrial Radiation

20020008982 Boise State Univ. , Boise, ID USA

A Comparison of Vertical and Horizontal GPR Velocity Estimates in Alluvial Sediments

Clement, William P. ; Knoll, Michael D. ; Nov. 2001 ; 9p ; In English

Contract(s)/Grant(s): DAAG55-98-1-0277

Report No.(s): AD-A396015 ; ARO-37739.10-EV-DPS ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

We have measured the horizontal and vertical electromagnetic velocity through an alluvial, sand and cobble aquifer near Boise, Idaho. to measure the horizontal velocity, we deployed antennas in two wells 6.9 m apart. to measure the vertical velocity, we placed one antenna on the surface adjacent to a well and lowered the other antenna down that well. We collected data at three wells; two wells at either end and a well located in between the two end wells. We thus have one measure of the horizontal velocity and three measures of the vertical velocity. The horizontal and vertical velocity are essentially the same below the water table at 2 m depth. In the vadose zone, the velocities differ, but we think that refracted waves cause the velocity differences. The directional independence of the velocities indicates that we can assume isotropic models in our interpretation of the aquifer.

DTIC

Aquifers ; Electromagnetic Radiation ; Electromagnetic Wave Transmission ; Antennas ; Experiment Design

20020008992 Mathematica, Inc. , Princeton, NJ USA

Technical and Economic Potentials of Shale Oil Production by Nuclear Explosives

Heiss, Klaus-Peter ; Aug. 31, 1967 ; 134p ; In English

Report No.(s): AD-A395966 ; PNE-3006 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

The largest single reserve of hydrocarbons known to exist anywhere in the world is given by the oil shales of the Green River formation in the western part of the USA. With available conventional techniques only an insignificant part of these resources could be tapped, and that only at great cost and under considerable technical uncertainties. It is on this basis that the Oil Shale Advisory Board came in 1964 to the negative conclusion that such an oil shale industry would not be competitive under conditions as they were at that time. In the following report a new technology is discussed which was first proposed in 1959, but which has been developed mainly since 1964: the in situ production of oil from shale by large underground retorts created by nuclear explosives. The first part of the present report describes this new process; the second part gives an analysis of the USA and the world endowments with crude oil resources and oil shale deposits and finally, the third part deals with expected cost estimates of this new technology as compared with present crude oil prices and potential costs of conventional shale oil production.

DTIC

Nuclear Explosions ; Economics ; Cost Estimates ; Shale Oil

20020009072 Boise State Univ. , Boise, ID USA

Hydrogeological Property Estimation Using Tomographic Data at the Boise Hydrogeophysical Research Site

Peterson, John E., Jr. ; Knoll, Micheal D. ; Nov. 2001 ; 11p ; In English

Contract(s)/Grant(s): DAAG55-98-1-0277

Report No.(s): AD-A396059 ; ARO-37739.5-EV-DPS ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Crosswell seismic and radar data were acquired at the Boise Hydrogeophysical Research Site (BHRS) as part of an effort to characterize the hydrological property distribution in a heterogeneous alluvial aquifer. The dielectric constant and amplitude attenuation values obtained from inversion of the radar data, as well as the seismic P-wave velocity values obtained from inversion of the seismic data, reveal similar spatial patterns. Comparison of this tomographic information with coincident weilbore logs suggest that the geophysical attributes are sensitive to hydrogeological variations. Information obtained from the radar tomography data were used to produce 2-D, high-resolution images of porosity and electrical conductivity. Comparison of these images with coincident log data reveal that these estimates are reasonable and suggests that the tomography data will be useful at this site for delineating variations in hydrological parameters.

DTIC

Data Management ; Seismology ; Tomography ; Radar Data

20020009090 Army Engineer Research and Development Center , Geotechnical and Structures Lab. , Vicksburg, MS USA

Hydrogeology of Proposed Harbor Site at Head of Akutan Bay, Akutan Island, Alaska ***Final Report***

Dunbar, Joseph B. ; Corcoran, Maureen K. ; Murphy, William L. ; August 2001 ; 134p ; In English ; Original contains color images

Contract(s)/Grant(s): WCIJUW01465645

Report No.(s): AD-A395644 ; ERDC/GSL-TR-01-13 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

This work supports the environmental impact and feasibility studies by the Planning Division of the U.S. Army Engineer District, Alaska (CEPOA-EN-CW), for the proposed development of a small-boat harbor at the head of Akutan Bay, Akutan

Island, Alaska (Figure 1). The commercial fishing industry, the seafood processing industry, and the city of Akutan support development of a harbor facility at the head of Akutan Bay. This location is well-suited because it is ice-free during the winter months. A harbor facility on Akutan Island would increase the capacity of winter storage for the fishing fleet in the Aleutian Islands and bring additional economic growth to the city of Akutan. Work by the U.S. Army Engineer Research and Development Center (ERDC), for CEPOA-EN-CW for the Akutan Harbor project, involves three separate studies: (1) a wetland delineation, (2) a site survey and development of a digital elevation model, and (3) a geologic/hydrologic assessment. Work for the wetland delineation and the site survey/digital elevation model are presented as separate reports. This report presents the results of a reconnaissance-level field study to characterize the geology, geomorphology, and hydrology of the proposed harbor area at the head of Akutan Bay. The primary purpose for the hydrogeologic investigation was to determine the impacts to the groundwater table from harbor construction. A major environmental concern and focus of this study was to estimate the onshore movement of the saltwater wedge in the impacted area due to harbor construction. Primary objectives of this study were to determine the geology of the harbor area to define important aquifer characteristics of the wetland area. Important aquifer characteristics include the elevation and direction of flow of groundwater, character of the sediments and permeability of the shallow aquifer, and depth to the saltwater wedge.

DTIC

Regional Planning ; Hydrogeology ; Water Tables ; Aleutian Islands (US) ; Artificial Harbors ; Construction ; Environment Effects

20020009093 Army Engineer Research and Development Center , Vicksburg, MS USA

Development of a Geomorphology-Based Framework for Cultural Resources Management, Dworshak Reservoir, Idaho ***Final Report***

Corcoran, Maureen K. ; Smith, Lawson M. ; Wakeley, Lillian D. ; Nickens, Paul R. ; August 2001 ; 62p ; In English

Report No.(s): AD-A395602 ; ERDC-TR-01-8 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The U.S. Army Engineer Research and Development Center developed a technical framework for identifying, evaluating, and mitigating impacts to cultural resource sites affected by reservoir operation in the Columbia River System. Components of this framework include geomorphic analysis, resource monitoring, and site protection procedures. Geomorphic analysis encompasses identifying active erosional processes in the vicinity of a reservoir, and defining how these processes will change when operational procedures for the reservoir are changed. Cultural resource monitoring occurs at four levels: compiling existing information; designing a monitoring program based on site-specific data; implementation of monitoring; and synthesis and analysis of data derived from the monitoring. The protection plan can be tailored to either storage-type or run-of-river reservoirs. It may involve long-term protection in place, or removal of endangered cultural sites. Changing operational procedures at each Corps reservoir has the potential to impact cultural resources. Development and implementation of a cultural resource management plan should mitigate some of the negative impacts.

DTIC

Geomorphology ; Cultural Resources ; Reservoirs ; Columbia River Basin (ID-OR-WA)

20020009117 Los Alamos National Lab. , NM USA

Multispectral Thermal Imager: Overview

Weber, P. ; Mar. 01, 2001 ; 12p ; In English

Report No.(s): DE2001-776138 ; LA-UR-01-1253 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Multispectral Thermal Imager satellite fills a new and important role in advancing the state of the art in remote sensing sciences. Initial results with the full calibration system operating indicate that the system was already close to achieving the very ambitious goals which we laid out in 1993, and we are confident of reaching all of these goals as we continue our research and improve our analyses. In addition to the Department of Energy's interests, the satellite is tasked about one-third of the time with requests from other users supporting research ranging from volcanology to atmospheric sciences.

NTIS

Calibrating ; Remote Sensing ; Artificial Satellites ; Imaging Techniques

20020009131 NASA Goddard Space Flight Center , Greenbelt, MD USA

GPS Signal Scattering from Sea Surface: Wind Speed Retrieval Using Experimental Data and Theoretical Model

Komjathy, Attila , Colorado Univ. , USA ; Zavorotny, Valery U. , Colorado Univ. , USA ; Axelrad, Penina , Colorado Univ. , USA ; Born, George H. , Colorado Univ. , USA ; Garrison, James L. , NASA Goddard Space Flight Center , USA ; Remote Sensing of Environment ; 2000 ; ISSN 0034-4257 ; Volume 73 , pp. 162-174 ; In English

Contract(s)/Grant(s): NAG1-1927 ; RTOP 622-47-55 ; Copyright ; Avail: Issuing Activity

Global Positioning System (GPS) signals reflected from the ocean surface have potential use for various remote sensing purposes. Some possibilities arc measurements of surface roughness characteristics from which ware height, wind speed, and direction could be determined. For this paper, GPS-reflected signal measurements collected at aircraft altitudes of 2 km to 5 km with a delay-Doppler mapping GPS receiver arc used to explore the possibility of determining wind speed. to interpret the GPS data, a theoretical model has been developed that describes the power of the reflected GPS signals for different time delays and Doppler frequencies as a function of geometrical and environmental parameters. The results indicate a good agreement between the measured and the modeled normalized signal power waveforms during changing surface wind conditions. The estimated wind speed using surface- reflected GPS data, obtained by comparing actual and modeled waveforms, shows good agreement (within 2 m/s) with data obtained from a nearby buoy and independent wind speed measurements derived from the TOPEX/Poseidon altimetric satellite.
Author
Global Positioning System ; Scattering ; Signal Transmission ; Seas ; Surface Roughness ; Wind Velocity ; Mathematical Models

20020009636 Los Alamos National Lab. , NM USA
Target characterization in 3D using infrared lidar
Foy, B. ; McVey, B. ; Petrin, R. ; Tiee, J. ; Wilson, C. ; Apr. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-777754 ; LA-UR-01-1995 ; No Copyright ; Avail: Department of Energy Information Bridge
We report examples of the use of a scanning tunable CO2 laser lidar system in the 9-11 (micro)m region to construct images of vegetation and rocks at ranges of up to 5 km from the instrument. Range information is combined with horizontal and vertical distances to yield an image with three spatial dimensions simultaneous with the classification of target type. Object classification is made possible by the distinct spectral signatures of both natural and man-made objects. Several multivariate statistical methods are used to illustrate the degree of discrimination possible among the natural variability of objects in both spectral shape and amplitude.
NTIS
Infrared Radar ; Three Dimensional Models ; Carbon Dioxide Lasers ; Multivariate Statistical Analysis ; Image Classification ; Vegetation ; Rocks

20020010583 North Carolina State Univ. , ECE Dept. , Raleigh, NC USA
Resolution Enhancement of Spaceborne Radiometer Images
Krim, Hamid , North Carolina State Univ. , USA ; [2001] ; 23p ; In English
Contract(s)/Grant(s): NAG5-7942 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Our progress over the last year has been along several dimensions: 1. Exploration and understanding of Earth Observatory System (EOS) mission with available data from NASA. 2. Comprehensive review of state of the art techniques and uncovering of limitations to be investigated (e.g. computational, algorithmic ...). and 3. Preliminary development of resolution enhancement algorithms. With the advent of well-collaborated satellite microwave radiometers, it is now possible to obtain long time series of geophysical parameters that are important for studying the global hydrologic cycle and earth radiation budget. Over the world's ocean, these radiometers simultaneously measure profiles of air temperature and the three phases of atmospheric water (vapor, liquid, and ice). In addition, surface parameters such as the near surface wind speed, the sea surface temperature, and the sea ice type and concentration can be retrieved. The special sensor microwaves imager SSM/I has wide application in atmospheric remote sensing over the ocean and provide essential inputs to numerical weather-prediction models. SSM/I data has also been used for land and ice studies, including snow cover classification measurements of soil and plant moisture contents, atmospheric moisture over land, land surface temperature and mapping polar ice. The brightness temperature observed by SSM/I is function of the effective brightness temperature of the earth's surface and the emission scattering and attenuation of the atmosphere. Advanced Microwave Scanning Radiometer (AMSR) is a new instrument that will measure the earth radiation over the spectral range from 7 to 90 GHz. Over the world's ocean, it will be possible to retrieve the four important geographical parameters SST, wind speed, vertically integrated water vapor, vertically integrated cloud liquid water L.
Derived from text
Radiometers ; Remote Sensing ; Algorithms ; Atmospheric Moisture ; Atmospheric Sounding

20020010629 Department of Energy , Savannah River Site , Aiken, SC USA
Subsurface Flow and Contaminant Transport Documentation and User's Guide
Aleman, S. E. ; Jul. 28, 1999 ; 467p ; In English
Report No.(s): DE2001-9310 ; WSRC-TR-95-0223-REV-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report documents a finite element code designed to model subsurface flow and contaminant transport, named FACT. FACT is a transient three-dimensional, finite element code designed to simulate isothermal groundwater flow, moisture movement, and solute transport in variably saturated and fully saturated subsurface porous media. The code is designed specifically to handle complex multi-layer and/or heterogeneous aquifer systems in an efficient manner and accommodates a wide range of boundary conditions. Additionally, 1-D and 2-D (in Cartesian coordinates) problems are handled in FACT by simply limiting the number of elements in a particular direction(s) to one. The governing equations in FACT are formulated only in Cartesian coordinates.
NTIS
Aquifers ; Contaminants ; Finite Element Method ; Computerized Simulation ; Isothermal Flow

20020011678 NASA Stennis Space Center , Bay Saint Louis, MS USA
Environmental Assessments in the Riparian Corridor of the Colorado River Delta
[2001] ; 17p ; In English
Contract(s)/Grant(s): NAG13-2001 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
We will develop remote sensing methods to conduct environmental assessments in the riparian corridor of the Colorado River delta, shared by the USA and Mexico. This important regional ecosystem is dependent upon US water flows, yet the most important wildlife habitats are in Mexico. The delta region is poorly known and difficult to monitor on the ground. We will use ground-validated, aerial and satellite methods to develop accurate vegetation and habitat maps and predictive hydrological and vegetation models of this ecosystem in response to US flood releases. The work products will advance our understanding of water resource issues in dryland climates and provide a specific application tool for a critical binational natural resource area.
Author
Colorado River (North America) ; Remote Sensing ; Deltas ; Ecosystems ; Water Flow

20020012257 National Aerospace Lab. , Space Div. , Amsterdam, Netherlands
Simultaneous Retrieval of Soil, Leaf, Canopy and Atmospheric Parameters from Hyperspectral Information in the Red Edge through Model Inversion ***Final Report***
Verhoef, W. ; Mar. 20, 2000 ; 16p ; In English
Report No.(s): PB2001-108700 ; NLR-TP-2000-126 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In a modelling case study it has been investigated whether it would be possible to retrieve from optical remote sensing data the (bio)physical parameters of the coupled soil-vegetation-atmosphere system that have an effect on spectral radiances detected by spaceborne sensors. For this, optical data on single leaves generated by means of the PROSPECT model have been applied in the integrated optical soil-canopy-atmosphere radiation model OSCAR. The influences of two soil parameters, two leaf parameters, four canopy parameters and three atmospheric parameters on hyperspectral directional planetary reflectances have been simulated in a model inversion experiment. The simultaneous retrieval of the 11 parameters has been tested using classical model inversion by means of the Gauss-Newton method of non-linear least squares parameter estimation. Preliminary results indicate that this approach has some potential, as in a number of widely differing cases the retrieval of all model parameters from 10 nm resolution hyperspectral red edge planetary reflectance data under five directions was successful.
NTIS
Canopies (Vegetation) ; Soils ; Atmospheric Effects ; Atmospheric Models

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20020006100 California Inst. of Tech. , Pasadena, CA USA
Anode Materials for Rechargeable Li-Ion Batteries. Progress report 2000
Fultz, B. ; Jan. 12, 2001 ; 7p ; In English
Report No.(s): DE2001-773359 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The annual progress report 2000 is presented. This research is on materials for anodes and cathodes in electrochemical cells. The work is a mix of electrochemical measurements and analysis of the materials by transmission electron microscopy and x-ray diffractometry. Our materials studies on electrode materials divide into electronic studies of the valence at and around Li atoms,

and the crystal structures of these materials. We are addressing the basic questions of how these change with Li concentration, and what long-term changes take place during charge/discharge cycling of the materials.
NTIS
Anodes ; Lithium Batteries ; Electrode Materials ; Cell Cathodes ; Electrochemistry ; Metal Ions

20020006107 Federal Energy Technology Center , Morgantown, WV USA
Supported liquid catalysts for removal of high temperature fuel cell contaminants
Weimer, A. W. ; Czerpak, P. ; Hilbert, P. ; Jan. 01, 2000 ; 154p ; In English
Report No.(s): DE2001-772422 ; DE-FG26-98FT40122-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A novel catalytic synthesis gas oxidation process using molten carbonate salts supported on compatible fluidized iron oxide particles (supported-liquid-phase-catalyst (SLPC) fluidized bed process) was investigated. This process combines the advantages of large scale fluidized bed processing with molten salt bath oxidation. Molten salt catalysts can be supported within porous fluidized particles in order to improve mass transfer rates between the liquid catalysts and the reactant gases. Synthesis gas can be oxidized at reduced temperatures resulting in low NO(sub x) formation while trace sulfides and halides are captured in-situ. Hence, catalytic oxidation of synthesis gas can be carried out simultaneously with hot gas cleanup. Such SLPC fluidized bed processes are affected by inter-particle liquid capillary forces that may lead to agglomeration and de-fluidization of the bed. An understanding of the origin and strength of these forces is needed so that they can be overcome in practice. Process design is based on thermodynamic free energy minimization calculations that indicate the suitability of eutectic Na(sub 2)CO(sub 3)/K(sub 2)CO(sub 3) mixtures for capturing trace impurities in-situ (< 1 ppm SO(sub x) released) while minimizing the formation of NO(sub x)(< 10 ppm). Iron oxide has been identified as a preferred support material since it is non-reactive with sodium, is inexpensive, has high density (i.e. inertia), and can be obtained in various particle sizes and porosities. Force balance modeling has been used to design a surrogate ambient temperature system that is hydrodynamically similar to the real system, thus allowing complementary investigation of the governing fluidization hydrodynamics. The primary objective of this research was to understand the origin of and to quantify the liquid capillary interparticle forces affecting the molten carbonate SLPC fluidized bed process. Substantial theoretical and experimental exploratory results indicate process feasibility. The potential environmental gain from success is enormous, impacting all areas of the world where coal is burned to supply steam or direct industrial heat. Project success may lead to an integrated combustion system providing for simultaneous catalytic oxidation and hot gas cleanup of raw synthesis gas from an upstream coal gasifier.
NTIS
Catalysts ; Fuel Cells ; Contaminants

20020006110 Federal Energy Technology Center , Morgantown, WV USA
Pressurized solid oxide fuel cell/gas turbine power system
Lundberg, W. L. ; Israelson, G. A. ; Moritz, R. R. ; Veyo, S. E. ; Holmes, R. A. ; Feb. 01, 2000 ; 156p ; In English
Report No.(s): DE2001-772401 ; DE-AC26-98FT40355-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Power systems based on the simplest direct integration of a pressurized solid oxide fuel cell (SOFC) generator and a gas turbine (GT) are capable of converting natural gas fuel energy to electric power with efficiencies of approximately 60% (net AC (alternating current)/LHV (Lower Heat Value)), and more complex SOFC and gas turbine arrangements can be devised for achieving even higher efficiencies. The results of a project are discussed that focused on the development of a conceptual design for a pressurized SOFC/GT power system that was intended to generate 20 MWe with at least 70% efficiency. The power system operates baseloaded in a distributed-generation application. to achieve high efficiency, the system integrates an intercooled, recuperated, reheated gas turbine with two SOFC generator stages, one operating at high pressure, and generating power, as well as providing all heat needed by the high-pressure turbine, while the second SOFC generator operates at a lower pressure, generates power, and provides all heat for the low-pressure reheat turbine. The system cycle is described, major system components are sized, the system installed-cost is estimated, and the physical arrangement of system components is discussed. Estimates of system power output, efficiency, and emissions at the design point are also presented, and the system cost of electricity estimate is developed.
NTIS
Fuel Cells ; Gas Turbines ; Electric Generators

20020006113 Federal Energy Technology Center , Morgantown, WV USA

Field testing of the taborr (tank bottom recovery and remediation) process using the asphalt and dry bottoms configurations

Satchwell, R. M. ; Sethi, V. K. ; Johnson, L. A. ; Brecher, L. E. ; Apr. 01, 1997 ; 19p ; In English

Report No.(s): DE2001-772389 ; DE-FC21-93MC30127-34 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The TABORR(reg-sign) (Tank Bottom Recovery and Remediation) process being developed at Western Research Institute (WRI) offers an alternative to current disposal methods. The TABORR process is designed to: (1) process these wastes, (2) provide a cost saving, and (3) limit or reduce the environmental liability of the producers. This process removes the water through evaporation, eliminating water disposal costs, creates a salable crude oil that has been valued at or above the current market price for sweet West-Texas intermediate crude, and reduces the solids to a benign state for disposal at a landfill. This report presents the background information associated with this program, a detailed description of the process, and the work that has been completed during the first year of this program. The plant assembly, unit operations, product analyses of the materials created during operations, the pyrolyzer design, and permitting of the process in Wyoming are described. Also discussed in the report is the future work required to take this process to commercialization. Future work discussed includes shakedown and operation of the pyrolyzer, control systems and plant automation, integrated operations, equipment reliability, effluent sample analysis, and long-term testing of the process.

NTIS

Asphalt ; Waste Disposal ; Tanks (Containers) ; Environmental Cleanup ; Systems Engineering ; Field Tests

20020006114 Federal Energy Technology Center , Morgantown, WV USA

In situ treatment of soils contaminated with manufactured gas plant wastes, demonstration program

Johnson, L. A. ; Fahy, L. J. ; Apr. 01, 1997 ; 26p ; In English

Report No.(s): DE2001-772388 ; DE-FC21-93MC30127-33 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The contained recovery of oily waste (CROW(trademark)) process developed by Western Research Institute (WRI) removes organic contaminants from the subsurface by means of adaptation of technology used for secondary and heavy oil recovery. The CROW technology was successfully tested in the laboratory as part of a project for the US Environmental Protection Agency (EPA) SITE (Superfund Innovative Technology Evaluation) Programs Emerging Technology Program. The experimental program consisted of several one- and three-dimensional hot-water flushing tests to simulate the process. The tests were conducted with organically saturated, sand packed tubes and blocks. These experiments showed that hot-water flushing could reduce the organic contaminant content by approximately 60%. Further testing with totally biodegradable chemicals showed that the removal rate could be increased to approximately 90%. Additional testing showed that the CROW process did not hinder but helped in the biodegradation of the residual organics. Based on the laboratory performance of the process, the EPA advanced the process to the SITE Demonstration Program. Further development of the process has included the completion of a pilot test at an active wood treatment facility. The pilot test provided additional information for the design of a field-scale remediation effort in addition to verifying several of the prepilot design specifications and predictions. Verified by the pilot test were the abilities to: (1) establish and maintain desired injection and extraction rates, (2) heat the test area to the desired temperature, (3) achieve non-aqueous phase liquid (NAPL) removal rates equivalent to laboratory rates, and (4) show that the produced fluid can be treated for reinfection or disposal.

NTIS

Biodegradation ; Soils ; Biodegradability ; Contaminants ; Environmental Cleanup ; Oil Recovery

20020006126 National Renewable Energy Lab. , Golden, CO USA

Save with Solar, Vol. 3, No. 2 (Fall 2000)

Eiffert, P. ; Nov. 08, 2000 ; 12p ; In English

Report No.(s): DE2001-775876 ; NREL/BR-710-28726 ; DOE/GO-102000-1096 ; No Copyright ; Avail: Department of Energy Information Bridge

This is the second issue of the third volume (Fall 2000) of a technical bulletin produced for the Department of Energy's (DOE's) Federal Energy Management Program (FEMP). It is intended for Federal solar energy champions, that is, energy officers, contracting officials, facility managers, and others who participate in projects in which solar and other renewable energy technologies are installed in Federal government facilities in order to meet the directives of Executive Order 13123 and the President's Million Solar Roofs Initiative. This issue recognizes the contributions of the Federal agencies and specific individuals who enabled the government to meet its goal of installing 2,000 solar energy systems (and related systems) on Federal roofs by

the year 2000. Although only about 30 solar energy champions were given awards, they represent hundreds of government employees who are working to save energy, money, and the environment through energy efficiency and renewable energy.
NTIS
Energy Conservation ; Energy Technology ; Renewable Energy ; Solar Energy ; Energy Conversion

20020006127 National Renewable Energy Lab. , Golden, CO USA
Temperature-Dependent Battery Models for High-Power Lithium-Ion Batteries
Johnson, V. H. ; Sack, T. ; Jan. 10, 2001 ; 17p ; In English
Report No.(s): DE2001-775874 ; NREL/CP-540-28716 ; No Copyright ; Avail: Department of Energy Information Bridge

In this study, two battery models for a high-power lithium ion (Li-Ion) cell were compared for their use in hybrid electric vehicle simulations in support of the U.S. Department of Energy's Hybrid Electric Vehicle Program. Saft America developed the high-power Li-Ion cells as part of the U.S. Advanced Battery Consortium/U.S. Partnership for a New Generation of Vehicles programs. Based on test data, the National Renewable Energy Laboratory (NREL) developed a resistive equivalent circuit battery model for comparison with a 2-capacitance battery model from Saft. The Advanced Vehicle Simulator (ADVISOR) was used to compare the predictions of the two models over two different power cycles. The two models were also compared to and validated with experimental data for a US06 driving cycle. The experimental voltages on the US06 power cycle fell between the NREL resistive model and Saft capacitance model predictions. Generally, the predictions of the two models were reasonably close to the experimental results; the capacitance model showed slightly better performance. Both battery models of high-power Li-Ion cells could be used in ADVISOR with confidence as accurate battery behavior is maintained during vehicle simulations.
NTIS
Renewable Energy ; Simulation ; Temperature Dependence ; Lithium Batteries ; Metal Ions

20020006128 National Renewable Energy Lab. , Golden, CO USA
Variable-Speed Generation Subsystem Using the Doubly-Fed Generator ***Progress Report , Feb. 9, 1994 - April 30, 1999***
Weigand, C. H. ; Lauw, H. K. ; Dec. 18, 2000 ; 137p ; In English
Report No.(s): DE2001-775816 ; NREL/SR-500-27066 ; No Copyright ; Avail: Department of Energy Information Bridge

Over the past decade, fixed-speed, utility-scale wind turbines have technically advanced to a point where they can economically complete against nuclear and fossil-fuel-based power plants in geographical areas with a sufficient wind resource. The objective of this subcontract was to compare various electrical topologies allowing variable-speed turbine operation, identify the most suitable for a 275-kW (or larger) utility-scale wind turbine, and then design, build, lab test, and field test this variable-speed generation subsystem based on the previously identified optimum approach. Preliminary tests of the controls for a doubly fed variable-speed generation system rated at 750 kW were performed on a wind turbine. A 275-kW VSGS was thoroughly tested in the laboratory and on a wind turbine. Using field-oriented control, excellent dynamic behavior of the drive train was demonstrated, acoustic tests revealed an 11 dB reduction in turbine noise in low-wind, low-RPM operation compared to fixed-speed operation. The overall efficiency of the electrical system suffered from inadequate efficiency of the power converter at low power. Consequently, a different converter topology has been proposed that will satisfy both efficiency and power quality requirements for future use. This report provides information on all aspects of the project, including events that were unanticipated at the outset. A great deal of information is available in the references, comprised of NREL reports, journal articles, and conference papers on specific project results.
NTIS
Dynamic Characteristics ; Field Tests ; Power Converters ; Wind Turbines ; Generators

20020006129 National Renewable Energy Lab. , Golden, CO USA
Combustion Equipment Safety; BTS Technology Fact Sheet
Tromly, K. ; Nov. 07, 2000 ; 4p ; In English
Report No.(s): DE2001-775814 ; NREL/FS-810-26464 ; DOE/GO-102000-0784 ; No Copyright ; Avail: Department of Energy Information Bridge

Combustion appliances that use fuels like natural gas, propane, oil, kerosene, or wood can be more efficient and effective at heating than electricity. However, careful installation is required to ensure safe and efficient operation. This fact sheet addresses problems posed by combustion equipment and provides suggestions for furnaces and water heaters, unvented space heaters and fireplaces, and stoves and ovens. Installation, combustion closet design, causes of and prevention of backdrafting are also covered.
NTIS
Combustion ; Heaters ; Heating ; Safety ; Installing

20020006137 Federal Energy Technology Center , Morgantown, WV USA

Second generation PFBC systems R and D - Phase 2 and Phase 3 ***Monthly Report , 1-31 Aug. 1999***

Robertson, A. ; Sep. 30, 1999 ; 6p ; In English

Contract(s)/Grant(s): AC21-86MC21023

Report No.(s): DE2001-774497 ; DE-AC21-86MC21023-73 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

When DOE funds were exhausted in March 1995, all Phase 2 activities were placed on hold. In February 1996 a detailed cost estimate was submitted to the DOE for completing the two remaining Phase 2 Multi Annular Swirl Burner (MASB) topping combustor test campaigns; in August 1996 release was received from FETC to proceed with the two campaigns to: (1) test the MASB at proposed demonstration plant full to minimum load operating conditions; (2) identify the lower oxygen limit of the MASB; (3) demonstrate natural gas to carbonizer fuel gas switching; and (4) demonstrate operation with low temperature compressor discharge air rather than high temperature ((approx) 1,600 F) vitiated air. The 18 in. MASB was last tested at the University of Tennessee Space Institute (UTSI) in a high-oxygen configuration and must be redesigned/modified for low oxygen operation. A second-generation PFB combustion plant incorporating an MASB based topping combustor will be constructed at the City of Lakeland's McIntosh Power Plant under the US DOE Clean Coal V Demonstration Plant Program. This plant will require the MASB to operate at oxygen levels that are lower than those previously tested. Preliminary calculations aimed at defining the operating envelope of the demonstration plant MASB have been completed. Phase 3--Commercial plant design update: The Second-Generation PFB Combustion Plant conceptual design prepared in 1987 is being updated to reflect the benefit of pilot plant test data and the latest advances in gas turbine technology. The updated plant is being designed to operate with 95% sulfur capture and a single Westinghouse 501G gas turbine. The 1987 study investigated two coal feeding arrangements, e.g., dry and paste feed. Paste feeding resulted in a lower cost of electricity. Paste, however, increases the water content of the carbonizer generated syngas; this increases the equilibrium partial pressure of hydrogen sulfide gas over calcium oxide/calcium carbonate and thereby reduces the carbonizer sulfur capture efficiency. Recognizing that the carbonizer and the CPFBC work together to control the plant overall sulfur capture efficiency, the higher CPFBC efficiency can compensate for the carbonizer's lower sulfur capture efficiency depending upon the amount of coal and/or char being fed to each unit. Since the latter are determined by the overall plant heat and material balance, they prepared a balance for each feed case to enable selection of the plant coal feed system. NTIS

Fluidized Bed Processors ; Combustion ; Power Plants ; Combustion Chambers

20020006138 Federal Energy Technology Center , Morgantown, WV USA

Second generation PFBC systems R and D Phase 2 and Phase 3 ***Monthly Report , 1 - 31 July, 1999***

Robertson, A. ; Sep. 01, 1999 ; 6p ; In English

Contract(s)/Grant(s): AC21-86MC21023

Report No.(s): DE2001-774496 ; DE-AC21-86MC21023-72 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

When DOE funds were exhausted in March 1995, all Phase 2 activities were placed on hold. In February 1996 a detailed cost estimate was submitted to the DOE for completing the two remaining Phase 2 Multi Annular Swirl Burner (MASB) topping combustor test campaigns; in August 1996 release was received from FETC to proceed with the two campaigns to: (1) test the MASB at proposed demonstration plant full to minimum load operating conditions; (2) identify the lower oxygen limit of the MASB; (3) demonstrate natural gas to carbonizer fuel gas switching; and (4) demonstrate operation with low temperature compressor discharge air rather than high temperature ((approx) 1,600 F) vitiated air. The 18 in. MASB was last tested at the University of Tennessee Space Institute (UTSI) in a high-oxygen configuration and must be redesigned/modified for low oxygen operation. A second-generation PFB combustion plant incorporating an MASB based topping combustor will be constructed at the City of Lakeland's McIntosh Power Plant under the US DOE Clean Coal V Demonstration Plant Program. This plant will require the MASB to operate at oxygen levels that are lower than those previously tested. Preliminary calculations aimed at defining the operating envelope of the demonstration plant MASB have been completed. Phase 3--Commercial plant design update: The Second-Generation PFB Combustion Plant conceptual design prepared in 1987 is being updated to reflect the benefit of pilot plant test data and the latest advances in gas turbine technology. The updated plant is being designed to operate with 95% sulfur capture and a single Westinghouse 501G gas turbine. The 1987 study investigated two coal feeding arrangements, e.g., dry and paste feed. Paste feeding resulted in a lower cost of electricity. Paste, however, increases the water content of the carbonizer generated syngas; this increases the equilibrium partial pressure of hydrogen sulfide gas over calcium oxide/calcium carbonate and thereby reduces the carbonizer sulfur capture efficiency. Recognizing that the carbonizer and the CPFBC work together to control the plant overall sulfur capture efficiency, the higher CPFBC efficiency can compensate for the carbonizer's lower sulfur

capture efficiency depending upon the amount of coal and/or char being fed to each unit. Since the latter are determined by the overall plant heat and material balance, they prepared a balance for each feed case to enable selection of the plant coal feed system.
NTIS
Fluidized Bed Processors ; Combustion ; Industrial Plants ; Power Plants

20020006163 Sandia National Labs. , Albuquerque, NM USA
Lithium/Manganese Dioxide (Li/MnO2) Battery Performance Evaluation ***Final Report***
Ingersoll, D. ; Clark, N. H. ; Apr. 01, 1999 ; 184p ; In English
Report No.(s): DE2001-7009 ; SAND99-0979 ; No Copyright ; Avail: Department of Energy Information Bridge

In February 1997, under the auspices of the Product Realization Program, an initiative to develop performance models for lithium/manganese dioxide-based batteries began. As a part of this initiative, the performance characteristics of the cells under a variety of conditions were determined, both for model development and for model validation. As a direct result of this work, it became apparent that possible Defense Program (DP) uses for batteries based on this cell chemistry existed. A larger effort aimed at mapping the performance envelope of this chemistry was initiated in order to assess the practicality of this cell chemistry, not only for DP applications, but also for other uses. The work performed included an evaluation of the cell performance as a function of a number of variables, including cell size, manufacturer, current, pulse loads, constant current loads, safety, etc. In addition, the development of new evaluation techniques that would apply to any battery system, such as those related to reliability assessments began. This report describes the results of these evaluations.
NTIS
Electric Batteries ; Lithium Oxides ; Manganese Oxides ; Performance Tests

20020006523 Federal Energy Technology Center , Morgantown, WV USA
Proceedings of the NETL Workshop on Fuel Cell Modeling
Gemmen, R. S. ; Selman, J. R. ; Apr. 18, 2000 ; 255p ; In English
Report No.(s): DE2001-772640 ; DOE/NETL-2000/1128 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This workshop was the first U.S. DOE sponsored meeting devoted to fuel cell modeling. The workshop was attended by over 45 people from industry, universities, and the government. The goals of the meeting were to assess the status of fuel cell modeling, and determine how new developments in fuel cell modeling can improve cell design, stack design, and power system design. The primary focus was on cell and stack modeling. Following a review of DOE/NETL fuel cell related programs and activities, Professor Robert Selman (Illinois Institute of Technology) kicked off the technical portion of the workshop by presenting an overview of fuel cell phenomena and the status of fuel cell modeling. This overview provided the necessary background for establishing a common framework for discussing fuel cell modeling. A distinction was made between micro modeling, electrode modeling, cell modeling, stack modeling, and system modeling. It was proposed that all modeling levels be supported for further development. In addition, due to significant advances being made outside the U.S., it was proposed that dialog/exchange with other international researchers be established. Following the Overview Session, eight leading researchers in modeling gave individual presentations. These presentations provided additional information on the status and present direction of model developments. All these presentations can be found in Attachment A. Before the workshop, a survey was sent out requesting comments from the attendees. Results from this survey can be found in Attachment B. This survey was then used as initial talking points at the individual breakout sessions on the afternoon of the workshop. Breakouts were organized by microfundamental modeling, cell modeling, stack modeling, and systems modeling.
NTIS
Conferences ; Fuel Cells

20020006769 National Energy Technology Lab. , Pittsburgh, PA USA
Biomass reburning: modeling/engineering studies
Zamansky, V. ; Moyeda, D. ; Sheldon, M. ; Apr. 28, 2000 ; 19p ; In English
Report No.(s): DE2001-786515 ; FC26-97FT97270-10 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This project is designed to develop engineering and modeling tools for a family of NO-x control technologies utilizing biomass as a reburning fuel. During the tenth reporting period (January 1-March 31, 2000), EER and NETL R&D group continued to work on Tasks 2, 3, 4, and 5. Information regarding these tasks will be included in the next Quarterly Report. This report includes

(Appendix 1) a conceptual design study for the introduction of biomass reburning in a working coal-fired utility boiler. This study was conducted under the coordinated SBIR program funded by the U.S. Department of Agriculture.
NTIS
Biomass ; Nitrogen Oxides ; Boilers

20020006791 Congressional Budget Office , Washington, DC USA
Causes and Lessons of the California Electricity Crisis
September 2001 ; 45p ; In English
Report No.(s): AD-A395537 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The 1996 law that restructured California's electricity industry was intended to be the first step toward lower electricity prices for 70 percent of the state's population. Few observers foresaw the situation that would exist in California by the summer of 2001. Just five years after restructuring became law, the state's electricity market was commonly described as being in crisis. The goals of restructuring-lower prices for residential customers and more competitive prices for industrial customers-seemed farther away than ever. This paper addresses four questions: (1) What happened in California's electricity market from the mid-1990s through the middle of 2001? (2) What role did the state's restructuring plan play in those events? (3) How did California respond to its market problems? What can other governments learn from California's experience?
DTIC
Electricity ; California ; Low Cost

20020007093 NASA Glenn Research Center , Cleveland, OH USA
Baseline Testing of the Ultracapacitor Enhanced Photovoltaic Power Station
Eichenberg, Dennis J. , NASA Glenn Research Center , USA ; Kolacz, John S. , NASA Glenn Research Center , USA ; Tavernelli, Paul F. , NASA Glenn Research Center , USA ; November 2001 ; 27p ; In English
Contract(s)/Grant(s): RTOP 251-30-07
Report No.(s): NASA/TM-2001-211316 ; E-13127 ; NAS 1.15:211316 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The NASA John H. Glenn Research Center is developing an advanced ultracapacitor enhanced photovoltaic power station. Goals of this effort include maximizing photovoltaic power generation efficiency and extending the life of photovoltaic energy storage systems. Unique aspects of the power station include the use of a solar tracker, and ultracapacitors for energy storage. The photovoltaic power station is seen as a way to provide electric power in remote locations that would otherwise not have electric power, provide independence form utility systems, reduce pollution, reduce fossil fuel consumption, and reduce operating costs. The work was done under the Hybrid Power Management (HPM) Program, which includes the Hybrid Electric Transit Bus (HETB), and the E-Bike. The power station complements the E-Bike extremely well in that it permits the charging of the vehicle batteries in remote locations. Other applications include scientific research and medical power sources in isolated regions. The power station is an inexpensive approach to advance the state of the art in power technology in a practical application. The project transfers space technology to terrestrial use via nontraditional partners, and provides power system data valuable for future space applications. A description of the ultracapacitor enhanced power station, the results of performance testing and future power station development plans is the subject of this report. The report concludes that the ultracapacitor enhanced power station provides excellent performance, and that the implementation of ultracapacitors in the power system can provide significant performance improvements.
Author
Photovoltaic Conversion ; Power Plants ; Performance Tests ; Solar Generators

20020007933 International Atomic Energy Agency , Vienna Austria
Solar photoproduction of hydrogen. IEA technical report of the IEA Agreement of the Production and Utilization of Hydrogen
Sep. 30, 1996 ; 51p ; In English
Report No.(s): DE2001-776257 ; IEA/H2-TR-96 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The report was prepared for the International Energy Agency (IEA) Hydrogen Program and represents the result of subtask C, Annex 10 - Photoproduction of Hydrogen. The concept of using solar energy to drive the conversion of water into hydrogen and oxygen has been examined, from the standpoints of potential and ideal efficiencies, measurement of (and how to calculate) solar hydrogen production efficiencies, a survey of the state-of-the-art, and a technological assessment of various solar hydrogen options. The analysis demonstrates that the ideal limit of the conversion efficiency for 1 sun irradiance is (approximately)31% for a single photosystem scheme and (approximately)42% for a dual photosystem scheme. However, practical considerations

indicate that real efficiencies will not likely exceed (approximately)10% and (approximately)16% for single and dual photosystem schemes, respectively. Four types of solar photochemical hydrogen systems have been identified: photochemical systems, semiconductor systems, photobiological systems, and hybrid and other systems. A survey of the state-of-the-art of these four types is presented. The four types (and their subtypes) have also been examined in a technological assessment, where each has been examined as to efficiency, potential for improvement, and long-term functionality. Four solar hydrogen systems have been selected as showing sufficient promise for further research and development: (1) Photovoltaic cells plus an electrolyzer; (2) Photoelectrochemical cells with one or more semiconductor electrodes; (3) Photobiological systems; and (4) Photodegradation systems. The following recommendations were presented for consideration of the IEA: (1) Define and measure solar hydrogen conversion efficiencies as the ratio of the rate of generation of Gibbs energy of dry hydrogen gas (with appropriate corrections for any bias power) to the incident solar power (solar irradiance times the irradiated area); (2) Expand support for pilot-plant studies of the PV cells plus electrolyzer option with a view to improving the overall efficiency and long-term stability of the system. Consideration should be given, at an appropriate time, to a full-scale installation as part of a solar hydrogen-based model community; (3) Accelerate support, at a more fundamental level for the development of photoelectrochemical cells, with a view to improving efficiency, long-term performance and multi-cell systems for non-biased solar water splitting; (4) Maintain and increase support for fundamental photobiological research with the aim of improving long-term stability, increasing efficiencies and engineering genetic changes to allow operation at normal solar irradiances; and (5) Initiate a research program to examine the feasibility of coupling hydrogen evolution to the photodegradation of waste or polluting organic substances.
NTIS
Hydrogen ; Solar Energy ; Photoelectrochemical Devices

20020008106 Federal Energy Technology Center , Morgantown, WV USA
Novel CO2 Separation System
Copeland, R. J. ; Jan. 15, 2001 ; 40p ; In English
Report No.(s): DE2001-775509 ; DE-AC26-98FT40421-05 ; No Copyright ; Avail: Department of Energy Information Bridge
Current technologies for capturing CO2 are inefficient and expensive. TDA Research objectives are to sequester most to all of the CO2; generate electricity at high efficiency and low costs; usable for GTCC, fuel cells, GT and any fossil fuel (after gasification or other pre-treatment). Their approach is to use a chemical sorbent to transfer the energy in the fossil fuel to heat air in a power generation cycle; condense the water; and to use their Sorbent Energy Transfer System (SETS) which is described in the paper. No additional energy required for CO2 separation, they oxidize the fuel in two steps for the same net reaction: full oxidation of the fuel to water and CO2.
NTIS
Carbon Dioxide ; Separators

20020008195 Sandia National Labs. , Albuquerque, NM USA
Solar Power Tower Design Basis Document, Revision 0
Zavoico, ; Jul. 01, 2001 ; 148p ; In English
Report No.(s): DE2001-786629 ; SAND2001-2100 ; No Copyright ; Avail: Department of Energy Information Bridge
This report contains the design basis for a generic molten-salt solar power tower. A solar power tower uses a field of tracking mirrors (heliostats) that redirect sunlight on to a centrally located receiver mounted on top a tower, which absorbs the concentrated sunlight. Molten nitrate salt, pumped from a tank at ground level, absorbs the sunlight, heating it up to 565degC. The heated salt flows back to ground level into another tank where it is stored, then pumped through a steam generator to produce steam and make electricity. The report establishes a set of criteria upon which the next generation of solar power towers will be designed. The report contains detailed criteria for each of the major systems: Collector System, Receiver System, Thermal Storage System, Steam Generator System, Master Control System, and Electric Heat Tracing System. The Electric Power Generation System and Balance of Plant discussions are limited to interface requirements. This design basis builds on the extensive experience gained from the Solar Two project and includes potential design innovations that will improve reliability and lower technical risk. This design basis document is a living document and contains several areas that require trade-studies and design analysis to fully complete the design basis. Project- and site-specific conditions and requirements will also resolve open to Be Determined issues.
NTIS
Molten Salts ; Design Analysis ; Electric Generators ; Towers

20020008400 Federal Energy Technology Center , Morgantown, WV USA

Evaluation of Fuel Impurity Effects on Solid Oxide Fuel Cell Performance

Apr. 01, 1998 ; 59p ; In English

Report No.(s): DE2001-774909 ; DE-AC21-89MC26355-02 ; No Copyright ; Avail: Department of Energy Information Bridge

The effects of various fuel and air impurities on the performance of tubular solid oxide fuel cells (SOFCs) have been examined. Two-cell SOFC tests were conducted using simulated coal gas contaminated with 1 ppm H2S, 1 ppm HCl, and 5000 ppm NH3. of these only H2S was found to have a significant effect. Another two-cell test was conducted in which the effect of SiO2 carryover into fuel electrode was examined. Testing was also conducted to investigate the effects of copper on nickel containing cell components. Three different air impurities were examined. Single cell testing was performed using air contaminated with sulfur dioxide, with extremely high levels of water vapor, with water vapor and sulfur dioxide, and with sea water mist.

NTIS

Hydrogen Sulfide ; Impurities ; Silicon Dioxide ; Solid Oxide Fuel Cells

20020008682 International Atomic Energy Agency , Vienna Austria

Process Analysis and Economics of Biophotolysis of Water. IEA Technical Report from the IEA Agreement on the Production and Utilization of Hydrogen

Benemann, J. R. ; Mar. 31, 1998 ; 38p ; In English

Report No.(s): DE2001-776255 ; IEA/H2-10-TR2-98 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report is a preliminary cost analysis of the biophotolysis of water and was prepared as part of the work of Annex 10 of the IEA Hydrogen agreement. Biophotolysis is the conversion of water and solar energy to hydrogen and oxygen using microalgae. In laboratory experiments at low light intensities, algal photosynthesis and some biophotolysis reactions exhibit highlight conversion efficiencies that could be extrapolated to about 10% solar efficiencies if photosynthesis were to saturate at full sunlight intensities. The most promising approach to achieving the critical goal of high conversion efficiencies at full sunlight intensities, one that appears within the capabilities of modern biotechnology, is to genetically control the pigment content of algal cells such that the photosynthetic apparatus does not capture more photons than it can utilize. A two-stage indirect biophotolysis system was conceptualized and general design parameters extrapolated. The process comprises open ponds for the CO2 fixation stage, an algal concentration step, a dark adaptation and fermentation stage, and a closed tubular photobioreactor in which hydrogen production would take place. A preliminary cost analysis for a 200 hectare (ha) system, including 140 ha of open algal ponds and 14 ha of photobioreactors was carried out. The cost analysis was based on prior studies for algal mass cultures for fuels production and a conceptual analysis of a hypothetical photochemical processes, as well as the assumption that the photobioreactors would cost about $100/sq m. Assuming a very favorable location, with 21 megajoules (MJ)/sq m total insolation, and a solar conversion efficiency of 10% based on CO2 fixation in the large algal ponds, an overall cost of $10/gigajoule (GJ) is projected. of this, almost half is due to the photobioreactors, one fourth to the open pond system, and the remainder to the H2 handling and general support systems. It must be cautioned that these are highly preliminary, incomplete, and optimistic estimates. Biophotolysis processes, indirect or direct, clearly require considerable basic and applied research and development (R and D) before a more detailed evaluation of their potential and plausible economics can be carried out. For example, it is not yet clear which type of algae, green algae, or cyanobacteria, would be preferred in biophotolysis. If lower-cost photobioreactors can be developed, then small-scale, single-stage biophotolysis processes may become economically feasible. A major basic and applied R and D effort will be required to develop such biophotolysis processes.

NTIS

Algae ; Cost Analysis ; Microorganisms ; Solar Energy Conversion ; Water

20020008894 National Renewable Energy Lab. , Golden, CO USA

Renewable Energy Power System Modular Simulators: RPM-Sim User's Guide (Supersedes October 1999 edition)

Bialasiewicz, J. T. ; Muljadi, E. ; Nix, G. R. ; Drouilhet, S. ; Mar. 28, 2001 ; 182p ; In English

Report No.(s): DE2001-777317 ; NREL/TP-500-29721 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This version of the Renewable Energy Power System Modular Simulators (RPM-SIM) Users Guide supersedes the October 1999 edition. Using the VisSim(trademark) visual environment, researchers developed a modular simulation system to facilitate an application-specific, low-cost study of the system dynamics for wind-diesel hybrid power systems. This manual presents the

principal modules of the simulator and, using case studies of a hybrid system, demonstrates some of the benefits that can be gained from understanding the effects of the designers modifications to these complex dynamic systems.
NTIS
Complex Systems ; Renewable Energy ; Simulators

20020008903 National Renewable Energy Lab. , Golden, CO USA
Life Cycle Assessment of a Natural Gas Combined Cycle Power Generation System
Spath, P. L. ; Mann, M. K. ; Dec. 27, 2000 ; 56p ; In English
Report No.(s): DE2001-776930 ; NREL/TP-570-27715 ; No Copyright ; Avail: Department of Energy Information Bridge
Natural gas is used for steam and heat production in industrial processes, residential and commercial heating, and electric power generation. Because of its importance in the power mix, a life cycle assessment on electricity generation via a natural gas combined cycle system has been performed.
NTIS
Natural Gas ; Cogeneration ; Electricity ; Combined Cycle Power Generation

20020009026 NASA Glenn Research Center , Cleveland, OH USA
Friction Factor Characterization for High-Porosity Random Fiber Regenerators ***Semiannual Report , Nov. 1997 - Mar. 1999***
Thieme, Lanny G. , NASA Glenn Research Center , USA ; August 2001 ; 24p ; In English
Contract(s)/Grant(s): SAA3-198 ; RTOP 783-82-00
Report No.(s): NASA/TM-2001-211098 ; E-12943 ; NAS 1.15:211098 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
NASA Glenn Research Center, the Department of Energy (DOE), and Stirling Technology Company (STC) of Kennewick, Washington are developing a Stirling convertor for a high-efficiency Stirling Radioisotope Power System to provide electric power for NASA Space Science Missions. STC is developing the 55-We Technology Demonstration Convertor (TDC) under contract to DOE. Steady-flow tests were completed to determine the friction factor for the high-porosity regenerators that are used in the TDC. STC fabricated a flow test fixture and three random fiber regenerator test samples, one each at approximately 80, 88, and 96 percent porosities. The flow tests were then completed by the NASA Glenn Flow Calibration Laboratory, and the data reduced to Reynolds number and friction factor. The results showed that the 80 and 88 percent porosity samples had similar characteristics while the 96 percent porosity sample had significantly higher friction factors for given Reynolds numbers compared to the samples with lower porosities. Comparisons were also made between the test data and existing correlations. STC used this data to derive a modified regenerator friction factor correlation for use in the Stirling design code GLIMPS for porosities greater than 88 percent. Using this new correlation, the final optimized regenerator design porosity was reduced from 96 to 90 percent.
Author
Friction Factor ; Regenerators ; Stirling Engines ; Design Analysis

20020009047 Corps of Engineers , Engineer Research and Development Center , Champaign, IL USA
Energy-Efficient Buildings Through Design Automation ***Final Report***
McGraw, Kirk D. ; Lawrie, Linda K. ; Aug. 2001 ; 44p ; In English
Report No.(s): AD-A396128 ; ERDC/CERL-TR-01-62 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Since the mid-1970s, the Department of Defense (DOD) has pursued a strategy of increasing the energy efficiency of its buildings, both in new designs and existing facilities. Designers have effectively produced more energy-efficient buildings, but are also under constant pressure to reduce facility delivery times, first cost, and maintenance requirements. They must also address design considerations such as aesthetics, indoor air quality, and occupant comfort--factors that can be at odds with minimum energy consumption. Modern information technology offers efficient ways to consolidate, organize, and share the content of laws, regulations, and guidance and implementation documents that relate to building design. Computer programs can help building designers incorporate energy-efficient design measures into new and existing buildings, and help coordinate energy-related considerations with other competing design factors. This study reviewed current practices and technologies that may help building designers better incorporate energy efficiency into all design phases.
DTIC
Energy Conservation ; Energy Consumption ; Information Systems

20020009120 Lawrence Livermore National Lab. , Livermore, CA USA

Impedance behavior of the LiMn2O4/LiPF6-DMC-EC interface during cycling

Striebel, K. A. ; Sakai, E. ; Cairns, E. J. ; Dec. 19, 2000 ; 7p ; In English

Report No.(s): DE2001-775174 ; LBNL-47224 ; No Copyright ; Avail: Department of Energy Information Bridge

Room temperature impedance measurements of the LiMn2O4/LiPF6-EC-DMC interface have been used to identify a previously unreported step in the formation of the SEI layer on this cathode. The low frequency impedance and potential of pure dense LiMn2O4 films was found to depend logarithmically on time in the end-of-discharge (EOD) state. The rate of the impedance rise decreased with Mn(3+) content. The increased impedance was removed by oxidation of the film to 4.5 V vs. Li/Li(+). The observations are consistent with a reversible disproportionation of part of the LiMn2O4 into Li2Mn2O4 and l-Mn2O4. Analyses of cyclic voltammograms and impedance spectra at intervals during constant current cycling of the LiMn2O4 films suggest that Li2Mn2O4 on the surface also plays a major role in the capacity fade.

NTIS

Impedance ; Lithium Batteries ; Cathodes ; Oxidation ; Lithium Compounds ; Manganese Oxides

20020009132 National Renewable Energy Lab. , Golden, CO USA

Four Federal Grid-Connected Photovoltaic Systems: Powering Our Nation's Capital with Solar

Plympton, P. ; Kappaz, P. ; Kroposki, B. ; Stafford, B. ; Thornton, J. ; Apr. 16, 2001 ; 9p ; In English

Report No.(s): DE2001-778918 ; NREL/CP-710-29050 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

One of the fastest growing markets for photovoltaics (PV) is the urban sector. Municipal planners have discovered that PV systems operate favorably in their urban areas, and can be aesthetically integrated into the urban landscape. The federal government has a long history of using PV in a variety of applications, but until recently few applications have been in urban environments. During the last five years, four grid-connected PV systems have been installed on federally owned or federally leased facilities in the Washington, D.C. area: (1) Earth Day Park, (2) U.S. Department of Energy Headquarters, (3) the Pentagon, and (4) Federal Energy Regulatory Commission Headquarters. This paper reviews these four urban, grid-connected systems-particularly the issues of siting, permitting, and grid interconnection.

NTIS

Photovoltaic Conversion ; Terrain ; Market Research ; Cities

20020009563 National Renewable Energy Lab. , Golden, CO USA

Thin-Film CIGS Photovoltaic Technology: Annual Technical Report-Phase II, 16 April 1999-15 April 2000

Delahoy, A. E. ; Bruns, J. ; Ruppert, A. ; Akhtar, M. ; Chen, L. ; Aug. 24, 2000 ; 30p ; In English

Report No.(s): DE2001-763520 ; NREL/SR-520-28786 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A summary of Energy Photovoltaics' Phase II work includes the following: (1) EPV has demonstrated that it can sputter a Mo back-contact capable of supporting very high efficiency cell processing. Using EPV Mo, NREL has deposited a 17.1% CIGS cell (no AR coating). EPV believes it can identify the signature of 'good' Mo. The Mo was produced on EPV's 0.43 m(sup 2) pilot-line equipment; (2) EPV has performed compound synthesis for several classes of materials, namely non-Cu precursor materials, Cu-containing materials, and ternary buffer materials. Using a ternary compound synthesized at EPV (ZIS) as an evaporation source material for the buffer layer, a Cd-free CIGS device has been produced having an efficiency of 11.5% (560 mV, 32.1 mA/cm(sup 2), FF 64.3%). The ZIS films are photoconductive, and the devices exhibit no dark-light crossover or light soaking effects; (3) EPV initiated the interest of the University of Oregon in capacitance spectroscopy of CIGS devices. An Urbach tail with characteristic energy E0 & 20meV was identified by transient photocapacitance spectroscopy; (4) Small-area CIGS devices were produced in the pilot-line system with an efficiency of 12.0% (581 mV, 30.1 mA/cm(sup 2), FF 68.7%), and in an R and D-scale system with 13.3% efficiency (569 mV, 34.1 mA/cm(sup 2), FF 68.1%); (5) An improved linear evaporation source for Cu delivery has been developed and was used for CIGS formation in the pilot-line system. The deposition width is 45 cm. This technological 'tour de force' allows EPV to build large-area CIGS systems possessing considerable flexibility. In particular, both EPV's FORNAX process and NREL's 3-stage process have been implemented on the pilot line. A CIGS thickness uniformity of 7% over a 40 cm width has been achieved; (6) A 4-head linear source assembly was designed, constructed, and is in use. Flux monitoring is practiced; (7) Large-area CIGS modules were produced with Voc's up to 36.3 V; (8) EPV has started to construct an entirely new CIGS pilot line for scale-up and limited manufacturing purposes. The coating width will be 65 cm; (9) The company's analytical capabilities are currently being upgraded with the installation of ICP and SEM/EDS facilities.

NTIS

Thin Films ; Photovoltaic Conversion ; Photoconductivity ; Solar Cells

20020009596 Federal Energy Technology Center , Morgantown, WV USA

Nondestructive evaluation of ceramic candle filters

Chen, R. H. L. ; Kiriakidis, A. ; Sep. 01, 1999 ; 119p ; In English

Report No.(s): DE2001-780456 ; DE-FG21-97MC34160-01 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Nondestructive evaluation (NDE) techniques have been used to reduce the potential mechanical failures and to improve the reliability of a structure. Failure of a structure is usually initiated at some type of flaw in the material. NDE techniques have been developed to determine the presence of flaws larger than an acceptable size and to estimate the remaining stiffness of a damaged structure. Ceramic candle filters have been tested for use in coal-fueled gas turbine systems. They protect gas turbine components from damage due to erosion. A total of 101 candle filters were nondestructively evaluated in this study. 98 ceramic candle filters and three ceramic composite filters have been nondestructively inspected using a dynamic characterization technique. These ceramic filters include 12 unused Coors alumina/mullite, 24 unused and 15 used Schumacher-Dia-Schumalith TF-20, 25 unused and nine used Refractron 326, eight unused and three used Refractron 442T, one new Schumacher-T 10-20, and one used Schumacher-Dia-Schumalith F-40. All filters were subjected to a small excitation and the dynamic response was picked up by a piezoelectric accelerometer. The evaluation of experimental results was processed using a digital signal analysis technique including various forms of data transformation. The modal parameters for damage assessment for the unexposed (unused) vs. exposed (used) specimen were based on two vibration parameters: natural frequencies and mode shapes. Finite Element models were built for each specimen type to understand its dynamic response. Linear elastic modal analysis was performed using eight nodes, three-dimensional (3D) isotropic solid elements. Conclusions based on our study indicate that dynamic characterization is a feasible NDE technique in studying structural properties of ceramic candle filters. It has been shown that the degradation of the filters due to long working hours (or excessive back pulsing conditions and high temperature transient) could be reflected from the shift of vibration frequencies. These shifts are due to changes in structural properties such as stiffness, which are directly related to the Young's modulus of the candle filters. Further studies are necessary in implementing and verifying the applicability of dynamic NDE characterization methods for actual in-situ conditions, and in establishing a systematic testing procedure for field applications. Also investigations on the filter's natural frequency due to the effect of dust cake or due to the change of boundary conditions may provide insight as to how the filter will perform in the field.

NTIS

Nondestructive Tests ; Fluid Filters ; Ceramics ; Gas Turbine Engines

20020009597 Federal Energy Technology Center , Morgantown, WV USA

MCFC product design improvement

Apr. 30, 2000 ; 7p ; In English

Report No.(s): DE2001-780454 ; DE-FC21-95MC31184-35 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The objective of the DOE (Department of Energy) program is to advance the direct carbonate fuel cell technology to a level suitable for commercial entry. The specific objectives of the DOD's (Department of Defense) initiative on 2 MW Fuel Cell Fixed Base Power Plant are: (1) to provide a detailed engineering design, development and cost estimate of the 2 MW fuel cell fixed base dual fuel power plant for DOD applications. Installation and operational support systems will also be developed. (2) to construct a full-size MW-class dual fuel power plant simulator. These objectives are planned to be achieved in the program coordinated with the Department of Energy, which has been funding a multiyear natural gas fueled direct fuel cell power plant program (DE-FC21-95MC31184) for civilian applications. Because many DARPA (Defense Advanced Research Projects Agency) and DOE objectives are similar, the coordinated program activities are considered the most cost-effective for accomplishment of the program objectives. The DARPA/DOE joint program was launched in 1994. The DOE part of the program is expected to continue to Year 2000. The final output of this DOE program is to construct and operate a 2 MW power plant on an East Coast site. The site will be accessible to DOD energy/environmental systems base planners and logistics personnel as well as mission and policy planners to refine deployment configurations of this new power generation system for fixed base applications.

NTIS

Fuel Cell Power Plants ; Energy Technology ; Carbonates ; Energy Policy

20020009598 Federal Energy Technology Center , Morgantown, WV USA

Utility advanced turbine systems (ATS) technology readiness testing phase 3 restructured (3r)

Sep. 01, 2000 ; 11p ; In English

Report No.(s): DE2001-780452 ; DE-FC21-95MC31176-30 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Much of the 'H' technology design is based on proven, established technologies. The major technologies of the combined cycle powertrain, including the bearing designs, the evaluation methods for rotor dynamics, the compressor and turbine blading designs, and the generator field construction methods are all either direct applications of proven design technology or evolutionary refinement of existing designs. It is for these reasons that GE (General Electric) expects that the reliability of the new 'H' Class generating system will be fully commensurate with the levels associated with today's 'F' Class combined cycle power plants. With maintenance and operations performed at 'best practice' levels, the new 'H' Class plant should reach its full reliability potential of 97.0% or better.

NTIS

Compressor Blades ; Rotor Dynamics ; Turbines ; Electric Generators

20020009605 Sandia National Labs. , Albuquerque, NM USA

Formation of Random, RIE-Textured Silicon Surfaces with Reduced Reflection and Enhanced Near IR Absorption

Zaidi, S. H. ; Apr. 01, 2001 ; 28p ; In English

Report No.(s): DE2001-780311 ; SAND2001-0836 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors have developed novel metal-assisted texturing processes that have led to optically favorable surfaces for solar cells. Large area ((approximately) 200 cm(sup 2)) uniform texturing has been achieved. The physical dimensions of the chamber limited texturing of even larger wafers. Surface contamination and residual RIE-induced damage were removed by incorporation of a complete RCA clean process followed by wet-chemical etching treatments. RIE-textured solar cells with optimized profiles providing performance comparable to the random, wet-chemically etched cells have been demonstrated. A majority of the texture profiles exhibit an enhanced IQE response in the near IR region using scanning electron microscope measurements, they carried out a detailed analysis of the microstructure of random RIE-textured surfaces. The random microstructure represents a superposition of sub-(micro)m grating structures with a wide distribution of periods, depths, and profiles as determined by the SEM measurements. These structures were modeled using GSOLVER(trademark) software for periodic patterns. The enhanced IR response from random, RIE-textured surfaces is attributed to enhanced coupling of light into the transmitted diffraction orders. These obliquely propagating diffraction orders generate electron-hole pairs closer to the surface, thus, reducing bulk recombination losses relative to a non-scattering, planar surface with identical hemispherical reflection. The optimized texture and damage removal processes have been applied to large area (100--132 cm(sup 2)) multi-crystalline wafers initial results have demonstrated improved performance relative to planar, control wafers. However, the texture and solar cell fabrication processes require further optimization in the RCA clean, DRE treatments, and emitter formation in order to fully realize the benefits of the low-reflection ((approximately)1-2%) textured surfaces.

NTIS

Crystallinity ; Fabrication ; Infrared Absorption ; Near Infrared Radiation ; Silicon ; Solar Cells ; Microstructure

20020009621 National Renewable Energy Lab. , Golden, CO USA

Wind Powering America: Clean Energy for the 21st Century

Feb. 14, 2001 ; 6p ; In English

Report No.(s): DE2001-779012 ; DOE/GO-102001-1280-Rev ; NREL/BR-500-29855-Rev ; No Copyright ; Avail: Department of Energy Information Bridge

This Wind Powering America brochure provides the perspectives on the benefits of wind power from 10 U.S. citizens from different sectors of society, including ranching, utility commissioner, parent, Native American, farmer/county commissioner, business owner, and independent turbine operator. It also provides basic facts about wind power, contacts for information about wind power, and a brief description of the Wind Powering America Initiative, its goals and its benefits.

NTIS

Windpower Utilization ; USA

20020010117 Sandia National Labs. , Albuquerque, NM USA

Development of Zinc/Bromine Batteries for Load-Leveling Applications: Phase 1 Final Report

Eidler, P. ; Jul. 01, 1999 ; 91p ; In English

Report No.(s): DE2001-9466 ; SAND99-1853 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Zinc/Bromine Load-Leveling Battery Development contract (No. 40-8965) was partitioned at the outset into two phases of equal length. Phase 1 started in September 1990 and continued through December 1991. In Phase 1, zinc/bromine battery technology was to be advanced to the point that it would be clear that the technology was viable and would be an appropriate choice for electric utilities wishing to establish stationary energy-storage facilities. Criteria were established that addressed most of the concerns that had been observed in the previous development efforts. The performances of 8-cell and 100-cell laboratory batteries demonstrated that the criteria were met or exceeded. In Phase 2, 100-kWh batteries will be built and demonstrated, and a conceptual design for a load-leveling plant will be presented. At the same time, work will continue to identify improved assembly techniques and operating conditions. This report details the results of the efforts carried out in Phase 1. The highlights are: (1) Four 1-kWh stacks achieved over 100 cycles, One l-kWh stack achieved over 200 cycles, One 1-kWh stack achieved over 300 cycles; (2) Less than 10% degradation in performance occurred in the four stacks that achieved over 100 cycles; (3) The battery used for the zinc loading investigation exhibited virtually no loss in performance for loadings up to 130 mAh/cm(sup 2); (4) Charge-current densities of 50 ma/cm(sup 2) have been achieved in minicells; (5) Fourteen consecutive no-strip cycles have been conducted on the stack with 300+ cycles; (6) A mass and energy balance spreadsheet that describes battery operation was completed; (7) Materials research has continued to provide improvements in the electrode, activation layer, and separator; and (8) A battery made of two 50-cell stacks (15 kWh) was produced and delivered to Sandia National Laboratories (SNL) for testing. The most critical development was the ability to assemble a battery stack that remained leak free. The task of sealing the battery stack using vibration welding has undergone significant improvement resulting in a viable production process. Through several design iterations, a solid technology base for larger battery stack designs was established. Internal stack stresses can now be modeled, in addition to fluid velocity and fluid pressure distribution, through the use of a finite element analysis computer program. Additionally, the Johnson Controls Battery Group, Inc. (JCBGI) proprietary FORTRAN model has been improved significantly, enabling accurate performance predictions. This modeling was used to improve the integrity and performance of the battery stacks, and should be instrumental in reducing the turnaround time from concept to assembly.

NTIS

Energy Storage ; Computer Programs ; Current Density ; Electric Batteries

20020010211 Bonneville Power Administration , Portland, OR USA

Evaluate status of pacific lamprey in the Clearwater River drainage, Idaho: annual report 2000

Cochnauer, T. ; Claire, C. ; Jan. 01, 2000 ; 28p ; In English

Report No.(s): DE2001-781908 ; DOE/BP-00000090-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Recent decline of Pacific lamprey Lampetra tridentata adult migrants to the Snake River drainage has focused attention on the species. Adult returns in 1995-1999 were more than ten magnitudes less than returns in the early 1960's. Human activities in the Snake River and Clearwater River drainages have altered ecosystem habitat in the last 100 years and likely the productive potential of Pacific lamprey habitat. Logging, stream impoundment, road construction, grazing, mining, and community development have dominated habitat alteration in the Clearwater River system and Snake River corridor. Hydroelectric projects in the Snake River corridor impact juvenile Pacific lamprey outmigrants and returning adults. Juvenile lamprey outmigrants potentially pass through turbines, turbine bypass and collection systems, and spillway structures at lower Snake River hydroelectric dams. Clearwater River drainage hydroelectric facilities including the Pacific Power and Light Dam on the Clearwater River in Lewiston, Idaho, impacted Pacific lamprey populations, however, the degree of impact is unknown (1920's-early 1970's). Hydroelectric dam construction (Harpster Dam) on the South Fork of the Clearwater River resulted in obstructed salmonid passage in the mid-1900's. Habitat alterations in the Snake River basin and Clearwater River drainage have had numerous negative effects on salmon Oncorhynchus spp. and steelhead trout O. mykiss populations (wild fish), but the magnitude of impacts on lamprey productivity and survival is unknown. Thorough understanding of Pacific lamprey habitat use and life history processes is needed to facilitate management and restoration of the species. Through Bonneville Power Administration support, the Idaho Department of Fish and Game began investigation into the status of Pacific lamprey populations in Idaho's Clearwater River drainage in 2000. Trapping, electrofishing, and spawning ground redd surveys were used to determine where Pacific lamprey persist in the South Fork of the Clearwater River drainage. Habitat surveys evaluating juvenile habitat use were primarily conducted in the Red River subbasin. Red River subbasin resource manipulations have resulted in elevated stream sediment, stream destabilization, riparian canopy reduction, and water temperature extremes. A total of 262 juvenile Pacific lamprey were captured during the 2000 field season. Sampling in the Red River drainage yielded the largest number of Pacific

lamprey juveniles. Preliminary findings indicate Pacific lamprey juveniles, while present, are not numerous or widely distributed. Age of juveniles captured was determined using length frequency.
NTIS
Dams ; Drainage ; Ecosystems ; Habitats ; Idaho ; Hydroelectricity

20020010219 Reis and Associates , Prescott Valley, AZ USA
New Heat Flow Models in Fractured Geothermal Reservoirs. Final Report
Reis, J. ; Mar. 31, 2001 ; 158p ; In English
Report No.(s): DE2001-782011 ; DOE/ID/13746 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This study developed new analytical models for predicting the temperature distribution within a geothermal reservoir following reinjection of water having a temperature different from that of the reservoir. The study consisted of two parts: developing new analytical models for the heat conduction rate into multi-dimensional, parallelepiped matrix blocks and developing new analytical models for the advance of the thermal front through the geothermal reservoir. In the first part of the study, a number of semi-empirical models for the multi-dimensional heat conduction were developed to overcome the limitations to the exact solutions. The exact solution based on a similarity solution to the heat diffusion equation is the best model for the early-time period, but fails when thermal conduction fronts from opposing sides of the matrix block merge. The exact solution based on an infinite series solution was found not to be useful because it required tens of thousands of terms to be include d for accuracy. The best overall model for the entire conduction time was a semi-empirical model based on an exponential conduction rate. In the second part of the study, the early-time period exact solution based on similarity methods and the semi-empirical exponential model were used to develop new analytical models for the location of the thermal front within the reservoir during injection. These equations were based on an energy balance on the water in the fractured network. These convective models allowed for both dual and triple porosity reservoirs, i.e., one or two independent matrix domains. A method for incorporating measured fracture spacing distributions into these convective models was developed. It was found that there were only minor differences in the predicted areal extent of the heated zone between the dual and triple porosity models. Because of its simplicity, the dual porosity model is recommended. These new models can be used for preliminary reservoir studies. Although they are not as accurate as numerical simulators, they are simple, easy and inexpensive to use. These new models can be used to get general information about reservoir behavior before committing to the considerable greater expense of numerical simulation.
NTIS
Prediction Analysis Techniques ; Mathematical Models ; Heat Transmission ; Convection ; Fluid Flow ; Conductive Heat Transfer ; Geotemperature

20020010234 Sandia National Labs. , Albuquerque, NM USA
Fatigue Analysis of Wind Turbines
Sutherland, H. J. ; Jun. 01, 1999 ; 147p ; In English
Report No.(s): DE2001-9460 ; SAND99-0089 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Modern wind turbines are fatigue critical machines that are typically used to produce electrical power from the wind. Operational experiences with these large rotating machines indicated that their components (primarily blades and blade joints) were failing at unexpectedly high rates, which led the wind turbine community to develop fatigue analysis capabilities for wind turbines. Our ability to analyze the fatigue behavior of wind turbine components has matured to the point that the prediction of service lifetime is becoming an essential part of the design process. In this review paper, I summarize the technology and describe the ’best practices’ for the fatigue analysis of a wind turbine component. The paper focuses on U.S. technology, but cites European references that provide important insights into the fatigue analysis of wind turbines.
NTIS
Forecasting ; Wind Turbines ; Rotation

20020010235 Sandia National Labs. , Albuquerque, NM USA
Design, Manufacture and Testing of A Bend-Twist D-Spar
Ong, C. H. ; Tsai, S. W. ; Jun. 01, 1999 ; 117p ; In English
Report No.(s): DE2001-9461 ; SAND99-1324 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Studies have indicated that an adaptive wind turbine blade design can significantly enhance the performance of the wind turbine blade on energy capture and load mitigation. In order to realize the potential benefits of aeroelastic tailoring, a bend-twist D-spar, which is the backbone of a blade, was designed and fabricated to achieve the objectives of having maximum bend-twist coupling and fulfilling desirable structural properties (031 & GJ). Two bend-twist D-spars, a hybrid of glass and carbon fibers and an all-carbon D-spar, were fabricated using a bladder process. One of the D-spars, the hybrid D-spar, was subjected to a

cantilever static test and modal testing. Various parameters such as materials, laminate schedule, thickness and internal rib were examined in designing a bend-twist D-spar. The fabrication tooling, the lay-up process and the joint design for two symmetric clamshells are described in this report. Finally, comparisons between the experimental test results and numerical results are presented. The comparisons indicate that the numerical analysis (static and modal analysis) agrees well with test results.
NTIS
Carbon Fibers ; Wind Turbines ; Design ; Aeroelasticity ; Glass Fibers

20020010237 Sandia National Labs. , Albuquerque, NM USA
Sandia National Laboratories Electrochemical Storage System Abuse Test Procedure Manual
Unkelhaeuser, T. ; Smallwood, D. ; Jul. 01, 1999 ; 33p ; In English
Report No.(s): DE2001-9463 ; SAND99-0497 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The series of tests described in this report are intended to simulate actual use and abuse conditions and internally initiated failures that may be experienced in electrochemical storage systems (ECSS). These tests were derived from Failure Mode and Effect Analysis, user input, and historical abuse testing. The tests are to provide a common framework for various ECSS technologies. The primary purpose of testing is to gather response information to external/internal inputs. Some tests and/or measurements may not be required for some ECSS technologies and designs if it is demonstrated that a test is not applicable, and the measurements yield no useful information.
NTIS
Manuals ; Electrochemical Cells ; Evaluation ; Failure Modes

20020010378 Lawrence Livermore National Lab. , Livermore, CA USA
Vehicular hydrogen storage using lightweight tanks (regenerative fuel cell systems)
Mitlitsky, F. ; Myers, B. ; Weisberg, A. H. ; Jun. 01, 1999 ; 28p ; In English
Report No.(s): DE2001-9597 ; UCRL-JC-134540 ; No Copyright ; Avail: Department of Energy Information Bridge
Energy storage systems with extremely high specific energy (greater than 400 Wh/kg) have been designed that use lightweight tankage to contain the gases generated by reversible (unitized) regenerative fuel cells (URFCs). Lawrence Livermore National Laboratory (LLNL) will leverage work for aerospace applications supported by other sponsors (including BMDO, NASA, and USAF) to develop URFC systems for transportation and utility applications. Lightweight tankage is important for primary fuel cell powered vehicles that use on-board storage of hydrogen. Lightweight pressure vessels with state-of-the-art performance factors were designed, and prototypes are being fabricated to meet the DOE 2000 goals (4000 Wh/kg, 12% hydrogen by weight, 700 Wh/liter, and $20/kWh in high volume production). These pressure vessels use technologies that are easily adopted by industrial partners. Advanced liners provide permeation barriers for gas storage and are mandrels for composite overwrap. URFCs are important to the efficient use of hydrogen as a transportation fuel and enabler of renewable energy. H(sub 2)/halogen URFCs may be advantageous for stationary applications whereas H(sub 2)/O(sub 2) or H(sub 2)/air URFCs are advantageous for vehicular applications. URFC research and development is required to improve performance (efficiency), reduce catalyst loading, understand engineering operation, and integrate systems. LLNL has the experimental equipment and advanced URFC membrane electrode assemblies (some with reduced catalyst loading) for evaluating commercial hardware (not funded by DOE in FY1999).
NTIS
Energy Storage ; Hydrogen ; Pressure Vessels ; Regenerative Fuel Cells

20020010593 Sandia National Labs. , Albuquerque, NM USA
Summary of the State of the Art of Superconducting Magnetic Energy Storage Systems, Flywheel Energy Storage Systems, and Compressed Air Energy Storage Systems
Butler, P. ; DiPietro, P. ; Johnson, L. ; Philip, J. ; Reichart, K. ; Jul. 01, 1999 ; 161p ; In English
Report No.(s): DE2001-9724 ; SAND99-1854 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report details the results of an assessment of the state-of-the-art of three energy storage technologies for stationary applications; superconducting magnetic energy storage (SMES), flywheel energy storage (FES), and compressed air energy storage (CAES). The assessment analyzed performance and economic attributes of SMES and FES systems for utility applications and carried out sensitivity studies of the analytic results to identify critical cost issues and technical needs that must be addressed to attain widespread market acceptance. Through the analysis, the study identified areas of research and development that represent potential priorities for future development activities.
NTIS
Magnetic Energy Storage ; Compressed Air ; Superconductivity ; Flywheels

20020010594 Sandia National Labs. , Albuquerque, NM USA

Photovoltaic Power for the Nanosat Project

Rose, B. H. ; Jun. 01, 1999 ; 49p ; In English

Report No.(s): DE2001-9723 ; SAND99-1503 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report describes the characteristics of photovoltaic arrays that maybe suitable for use with nanosatellite electronic systems. It includes a thorough literature search on power management and distribution systems for satellites as small as microsatellites. The major conclusion to be drawn is that it is the total system, including satellite electronic system, photovoltaic systems, peak power tracker and the power management and distribution systems which need to be optimized. An example of a peak power tracker is given, and a novel series connected boost unit is described which might allow the system voltage to be increased if enough photovoltaic panels to operate the systems in real time is impractical. Finally, it is recommended that the development effort be oriented and expanded to include a peak power tracker and other power management and distribution systems.

NTIS

Photovoltaic Cells ; Electric Potential ; Real Time Operation ; Solar Arrays

20020010596 Sandia National Labs. , Albuquerque, NM USA

Lessons Learned from the Puerto Rico Battery Energy Storage System

Boyes, J. D. ; De Anda, M. F. ; Torres, W. ; Aug. 11, 1999 ; 9p ; In English

Report No.(s): DE2001-9707 ; SAND99-2094C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Puerto Rico Electric Power Authority (PREPA) installed a battery energy storage system in 1994 at a substation near San Juan, Puerto Rico. It was patterned after two other large energy storage systems operated by electric utilities in California and Germany. The Puerto Rico facility is presently the largest operating battery storage system in the world and has successfully provided frequency control, voltage regulation, and spinning reseme to the Caribbean island. The system further proved its usefulness to the PREPA network in the fall of 1998 in the aftermath of Hurricane Georges. However, the facility has suffered accelerated cell failures in the past year and PREPA is committed to restoring the plant to full capacity. This represents the first repowering of a large utility battery facility. PREPA and its vendors and contractors learned many valuable lessons during all phases of project development and operation, which are summarized in this paper.

NTIS

Energy Storage ; Electric Batteries ; Voltage Regulators

20020010604 Sandia National Labs. , Albuquerque, NM USA

Design of a High-Throughput Plasma-Processing System

Darkazalli, G. ; Matthei, K. ; Ruby, D. S. ; Jul. 20, 1999 ; 8p ; In English

Report No.(s): DE2001-9626 ; SAND99-1896C ; No Copyright ; Avail: Department of Energy Information Bridge

Sandia National Laboratories has demonstrated significant performance gains in crystalline silicon solar cell technology through the use of plasma-processing for the deposition of silicon nitride by Plasma Enhanced Chemical Vapor Deposition (PECVD), plasma-hydrogenation of the nitride layer, and reactive-ion etching of the silicon surface prior to the deposition to decrease the reflectivity of the surface. One of the major problems of implementing plasma processing into a cell production line is the batch configuration and/or low throughput of the systems currently available. This report describes the concept of a new in-line plasma processing system that could meet the industrial requirements for a high-throughput and cost effective solution for mass production of solar cells.

NTIS

Plasmas (Physics) ; Silicon Nitrides ; Vapor Deposition

20020010609 Sandia National Labs. , Albuquerque, NM USA

Plasma Texturing of Silicon Solar Cells

Narayanan, M. ; Roy, M. ; Ruby, D. S. ; Zaidi, S. H. ; Jul. 20, 1999 ; 6p ; In English

Report No.(s): DE2001-9610 ; SAND99-1893C ; No Copyright ; Avail: Department of Energy Information Bridge

Surface texture promotes enhanced light absorption in Si solar cells. The quality of lower cost multicrystalline-silicon (mc-Si) has increased to the point that its cell performance is close to that of single c-Si cells, with the major difference resulting from the inability to texture mc-Si affordably. This has reduced the cost-per-watt advantage of mc-Si. Surface texturing aimed at enhanced absorption in Si has been historically obtained by creating multimicrometer-sized pyramids using anisotropic wet etchants on single-crystalline silicon that take advantage of its single crystalline orientation. Since the surface feature sizes are several times the length of the incident solar wavelengths involved, the optical analysis of the reflected and absorbed light can

be understood using geometrical optics. Geometrical textures reduce reflection and improve absorption by double-bounce and oblique light coupling into the semiconductor. However, geometrical texturing suffers from several disadvantages that limit its effectiveness. Some of these are listed below: (1) Wet-chemical anisotropic etching used to form random pyramids on <100> crystal orientation is not effective in the texturing of low-cost multicrystalline wafers, (2) Anti-reflection films deposited on random features to reduce reflection have a resonant structure limiting their effectiveness to a narrow range of angles and wavelengths. Various forms of surface texturing have been applied to mc-Si in research, including laser-structuring, mechanical grinding, porous-Si etching, and photolithographically defined etching. However, these may be too costly to ever be used in large-scale production. A Japanese firm has reported the development of an RIE process using Cl2 gas, which textures multiple wafers per batch, making it attractive for mass-production. Using this process, they have produced a 17.1% efficient 225-sqare cm mc-Si cell, which is the highest efficiency mc-Si cell of its size ever reported. This proves that RIE texturing does not cause performance-limiting damage to Si cells. In this paper, we will discuss an RIE texturing process that avoids the use of toxic and corrosive Cl2 gas.
NTIS
Silicon ; Solar Cells ; Textures ; Electromagnetic Absorption

20020010623 National Renewable Energy Lab. , Golden, CO USA
Proceedings of the 1998 Photovoltaic Performance and Reliability Workshop, Cocoa Beach, Florida, November 3-5, 1998
Kroposki, B. ; Dec. 17, 1998 ; 420p ; In English
Report No.(s): DE2001-9545 ; NREL/BK-520-25850 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This proceedings is the compilation of all papers presented at the 11th PV Performance and Reliability Workshop held at the Doubletree Hotel in Cocoa Beach, Florida, on November 3-5, 1998. The workshop was hosted by the Florida Solar Energy Center. This year's workshop included presentations from 29 speakers and had 110 attendees.
NTIS
Solar Energy ; Photovoltaic Conversion ; Energy Conversion Efficiency

20020011154 Lawrence Livermore National Lab. , Livermore, CA USA
Applications and development of high pressure PEM systems
Leonida, A. ; Militsky, F. ; Myers, B. ; Weisberg, A. H. ; Jun. 01, 1999 ; 18p ; In English
Report No.(s): DE2001-9866 ; UCRL-JC-134539 ; No Copyright ; Avail: Department of Energy Information Bridge
Many portable fuel cell applications require high pressure hydrogen, oxygen, or both. High pressure PEM systems that were originally designed and developed primarily for aerospace applications are being redesigned for use in portable applications. Historically, applications can be broken into weight sensitive and weight insensitive cell stack designs. Variants of the weight sensitive designs have been considered to refill oxygen bottles for space suits, to provide oxygen for space shuttle, to provide oxygen and/or reboost propellants to the space station, and to recharge oxygen bottles for commercial aviation. A long operating history has been generated for weight insensitive designs that serve as oxygen generators for submarines. Exciting future vehicle concepts and portable applications are enabled by carefully designing lightweight stacks which do not require additional pressure containment. These include high altitude long endurance solar rechargeable aircraft and airships, water refuelable spacecraft, and a variety of field portable systems. High pressure electrolyzers can refill compressed hydrogen storage tanks for fuel cell powered vehicles or portable fuel cells. Hamilton Standard has demonstrated many high pressure PEM water electrolyzer designs for a variety of applications. Electrolyzers with operational pressures up to 3000 psi (20.7 MPa) are currently used for US Navy submarine oxygen generators. An aerospace version has been demonstrated in the Integrated Propulsion Test Article (IPTA) program. Electrolyzers with operational pressures up to 6000 psi (41.4 MPa) have also been demonstrated in the High Pressure Oxygen Recharge System (HPORS). Onboard oxygen generator systems (OBOGS) that generate up to 2000 psi (13.8 MPa) oxygen and refill breathable oxygen tanks for commercial aviation have been designed and successfully demonstrated. Other hardware applications that require high pressure PEM devices are related to these proven applications.
NTIS
Fuel Cells ; High Pressure Oxygen ; Hydrogen Fuels ; High Pressure

20020011217 Lawrence Livermore National Lab. , Livermore, CA USA
Novel thin film solid oxide fuel cell for microscale energy conversion
Jankowiski, A. F. ; Morse, J. D. ; May 01, 1999 ; 6p ; In English
Report No.(s): DE2001-9662 ; UCRL-JC-133146 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A novel approach for the fabrication and assembly of a solid oxide fuel cell system is described which enables effective scaling of the fuel delivery, manifold, and fuel cell stack components for applications in miniature and microscale energy conversion. Electrode materials for solid oxide fuel cells are developed using sputter deposition techniques. A thin film anode is formed by codeposition of nickel and yttria-stabilized zirconia (YSZ). This approach provides a mixed conducting interfacial layer between the nickel electrode and electrolyte layer. Similarly, a thin film cathode is formed by co-deposition of silver and yttria-stabilized zirconia. Additionally, sputter deposition of yttria-stabilized zirconia thin film electrolyte enables high quality, continuous films to be formed having thickness on the order of 1-2 micrometers. This will effectively lower the temperature of operation for the fuel cell stack significantly below the traditional ranges at which solid oxide electrolyte systems are operated (600-1000 C), thereby rendering this fuel cell system suitable for miniaturization. Scaling towards miniaturization is accomplished by utilizing novel micromachining approaches which allow manifold channels and fuel delivery system to be formed within the substrate which the thin film fuel cell stack is fabricated on, thereby circumventing the need for bulky manifold components which are not directly scalable.
NTIS
Deposition ; Electrolytes ; Energy Conversion ; Solid Oxide Fuel Cells ; Yttria-Stabilized Zirconia

20020011370 Lawrence Livermore National Lab. , Livermore, CA USA
Reversible (unitized) PEM fuel cell devices
Mitlitsky, F. ; Myers, B. ; Smith, W. F. ; Molter, T. M. ; Weisberg, A. H. ; Jun. 01, 1999 ; 16p ; In English
Report No.(s): DE2001-9867 ; UCRL-JC-134538 ; No Copyright ; Avail: Department of Energy Information Bridge
Regenerative fuel cells (RFCs) are enabling for many weight-critical portable applications, since the packaged specific energy (greater than 400 Wh/kg) of properly designed lightweight RFC systems is several-fold higher than that of the lightest weight rechargeable batteries. RFC systems can be rapidly refueled (like primary fuel cells), or can be electrically recharged (like secondary batteries) if a refueling infrastructure is not conveniently available. Higher energy capacity systems with higher performance, reduced weight, and freedom from fueling infrastructure are the features that RFCs promise for portable applications. Reversible proton exchange membrane (PEM) fuel cells, also known as unitized regenerative fuel cells (URFCs), or reversible regenerative fuel cells, are RFC systems which use reversible PEM cells, where each cell is capable of operating both as a fuel cell and as an electrolyzer. URFCs further economize portable device weight, volume, and complexity by combining the functions of fuel cells and electrolyzers in the same hardware, generally without any system performance or efficiency reduction. URFCs are being made in many forms, some of which are already small enough to be portable. Lawrence Livermore National Laboratory (LLNL) has worked with industrial partners to design, develop, and demonstrate high performance and high cycle life URFC systems. LLNL is also working with industrial partners to develop breakthroughs in lightweight pressure vessels that are necessary for URFC systems to achieve the specific energy advantages over rechargeable batteries. Proton Energy Systems, Inc. (Proton) is concurrently developing and commercializing URFC systems (UNIGEN product line), in addition to PEM electrolyzer systems (HOGEN product line), and primary PEM fuel cell systems. LLNL is constructing demonstration URFC units in order to persuade potential sponsors, often in their own conference rooms, that advanced applications based on URFC s are feasible. Safety and logistics force these URFC demonstration units to be small, transportable, and easily set up, hence they already prove the viability of URFC systems for portable applications.
NTIS
Regenerative Fuel Cells ; Fuel Cells ; Proton Energy

20020011372 National Renewable Energy Lab. , Golden, CO USA
Status of the US Department of Energy/National Renewable Energy Laboratory Avian Research Program
Sinclair, K. C. ; Jun. 21, 1999 ; 13p ; In English
Report No.(s): DE2001-9818 ; NREL/CP-500-26709 ; No Copyright ; Avail: Department of Energy Information Bridge
As wind energy development expands, concern over possible negative impacts of wind farms on birds remains an issue to be addressed. The concerns are twofold: (1) possible litigation over the killing of even one bird if it is protected by the Migratory Bird Treaty Act and/or the Endangered Species Act, and (2) the effect of avian mortality on bird populations. to properly address these concerns, the National Renewable Energy Laboratory (NREL), working collaboratively with stakeholders including utilities, environmental groups, consumer advocates, regulators, government officials, and the wind industry, supports an avian-wind interaction research program. The objectives of the program are to conduct and sponsor scientifically based research that will ultimately lead to the reduction of avian fatality due to wind energy development throughout the USA. The approach for this program involves cooperating with the various stakeholders to study the impacts of current wind plants on avian populations, developing approaches to siting wind plants that avoid avian problems in the future, and investigating methods for

reducing or eliminating impacts on birds due to the development of wind energy. This paper summarizes the research projects currently supported by NREL.
NTIS
Renewable Energy ; Research Projects ; Endangered Species ; Legal Liability

20020011377 Pacific Northwest National Lab. , Richland, WA USA
Energy R and D in the USA
Dooley, J. J. ; Aug. 09, 1999 ; 22p ; In English
Report No.(s): DE2001-9517 ; PNNL-12188 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In 1997, the US public and private sectors invested $205.7 billion in R&D. Private sector investments in R&D increased 34% between 1990 and 1997; over the same period the federal government decreased its expenditures by 15% in real terms. Projections of outyear federal budgets indicate the federal government will continue to reduce its investments in R&D for the foreseeable future. Defense R&D continues to be the largest area of concentration for federal government's R&D investments, with defense R&D accounting for 54% of all federal R&D outlays in 1998. Defense R&D is funded at a level which is there times higher than health R&D. Health R&D has experienced the largest inflation-adjusted increases of any federal R&D program, up 21% in real terms since 1990. US national (i.e., public and private) investments in energy R&D currently stand at a 23-year low of $4.4 billion in 1996. Federal support for energy R&D has declined 22% in real terms between 1990 and 1996. Federal energy R&D investments are also undergoing changes in priority. Fossil energy R&D programs are at the beginning of a potentially significant change away from 'clean coal' technology development programs and towards more fundamental research on ways to decarbonize fossil fuels and sequester carbon dioxide. The federal nuclear energy R&D program has restarted (at a modest level) research to develop new reactor concepts after many years of no federal research in this area. The USA has withdrawn from the ITER project, calling into question the viability of this international fusion energy program. Renewable energy and energy efficiency R&D programs continue to be the only consistent areas of growth in the federal energy R&D budget.
NTIS
Research and Development ; Federal Budgets ; Climate Change ; Energy Conservation

20020011716 Pacific Northwest National Lab. , Richland, WA USA
Energy R and D in Japan
Dooley, J. J. ; Aug. 09, 1999 ; 35p ; In English
Report No.(s): DE2001-9518 ; PNNL-12214 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In 1997, the public and private sectors in Japan invested $90.3 billion in R&D. Japan is the second largest supporter of R&D after the USA. A very large percentage (79.4%) of all R&D in Japan is supported by the private sector. The prolonged economic recession that has plagued the Japanese economy for most of the 1990s has significantly reduced the scale of the Japanese R&D effort compared to what it would have been had the economy been more robust. The Japanese government has recently attempted to bring the economy out of this recession through the use of economic stimulus packages. These stimulus packages have contained significant new funding for R&D, although it is apparent that much of the funding is going to R&D programs and R&D construction projects with very near tern payoff and not to the support of longer term R&D. In 1998, the Japanese government devoted 13.7% of all public R&D funds to the support of energy R&D. The priority accorded to energy R&D in Japan is significantly higher than in any other industrialized nation. The Japanese energy R&D program, which was funded at $2.5 billion in 1997, is overwhelmingly focused on nuclear energy R&D. Nuclear energy R&D (fission and fision) accounts for 75% of the total national energy R&D budget. The fission energy R&D effort has decreased nearly 24% since 1996 as the government attempts to refocus this program in the face of growing public opposition to the Japanese government's efforts to expand the nuclear power program. Energy efficiency R&D (8% of the total national energy R&D budget) and renewable energy R&D receive relatively modest support from the Japanese government.
NTIS
Research and Development ; Energy Conservation ; Renewable Energy

20020011870 Helsinki Univ. of Technology , Dept. of Engineering Physics and Mathematics , Espoo Finland
Advanced Energy Systems ***Annual Report , 2000***
May 2001 ; 84p ; In English
Report No.(s): PB2002-100327 ; TKK-F-C191 ; Copyright ; Avail: National Technical Information Service (NTIS)
Contents include the following: Introduction: Laboratory Staff; Research (New and Renewable Energy Systems, Fusion and Plasma Physics, Radiation Physics and Nuclear Engineering, Laser Physics and Applications); Teaching Activities: (Academic

degrees and theses, Course selection); Publications: Scientific Visits and Professional Activities (Visitors to the laboratory, Visits and activities of the staff).
NTIS
Energy Storage ; Laser Applications ; Reactor Technology ; Research and Development ; Renewable Energy

20020012246 Sandia National Labs. , Albuquerque, NM USA
Evaluation of Fiber Separators for Use in Thermal Batteries
Guidotti, ; Reinhardt, ; Sep. 08, 1999 ; 11p ; In English
Report No.(s): DE2001-13073 ; SAND99-1705C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Fiberglass tape and borosilicate filter discs impregnated with molten LiCL-/ KCl eutectic were examined for potential use as separators for high-temperature LiSi/LiCL-KCl thermal batteries. Test discs were punched from these materials and evaluated at 4000C in single cells at a steady-state current of 63 mA/cmz. The performance generally improved with electrolyte loading for most of the materials. Better results were obtained with the filter discs than with the tape. The best overall results were obtained with Whatman GF/A discs. Active lives for cells with these separators were about 85DG/0 of the standard cells with pressed-powder separators. More work with other materials and electrolytes over a wider temperature range is underway, along with 5-cell-battery tests.
NTIS
Thermal Batteries ; Glass Fibers ; Borosilicate Glass ; Separators

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20020005966 Federal Energy Technology Center , Morgantown, WV USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM) ***Quarterly Report , 3 Oct. 1999 - 1 Jan. 2000***
Patch, K. D. ; Apr. 28, 2000 ; 10p ; In English
Report No.(s): DE2001-772478 ; DE-AR26-98FT40365-05 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020005967 Los Alamos National Lab. , NM USA
Multiscale modeling of air flow in salt lake city and the surrounding region
Brown, M. ; Jan. 01, 2001 ; 15p ; In English
Report No.(s): DE2001-773886 ; LA-UR-01-509 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A general overview is given of a modeling effort to simulate the fate and transport of a tracer within the downtown core of Salt Lake City and beyond into the Salt Lake Basin. The problem crosses three significant scales where different physics are predominant: atmospheric mesoscale, city scale, and building scale. Three different computational fluid dynamics models were used, each with strengths at particular spatial and temporal scales. We show preliminary results and discuss what we believe to be the relevant phenomenon one must model as one crosses from atmospheric scale to engineering scale flow problems. We also describe our model validation efforts, including wind-tunnel and tow-tank experiments and a recently completed urban field experiment.
NTIS
Air Flow ; Mesoscale Phenomena ; Computational Fluid Dynamics ; Cities ; Wind Tunnel Models

20020005968 Federal Energy Technology Center , Morgantown, WV USA

Hemispheric center for environmental technology. Monthly Progress Report, January 2000

Ebadian, M. A. ; Jan. 31, 2000 ; 94p ; In English

Report No.(s): DE2001-772526 ; DE-FG01-95EW55094-76 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Online Measurement of Decontamination project team received a commitment for a demonstration in May from the Sacramento (California) Municipal Utility District (SMUD) Rancho Seco site. Since this site is a member of the DOE Commercial Utilities Consortium, the demonstration will fulfill the DOE and commercial technology demonstration requirements. Discussion on deployment of the Integrated Vertical and Overhead Decontamination (IVOD) System at Rancho Seco was conducted; date for deployment tentatively scheduled for early spring. Based upon fictional requirements from SRS for a shiny monitor in a high-level waste tank, FIU-HCET developed and delivered a draft slurry monitor design and draft test plan. Experiments measuring slurry settling time for SRS slurry simulant at 10 wt% have been completed on FIU-HCET'S flow loop with SRS dip. The completed design package of the test mockup for evaluating Non-Intrusive Location of Buried Items Technologies was sent to Fluor Fernald and the Operating Engineers National Hazmat Program for review. Comments are due at the end of January. Preliminary experiments to determine size distribution of aerosols generated during metal cutting were performed. A 1/4-inch-thick iron plate was cut using a plasma arc torch, and the size distribution of airborne particles was measured using a multistage impactor. Per request of DOE-Ohio, FIU-HCET participated in a weeklong value engineering study for the characterization, decontamination, and dismantlement of their critical path facility.

NTIS

Aerosols ; Air Pollution ; Plasmas (Physics) ; Size Distribution

20020006065 NASA Ames Research Center , Moffett Field, CA USA

Comparison of the Dispersion of the Mt. Pinatubo and El Chichon Stratospheric Aerosol Clouds

Young, R. E. , NASA Ames Research Center , USA ; Houben, H. , Space Physics Research Inst. , USA ; [1994] ; 1p ; In English ; 1994 Fall American Geophysical Union Meeting , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Insights into stratospheric transport and the climatic effects of large volcanic eruptions can be obtained by studying the dispersion of two of the largest volcanic eruptions this century, Mt. Pinatubo and El Chichon. Although both eruptions were located between 15 and 20 N latitude, and occurred either in spring or early summer (April vs June), the two volcanic clouds evolved differently in terms of dispersion of the volcanic aerosols. The El Chichon cloud stayed essentially confined to between 30 N and the equator until fall season following the eruption, whereas the Mt. Pinatubo cloud spread more rapidly into the southern hemisphere. Three dimensional stratospheric interactive tracer simulations for the particular years of the eruptions are reported. Radiative heating of the volcanic clouds due to upwelling IR radiation from the troposphere is important for understanding the dispersion of the volcanic aerosols, especially for Mt. Pinatubo. However, radiative heating alone does not explain the qualitative difference in meridional dispersion of the two volcanic clouds. The rate at which the aerosol clouds are sheared apart by wind shear limits the effectiveness of the radiative heating in producing meridional dispersion, and the wind shear is a function of the particular year of each eruption.

Author

Aerosols ; Clouds (Meteorology) ; Stratosphere ; Volcanoes ; Troposphere

20020006094 NASA Goddard Space Flight Center , Greenbelt, MD USA

Climate Change in the US: Potential Consequences for Human Health

Maynard, Nancy G. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; First University of Wyoming Global Climate Change Workshop , 16-17 Jul. 2001 , Laramie, WY , USA ; Sponsored by Wyoming Univ. , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The U.S. National Assessment identified five major areas of consequences of climate change in the USA: temperature-related illnesses and deaths, health effects related to extreme weather events, air pollution-related health effects, water- and food-borne diseases, and insect-, tick-, and rodent-borne diseases. The U.S. National Assessment final conclusions about these potential health effects will be described. In addition, a summary of some of the new tools for studying human health aspects of climate change as well as environment-health linkages through remotely sensed data and observations will be provided.

Author

Climate Change ; Public Health

20020006167 Department of Agriculture , Systems Research Lab. , Beltsville, MD USA
Interactions of CO2 with temperature and other climate variables: Response of vegetation ***Final Report***
Knipling, E. B. ; Feb. 28, 1995 ; 61p ; In English
Report No.(s): DE2001-6635 ; No Copyright ; Avail: Department of Energy Information Bridge
The overall objectives of this project were: (1) to examine experimentally, for major crop species, the interacting effects of CO(sub 2) concentration, temperature, and water availability on plant growth and development, (2) to model these interactions, and (3) to continue developing physiologically-based mechanistic models for predicting crop response to increased CO(sub 2) concentration and future global climate change. to meet these objectives, controlled-environment studies were conducted on cotton, lemon, rice, and soybean and a long-term open-top chamber study was continued on orange. Much progress was made on development of plant growth models for cotton, wheat, rice, and soybean. In addition, there were two special modeling efforts which have the potential for contributing to all of the crop models. These efforts are concerned with modeling root growth and physical and chemical processes in soil and with modeling the effect of stomatal aperture on photosynthesis and transpiration rates as a function of CO(sub 2) concentration, temperature, and vapor pressure deficit. The root growth and soil process modeling is important because it enables us to estimate the water available to the plant. The modeling of effects of stomatal aperture on photosynthesis and transpiration rates enables them to estimate dry weight gain and water use by the plant. These are both important components of the interaction of CO(sub 2) concentration with temperature and water availability. The work on stomatal aperture, photosynthesis, and transpiration has the added benefit of allowing us to improve predictions of energy partitioning by the terrestrial biosphere. The lack of realistic energy partitioning is a serious deficiency of the present general circulation models which are used to predict how climate will change. An additional important aspect of the rice experiments is a study of methane emissions of paddy-grown (i.e., flooded) rice grown under two levels of CO(sub 2) and three temperature regimes.
NTIS
Vegetation ; Climate Change ; Carbon Dioxide ; Temperature

20020006169 East Anglia Univ. , Norwich UK
Detection of Greenhouse-Gas-Induced Climatic Change
Jones, P. D. ; Wigley, T. M. L. ; May 26, 1998 ; 57p ; In English
Report No.(s): DE2001-6615 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this report is to assemble and analyze instrumental climate data and to develop and apply climate models as a basis for (1) detecting greenhouse-gas-induced climatic change, and (2) validation of General Circulation Models.
NTIS
Greenhouse Effect ; Climate Change

20020006170 Planning Research Corp. , San Jose, CA USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM)9 ***Quarterly Report , 4 Oct. 1998 - 2 Jan. 1999***
Patch, K. D. ; Apr. 28, 2000 ; 7p ; In English
Report No.(s): DE2001-772474 ; DE-AR26-98FT40365-01 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020006171 Federal Energy Technology Center , Morgantown, WV USA
High productivity vacuum blasting system
McPhee, W. S. ; May 31, 1999 ; 75p ; In English
Report No.(s): DE2001-772473 ; DE-AR26-98FT40367-02 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of this project is to improve the productivity and lower the expense of existing vacuum blasting technology. This technology is used to remove radioactive contamination, PCBs, and lead-based paint and provides worker protection by continuously recycling the material and dust for the decontamination tasks. The proposed work would increase the cleaning rate and provide safe and cost-effective decontamination of the DOE sites. This work focuses on redesigning and improving existing vacuum blasting technology including blast head nozzles, ergonomic handling of the blast head by reducing its weight; brush-ring design, vacuum level regulator, efficiency of the dust separator, and operational control sensors. The redesign is expected to enhance the productivity and economy of the vacuum blasting system by at least 50% over current vacuum blasting systems. There are three phases in the project. Phase I consists of developing and testing mathematical models. Phase II consists of pre-prototype design and fabrication and pre-prototype unit testing. Phase III consists of prototype design and field verification testing. In phase I, mathematical models are developed and analyzed for the nozzle, blast head, wind curtain, and dust separator, first as individual devices and then combined as an integrated model. This allows study of respective airflow and design parameters. The Contractor shall, based on the results of the mathematical modeling studies, design experimental models of the components and test these models. In addition, the Contractor shall develop sensors to detect the relationship of the blast head to the blast surfaces and controls to minimize the dependency on an operators skill and judgment to obtain optimum positioning, as well as real-time characterization sensors to determine as the blast head is moving the depth to which coatings must be removed, thereby improving production and minimizing waste. In phase II, the Contractor shall design and construct a pre-prototype of the nozzle, blast head with wind curtain, sensors, and dust separator and test this system to assess the performance of the new design under controlled conditions at the contractors facility. In phase III, the Contractor shall design and construct a prototype of the High Productivity Vacuum Blasting System, based on the results of the pre-prototype design and testing performed. This unit will be a full-scale prototype and will be tested at a designated Department of Energy (DOE) facility. Based on the results, the system performance, the productivity, and the economy of the improved vacuum blasting system will be evaluated.
NTIS
Vacuum Systems ; Decontamination ; Air Pollution ; Pollution Control ; Dust Collectors

20020006254 Federal Energy Technology Center , Morgantown, WV USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM) ***Quarterly Report , 2 Jan. - 1 Apr. 2000***
Patch, K. D. ; Apr. 28, 2000 ; 9p ; In English
Report No.(s): DE2001-772479 ; DE-AR26-98FT40365-06 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020006255 Federal Energy Technology Center , Morgantown, WV USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM)9 ***Quarterly Report , 4 Jul. - 2 Oct. 1999***
Patch, K. D. ; Apr. 28, 2000 ; 9p ; In English
Report No.(s): DE2001-772477 ; DE-AR26-98FT40365-04 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated

at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020006256 Federal Energy Technology Center , Morgantown, WV USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM) ***Quarterly Report , 4 Apr. - 3 Jul. 1999***
Patch, K. D. ; Apr. 28, 2000 ; 8p ; In English
Report No.(s): DE2001-772476 ; DE-AR26-98FT40365-03 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020006257 Federal Energy Technology Center , Morgantown, WV USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM) ***Quarterly Report , 3 Jan. - 3 Apr. 1999***
Patch, K. D. ; Apr. 28, 2000 ; 8p ; In English
Report No.(s): DE2001-772475 ; DE-AR26-98FT40365-02 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Radiation Detectors ; Radioactive Isotopes ; Alpha Particles ; On-Line Systems ; Real Time Operation

20020006768 Department of Energy , National Energy Technology Lab. , Pittsburgh, PA USA
Precombustion removal of hazardous air pollutant precursors
Oct. 09, 2000 ; 619p ; In English
Report No.(s): DE2001-786568 ; AC22-95PC95154-09 ; No Copyright ; Avail: Department of Energy Information Bridge
In response to growing environmental concerns reflected in the 1990 Clean Air Act Amendment (CAAA), the USA Department of Energy (DOE) sponsored several research and development projects in late 1995 as part of an initiative entitled Advanced Environmental Control Technologies for Coal-Based Power Systems. The program provided cost-shared support for research and development projects that could accelerate the commercialization of affordable, high-efficiency, low-emission, coal-fueled electric generating technologies. Clean coal technologies developed under this program would serve as prototypes for later generations of technologies to be implemented in the industrial sector. In order to identify technologies with the greatest potential for commercial implementation, projects funded under Phase 1 of this program were subject to competitive review by DOE before being considered for continuation funding under Phase II.
NTIS
Air Pollution ; Air Quality ; Commercialization

20020006848 Department of Energy , Office of Environmental Management , Washington, DC USA
Innovative technology summary report: concrete dust suppression system
Dec. 01, 1998 ; 32p ; In English
Report No.(s): DE2001-7505 ; DOE/EM-0411 ; OST-REF-2154 ; No Copyright ; Avail: Department of Energy Information Bridge

The improved technology is a water-based dust suppression system for controlling concrete dust generated by demolition equipment, in this case a demolition ram. This demonstration was performed to assess the effectiveness of this system to (1) minimize the amount of water used to suppress potentially contaminated dust, (2) focus the water spray on the dust-generating source and (3) minimize the dust cloud generated by the demolition activity. The technology successfully reduced the water required by a factor of eight compared to the traditional (baseline) method, controlled the dust generated, and permitted a reduction in the work force. The water spray can be focused at the ram point, but it is affected by wind. Prior to the use of this dust control system, dust generated by the demolition ram was controlled manually by spraying with fire hoses (the baseline technology). The improved technology is 18% less expensive than the baseline technology for the conditions and parameters of this demonstration, however, the automated system can save up to 80% versus the baseline whenever waste water treatment costs are considered. For demolishing one high-walled room and a long slab with a total of 413 cu m (14,580 cu ft) of concrete, the savings are $105,000 (waste water treatment included). The improved technology reduced the need for water consumption and treatment by about 88% which results in most of the savings.
NTIS
Dust Collectors ; Air Pollution ; Pollution Control ; Concretes ; Contamination ; Dust

20020006855 Health Effects Inst. , Cambridge, MA USA
Metabolism of Ether Oxygenates Added to Gasoline
Hong, J. ; Wang, Y. ; Mohr, S. N. ; Bondoc, F. Y. ; Deng, C. ; May 2001 ; 116p ; In English
Report No.(s): PB2001-108680 ; HEI/RR-01/102 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

The Clean Air Act Amendments of 1990 required use of oxygenated fuels in areas that exceeded the National Ambient Air Quality Standards for carbon monoxide and in areas with very high ozone levels. Adding oxygenates, such as MTBE (methyl tert-butyl ether), to gasoline promotes more efficient combustion and reduces emission of carbon monoxide, ozone-forming hydrocarbons, and some air toxics by increasing the oxygen content of the fuel. On the other hand, some oxygenates may increase emission of toxic compounds such as formaldehyde or acetaldehyde. Increased use of MTBE in fuel in the early 1990s led to complaints of unpleasant odor, headaches, and burning of eyes and throat. After reviewing the literature, HEI (Health Effects Institute) issued a request for applications to fund research on the comparative metabolism of ether oxygenates, such as MTBE, ETBE (ethyl tert-butyl ether), and TAME (tert-amyl methyl ether). The three studies funded are presented in this Research Report.
NTIS
Physiological Effects ; Automobile Fuels ; Gasoline ; Additives ; Air Quality

20020006856 Health Effects Inst. , Cambridge, MA USA
Acute Pulmonary Effects of Ultrafine Particles in Rats and Mice
Oberdorster, G. ; Finkelstein, J. N. ; Johnston, C. ; Gelein, R. ; Cox, C. ; August 2000 ; 100p ; In English
Report No.(s): PB2001-108679 ; HEI/RR-00/096 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A02 , Microfiche

Many epidemiologic studies, carried out in diverse locations with varying levels and composition of ambient particulate matter and other air pollutants, have reported associations between small increases in the level of particulate matter and increases in daily morbidity and mortality. The strongest associations appear to be in the elderly and in individuals with cardiopulmonary conditions such as chronic obstructive pulmonary disease (COPD). However, a biological mechanism linking low-level particle exposure and pathophysiologic effects has not been established. Assessing the effects of inhaled particulate matter in appropriate animal models is critical to learning how such pollutants may exert adverse health effects. The Health Effects Institute funded the animal study described in this report to address whether and how ultrafine particles might exert effects in the airways.
NTIS
Physiological Effects ; Air Pollution ; Particulates ; Respiratory System

20020006857 Health Effects Inst. , Cambridge, MA USA
Respiratory Tract Toxicity in Rats Exposed to Mexico City Air
Moss, O. R. ; Gross, E. A. ; James, R. A. ; Janszen, D. B. ; Ross, P. W. ; March 2001 ; 42p ; In English
Report No.(s): PB2001-108678 ; HEI/RR-01/100 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Residents of southwestern Mexico City are exposed to a mixture of air pollutants (ozone, formaldehyde, acetaldehyde, particulate matter, polycyclic aromatic hydrocarbons, and other hydrocarbons) not found in other areas of the city. Pathologists have found evidence of cell damage and inflammation in nasal tissue from some residents of this highly polluted area that was not present in people living in areas of the country with cleaner air. This finding prompted HEI (Health Effects Institute) to support a collaborative study to determine whether the effects of Mexico City air on humans could be replicated in rats. If so, rats could serve as sentinels to detect the effects of air pollutants on human nasal tissue.
NTIS
Respiratory System ; Air Pollution ; Physiological Effects

20020006858 Health Effects Inst. , Cambridge, MA USA
Effects of Concentrated Ambient Particles in Rats and Hamsters: An Exploratory Study ***Topical Report***
Gordon, T. ; Nadziejko, C. ; Chen, L. C. ; Schlesinger, R. ; April 2000 ; 54p ; In English
Report No.(s): PB2001-108673 ; HEI/RR-00/093 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Particulate matter (PM) is the term used to define the complex mixture of small particles in the atmosphere. The size, chemical components (such as metal, organic, and salt content), and other physical and biological properties of these particles are highly variable from place to place and from season to season. Particle properties are also influenced by their source (which may be either natural processes or human activities such as driving vehicles) as well as by changes the particles undergo in the atmosphere. Epidemiologic studies have indicated that exposure to PM is associated with increases in morbidity and mortality, particularly in individuals with compromised cardiopulmonary function. A plausible mechanism linking particles and pathophysiologic effects has not been established, however. Thus, toxicologic studies in appropriate animal models and in humans are critical in trying to establish how PM may exert its adverse health effects. An exploratory study was conducted to test the effects of exposure to PM derived from New York City air on the rodent cardiopulmonary system.
NTIS
Physiological Effects ; Particulates ; Toxicology ; Air Pollution

20020006859 Health Effects Inst. , Cambridge, MA USA
Respiratory Epithelial Penetration and Clearance of Particle-Borne Benzo(a)pyrene ***Topical Report***
Gerde, P. ; Muggenburg, B. A. ; Lundborg, M. ; Tesfaigzi, Y. ; Dahl, A. R. ; April 2001 ; 118p ; In English
Report No.(s): PB2001-108672 ; HEI/RR-01/101 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
Exposure to diesel exhaust is a suspected risk factor for human lung cancer. The carbonaceous core of the soot particles found in diesel exhaust and the condensed organic compounds adsorbed (or bound) onto the surface of the particles are both possible contributors to this suspected risk. The extent and rate at which organic procarcinogens desorb from soot particles in the lungs after environmental and workplace exposures and the degree of metabolic activation in the lungs are also not known. We explored the relationship between a model polynuclear aromatic hydrocarbon (PAH) and a typical carrier particle by measuring the rate of release, extent of release, and metabolic gate of benzo(a)pyrene (BaP) bound onto the carbonaceous core of diesel soot after bolus aerosol exposures of the dog's peripheral lung and trachea.
NTIS
Air Pollution ; Physiological Effects ; Exhaust Gases ; Diesel Fuels ; Cancer ; Lungs ; Polycyclic Aromatic Hydrocarbons

20020006860 Health Effects Inst. , Cambridge, MA USA
Mechanisms of Morbidity and Mortality from Exposure to Ambient Air Particles ***Topical Report***
Godleski, J. J. ; Verrier, R. L. ; Koutrakis, P. ; Catalano, P. ; February 2000 ; 91p ; In English
Report No.(s): PB2001-108670 ; HEI/RR-00/091 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
The studies reported here assessed pathophysiologic mechanisms that result from exposure to concentrated ambient particles (CAPs) in animals with and without cardiopulmonary compromise. These studies were carried out to determine the biologic plausibility of epidemiologic observations of increases in particulate air pollution associated with increases in human morbidity and mortality. Dogs were exposed two at a time to CAPs or filtered air via tracheostomy for six hours per day on three consecutive days. The electrocardiogram (ECG) and breathing pattern were recorded continuously, and indicators of inflammation were also assessed. In one experimental design, normal dogs were exposed in pairs to CAPs and subsequently to filtered air or to filtered air and subsequently CAPs (the double CAPs/double sham design). Comparisons were made between the CAPs measurements and each dog's own sham responses. In another design, one dog was exposed to CAPs while the chambermate received a sham

exposure; these experiments were followed by crossover of the protocol the subsequent week (the crossover design). Comparisons were made between the CAPs exposure and both the chambermate's sham and each dog's own sham responses.
NTIS
Air Pollution ; Particles ; Physiological Effects ; Dogs

20020006868 Environmental Protection Agency , Air and Energy Engineering Research Lab. , Research Triangle Park, NC USA
Radon Prevention in the Design and Construction of Schools and Other Large Buildings. Third Printing with Addendum, June 1994
Leovic, K. W. ; Craig, A. B. ; June 1994 ; 50p ; In English
Report No.(s): PB2001-108268 ; EPA/625/R-92/016 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
It is typically easier and much less expensive to design and construct a new building with radon-resistant and/or easy-to-mitigate features, than to add these features after the building is completed and occupied. Therefore, when building in an area with the potential for elevated radon levels, architects and engineers should use a combination of radon prevention construction techniques. To determine if your building site is located in a radon-prone area, consult your EPA (Environmental Protection Agency) Regional Office or state or local radiation office. The authors recommend the following three radon prevention techniques for construction of schools and other large buildings in radon-prone areas: (1) install an active soil depressurization (ASD) system, (2) pressurize the building using the heating, ventilating, and air-conditioning (HVAC) system, and (3) seal major radon entry routes. Specific guidelines on how to incorporate these radon prevention features in the design and construction of schools and other large buildings are detailed in this manual.
NTIS
Radon ; Buildings ; Air Pollution ; Pollution Control ; Construction ; Environmental Engineering

20020006879 Science Applications International Corp. , McLean, VA USA
Technical Background Document on the Efficiency and Effectiveness of CKD Landfill Design Elements
Jul. 18, 1997 ; 70p ; In English
Report No.(s): PB2001-107990 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Section 3001(b)(3)(A)(iii) of the Resource Conservation and Recovery Act (RCRA) excludes cement kiln dust (CKD) from regulation under Subtitle C of RCRA, pending completion of a Report to Congress and a determination by EPA (Environmental Protection Agency) either to promulgate regulations under Subtitle C or that such regulations are unwarranted. EPA completed its Report to Congress in December 1993 and issued its determination on cement kiln dust in February 1995. EPA's February 1995 determination concluded that additional control of CKD is warranted to protect the public from human health risks and to prevent environmental damages resulting from current CKD disposal practices. Citing damages to ground water and health risks from inhalation of airborne CKD and ingestion via food chain pathways, EPA determined that it will use its existing authority under the Clean Air Act, Clean Water Act, and RCRA to address potential contaminant releases from CKD.
NTIS
Ground Water ; Metals ; Alkalinity ; Adsorptivity ; Transport Properties

20020006941 Health Effects Inst. , Cambridge, MA USA
Association of Particulate Matter Components with Daily Mortality and Morbidity in Urban Populations
Lippmann, M. ; Ito, K. ; Nadas, A. ; Burnett, R. T. ; August 2000 ; 96p ; In English
Report No.(s): PB2001-108675 ; HEI/RR-00/095 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
Although evidence from epidemiologic studies supports an association between particulate matter (PM) and adverse health outcomes, many questions remain about how PM may cause such effects and who is affected. A major question is whether PM itself causes the effects, and if so, whether one of its components may be a better predictor of morbidity (illness) and mortality (death) than PM as a whole. The report attempts to identify and characterize components of PM and other air pollution mixtures that were associated with excess daily deaths and elderly hospital admissions in and around the area of Detroit, Michigan. to evaluate whether human health was associated with outdoor levels of PM, the authors compared day-to-day fluctuations in air pollution with day-to-day fluctuations in deaths and hospital admissions in the Detroit area.
NTIS
Physiological Effects ; Particulates ; Diurnal Variations ; Air Pollution

20020007094 Health Effects Inst. , Cambridge, MA USA

Daily Mortality and Fine and Ultrafine Particles in Erfurt, Germany , Part 1 , Role of Particle Number and Particle Mass

Wichmann, H. E. ; Spix, C. ; Tuch, T. ; Wolke, G. ; Peters, A. ; November 2000 ; 108p ; In English

Report No.(s): PB2001-108683 ; HEI/RR-00/098 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

Epidemiologic studies have shown an association between airborne particles and mortality data, but uncertainty persists as to which aspects of the particle mixture are the driving force underlying observed associations. Further, only a small number of studies have investigated the role of ultrafine particles (particles less than 0.1 micro m in diameter). Although ultrafine particles contribute little to mass concentration, they are present in urban air in high numbers and may be important in terms of health effects. One hypothesis is that these particles may be particularly toxic because their small size allows them to deposit efficiently deep in the lungs and that the higher number of ultrafine particles, and therefore their greater total particle surface area, may increase their toxicologic effects. However, the few epidemiologic studies that have tried to isolate effects of ultrafine particles have evaluated respiratory disease, not deaths.

NTIS

Physiological Effects ; Particles ; Air Pollution

20020008112 Federal Energy Technology Center , Morgantown, WV USA

Advanced Emissions Control Development Program

Holmes, M. J. ; Jan. 01, 1999 ; 25p ; In English

Report No.(s): DE2001-774955 ; DE-FC22-94PC94251-21 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of this project is to develop practical strategies and systems for the simultaneous control of SO2, NOx, particulate matter, and air toxics emissions from coal-fired boilers in such a way as to keep coal economically and environmentally competitive as a utility boiler fuel. Of particular interest is the control of air toxics emissions through the cost-effective use of conventional flue gas clean-up equipment such as electrostatic precipitators (ESP's), fabric filters (baghouses), and SO2 removal systems such as wet scrubbers and various clean coal technologies. This objective will be achieved through extensive development testing in the state-of-the art, 10 MW(sub e) equivalent, Clean Environment Development Facility (CEDF). The project has extended the capabilities of the CEDF to facilitate air toxics emissions control development work on backend flue gas cleanup equipment. Specifically, an ESP, a baghouse, and a wet scrubber for SO2 (and air toxics) control were added--all designed to yield air toxics emissions data under controlled conditions--and with proven predictability to commercial systems. A schematic of the CEDF and the project test equipment is shown. The specific objectives of the project are to: (1) Measure and understand production and partitioning of air toxics species in coal-fired power plant systems; (2) Optimize the air toxics removal performance of conventional flue gas cleanup systems; (3) Quantify the impacts of coal cleaning on air toxics emissions; (4) Identify and/or develop advanced air toxics emissions control concepts; (5) Develop and validate air toxics emissions measurement and monitoring techniques; and (6) Establish an air toxics data library to facilitate studies of the impacts of coal selection, coal cleaning, and emissions control strategies on the emissions of coal-fired power plants.

NTIS

Cleaning ; Coal ; Combustion ; Emission ; Air Pollution ; Pollution Control

20020008113 Federal Energy Technology Center , Morgantown, WV USA

Advanced Emissions Control Development Program

Holmes, M. J. ; Oct. 01, 1998 ; 25p ; In English

Report No.(s): DE2001-774954 ; DE-FC22-94PC94251-20 ; No Copyright ; Avail: Department of Energy Information Bridge

The objective of this project is to develop practical strategies and systems for the simultaneous control of SO2, NOx, particulate matter, and air toxics emissions from coal-fired boilers in such a way as to keep coal economically and environmentally competitive as a utility boiler fuel. Of particular interest is the control of air toxics emissions through the cost-effective use of conventional flue gas clean-up equipment such as electrostatic precipitators (ESP's), fabric filters (baghouses), and SO2 removal systems such as wet scrubbers and various clean coal technologies. This objective will be achieved through extensive development testing in the state-of-the art, 10 MW(sub e) equivalent, Clean Environment Development Facility (CEDF). The project has extended the capabilities of the CEDF to facilitate air toxics emissions control development work on backend flue gas cleanup equipment. Specifically, an ESP, a baghouse, and a wet scrubber for SO2 (and air toxics) control were added--all designed to yield air toxics emissions data under controlled conditions, and with proven predictability to commercial systems. A schematic of the CEDF and the project test equipment is shown. The specific objectives of the project are to: (1) Measure and understand production and partitioning of air toxics species in coal-fired power plant systems; (2) Optimize the air toxics removal performance of conventional flue gas cleanup systems; (3) Quantify the impacts of coal cleaning on air toxics emissions; (4) Identify and/or develop advanced air toxics emissions control concepts; (5) Develop and validate air toxics emissions measurement and

monitoring techniques; (6) Establish an air toxics data library to facilitate studies of the impacts of coal selection, coal cleaning, and emissions control strategies on the emissions of coal-fired power plants.
NTIS
Cleaning ; Coal ; Air Pollution ; Pollution Control ; Combustion

20020008114 Federal Energy Technology Center , Morgantown, WV USA
Advanced Emissions Control Development Program
Holmes, M. J. ; Jul. 01, 1998 ; 26p ; In English
Report No.(s): DE2001-774953 ; DE-FC22-94PC94251-19 ; No Copyright ; Avail: Department of Energy Information Bridge
The objective of this project is to develop practical strategies and systems for the simultaneous control of SO2, NOx, particulate matter, and air toxics emissions from coal-fired boilers in such a way as to keep coal economically and environmentally competitive as a utility boiler fuel. Of particular interest is the control of air toxics emissions through the cost-effective use of conventional flue gas clean-up equipment such as electrostatic precipitators (ESP's), fabric filters (baghouses), and SO2 removal systems such as wet scrubbers and various clean coal technologies. This objective will be achieved through extensive development testing in the state-of-the art, 10 MW(sub e) equivalent, Clean Environment Development Facility (CEDF). The project has extended the capabilities of the CEDF to facilitate air toxics emissions control development work on backend flue gas cleanup equipment. Specifically, an ESP, a baghouse, and a wet scrubber for SO2 (and air toxics) control were added--all designed to yield air toxics emissions data under controlled conditions, and with proven predictability to commercial systems. A schematic of the CEDF and the project test equipment is shown. The specific objectives of the project are to: (1) Measure and understand production and partitioning of air toxics species in coal-fired power plant systems; (2) Optimize the air toxics removal performance of conventional flue gas cleanup systems; (3) Quantify the impacts of coal cleaning on air toxics emissions; (4) Identify and/or develop advanced air toxics emissions control concepts; (5) Develop and validate air toxics emissions measurement and monitoring techniques; and (6) Establish an air toxics data library to facilitate studies of the impacts of coal selection, coal cleaning, and emissions control strategies on the emissions of coal-fired power plants.
NTIS
Cleaning ; Coal ; Combustion ; Emission ; Air Pollution ; Pollution Control

20020008201 Desert Research Inst. , Reno, NV USA
Comparison of Near-field and Far-field Air Monitoring of Plutonium-contaminated Soils from the Tonopah Test Range, Nevada
Bowen, J. L. ; Shafer, D. S. ; May 01, 2001 ; 25p ; In English
Report No.(s): DE2001-786230 ; DOE/NV/13609-08 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Operation Roller Coaster, a series of nuclear material dispersal experiments, resulted in three areas (Clean Slates 1, 2, and 3) of widespread surface soil plutonium (Pu) contamination on the Tonopah Test Range (TTR), located 225 miles northwest of Las Vegas, Nevada. The State's Division of Environmental Protection raised concerns that dispersal of airborne Pu particles from the sites could result in undetected deposition further downwind that the background monitoring stations. Air monitoring data from different distances from the Clean Slate sites but during the same period of time were compared. From the available data, there is no indication that airborne PM10 particles are being transported to the farther distance, however, the data are statistically insufficient to conclude whether there is a difference in transport of respirable Pu particles to the closer verses the farther sites from the Clean Slate sites.
NTIS
Environment Protection ; Environmental Monitoring ; Air Pollution ; Air Quality

20020008209 NASA Ames Research Center , Moffett Field, CA USA
Physical and Optical/Radiative Properties of Arctic Aerosols: Potential Effects on Arctic Climate
Pueschel, R. F. , NASA Ames Research Center , USA ; Kinne, S. A. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; World Climate Research Programme Conference , 7-10 Nov. 1994 , Goeteborg , Sweden
Contract(s)/Grant(s): RTOP 464-14-16 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
We have determined the abundance of light-scattering sulfuric acid (H2SO4/H2O) and light-absorbing black carbon aerosol (BCA) in Spring 1992 in the Arctic atmosphere by airborne in situ sampling with impactors, and measured particle sizes and morphologies by scanning electron microscopy. The mass of BCA in the Arctic troposphere is one percent of the total aerosol, reduced to one part in 104 in the stratosphere. A Mie algorithm permits the calculation of the optical properties of the various aerosol components, and an algorithm developed by Ackerman and Toon and modified to serve our needs lets us calculate the

optical effects of the black carbon aerosol that is mixed internally with the sulfuric acid aerosol. It follows that the effect of internally-mixed BCA on the aerosol scattering and absorption properties depends on its location within the droplet. BCA concentrated near the droplet surface has a greater effect on absorption of solar radiation than does the same amount of BCA located near its center. Single scatter albedos of the combined system are omega(sub 0)=1.0 in the post-Pinatubo Arctic stratosphere, and as low as 0.94 in the troposphere. The aerosol has the potential to regionally warm the Arctic earth-atmosphere system, because of the high surface albedo of the snow-covered Arctic.
Author
Optical Properties ; Radiation Absorption ; Aerosols ; Arctic Regions

20020008229 NASA Ames Research Center , Moffett Field, CA USA
Aerosol Effects on Radiation and Climate: Column Closure Experiments with Towers, Aircraft, and Satellites
Russell, Philip B. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Second Aerosol Characterization Experiment Meeting and Closure Workshop , 24-28 Oct. 1994 , Ispra , Italy
Contract(s)/Grant(s): RTOP 229-10-32-01 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Many theoretical studies have shown that anthropogenic aerosol particles can change the radiation balance in an atmospheric column and might thereby exert a significant effect on the Earth's climate. In particular, recent calculations have shown that sulfate particles from anthropogenic combustion may already exert a cooling influence on the Earth that partially offsets the warming caused by the greenhouse gases from the same combustion. Despite the potential climatic importance of anthropogenic aerosols, simultaneous measurements of anthropogenic aerosol properties and their effect on atmospheric radiation have been very rare. Successful comparisons of measured radiation fields with those calculated from aerosol measurements - now referred to as column closure comparisons - are required to improve the accuracy and credibility of climate predictions. This paper reviews the column closure experiment performed at the Mt. Sutro Tower in San Francisco in 1975, in which elevated radiometers measured the change in Earth-plus-atmosphere albedo caused by an aerosol layer, while a lidar, sunphotometer, nephelometer, and other radiometers measured properties of the responsible aerosol. The time-dependent albedo calculated from the measured aerosol properties agreed with that measured by the tower radiometers. Also presented are designs for future column closure studies using radiometers and aerosol instruments on the ground, aircraft, and satellites. These designs draw upon algorithms and experience developed in the Sutro Tower study, as well as more recent experience with current measurement and analysis capabilities.
Author
Aerosols ; Atmospheric Radiation ; Climate ; Earth Albedo

20020008637 Federal Energy Technology Center , Morgantown, WV USA
NO(x) Emissions Produced with Combustion of Powder River Basin Coal in a Utility Boiler
Nordin, J. S. ; Merriam, N. W. ; Apr. 01, 1997 ; 40p ; In English
Report No.(s): DE2001-772385 ; DE-FC21-93MC30127-30 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The objective of this report is to estimate the NOx emissions produced when Powder River Basin (PRB) coal is combusted in a utility boiler. The Clean Air Act regulations specify NOx limits of 0.45 lb/mm Btu (Phase I) and 0.40 lb/mm Btu (Phase II) for tangentially fired boilers, and 0.50 lb/mm 13tu (Phase II) and 0.46 lb/mm Btu (Phase II) for dry-bottom wall-fired boilers. The Clean Air Act regulations also specify other limits for other boiler types. Compliance for Phase I has been in effect since January 1, 1996. Compliance for Phase II goes into effect on January 1, 2000. Emission limits are expressed as equivalent NO(sub 2) even though NO (and sometimes N2O) is the NO(x) species emitted during combustion. Regulatory agencies usually set even lower NO(x) emission limits in ozone non-attainment areas. In preparing this report, Western Research Institute (WRI) used published test results from utilities burning various coals, including PRB coal, using state-of-the art control technology for minimizing NOx emissions. Many utilities can meet Clean Air Act NO(x) emission limits using a combination of tight combustion control and low-NO(x) burners and by keeping furnaces clean (i.e., no slag buildup). In meeting these limits, some utilities also report problems such as increased carbon in their fly ash and excessive furnace tube corrosion. This report discusses utility experience. The theory of NO(x) emission formation during coal combustion as related to coal structure and how the coal is combusted is also discussed. From this understanding, projections are made for NOx emissions when processed PRB coal is combusted in a test similar to that done with other coals. As will be shown, there are a lot of conditions for achieving low NOx emissions, such as tight combustion control and frequent water-lancing of the furnace to avoid buildup of deposits.
NTIS
Air Pollution ; Boilers ; Nitrogen Oxides ; Emittance ; Combustion ; River Basins

20020008647 Office of Air Quality Planning and Standards , Research Triangle Park, NC USA
Supplement F to Compilation of Air Pollutant Emission Factors. Volume I: Stationary Point and Area Sources
Sep. 2000 ; 66p
Report No.(s): PB2001-108766 ; EPA/454/R-01/012 ; No Copyright ; Avail: National Technical Information Service (NTIS)
This document contains emission factors and process information for more than 200 air pollution source categories. These emission factors have been compiled from source test data, material balance studies, and engineering estimates, and they can be used judiciously in making emission estimations for various purposes. When specific source test data are available, they should be preferred over the generalized factors presented in this document.
NTIS
Exhaust Emission ; Air Pollution ; Point Sources

20020008648 MBC Applied Environmental Sciences, Inc. , Costa Mesa, CA USA
8th Information Transfer Meeting: Conference Proceedings
Apr. 2001 ; 92p ; In English ; 8th Information Transfer Meeting , USA
Report No.(s): PB2001-108602 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
This report presents the 8th Information Transfer Meeting (ITM) since the Environmental Studies Program began in the late 1970s. The goals and objectives of the Alaska Environmental Studies Program are to: (1) obtain information for environmental impact assessment, (2) enhance decision processes and information transfer, and (3) in the event of offshore development, to conduct monitoring of any potential environmental changes.
NTIS
Conferences ; Information Transfer ; Alaska ; Environment Effects

20020008649 Environmental Protection Agency , National Exposure Research Lab. , Research Triangle Park, NC USA
Quality Assurance Performance Audit Report for the Secretaria del Medio Ambiente Ciudad de Mexico, DF, Mexico Red Automatica de Monitoreo Atmosferico (RAMA) Air Quality Monitoring Stations
Colon, M. ; Duncan, J. W. ; 2000 ; 48p
Report No.(s): PB2001-108589 ; No Copyright ; Avail: National Technical Information Service (NTIS)
The U.S. Environmental Protection Agency (U.S. EPA) Office of Research and Development (ORD) and the Secretariat of the Environment of Mexico City have been working together for more than fifteen years in the evaluation of the Red Automatica de Monitoreo Atmosferico (RAMA) of the City and State of Mexico. Previously these audits were performed once a year by Mr. Willie McLeod of ORD/NERL (National Exposure Research Laboratory), who retired last year. The government of Mexico City made a request to the agency for the continuation of the external audit of the network, and the Director of the NERL named two new auditors to continue this work in Mexico City for the next three years. The Automatic Atmospheric Monitoring Network (RAMA) is comprised of 32 monitoring stations distributed in the Federal District (21) and Mexico State (11), of which only 14 of these stations were evaluated during the year 2000 audit. These stations contain monitors for measuring and recording/transmitting ambient levels of various combinations of carbon monoxide (CO), nitrogen oxide (NO), oxides of nitrogen (NO-x), nitrogen dioxide (NO2), ozone (O3), and sulfur dioxide (SO2).
NTIS
Environmental Monitoring ; Air Quality ; Environment Protection ; Mexico

20020008652 General Accounting Office , Accounting and Information Management Div. , Washington, DC USA
Land Management Systems. Status of BLM's Actions to Improve Information Technology Management
Feb. 2000 ; 16p
Report No.(s): PB2001-108464 ; GAO/AIMD-00-67 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
On March 4, 1999, we testified before you on the Bureau of Land Management's (BLM) efforts to develop and deploy the Automated Land and Mineral Record System (ALMRS)/Modernization. The ALMRS/Modernization project was intended to improve BLM's ability to record, maintain, and retrieve land description, ownership, and use information. In our testimony statement we reported that the major software component of the ALMRS/Modernization-known as the ALMRS Initial Operating Capability (IOC)-failed to meet BLM's business needs and was not deployable. We cited numerous problems and risks that had threatened the successful development and deployment of the ALMRS/Modernization and recommended actions to help BLM strengthen its information technology management practices and reduce the risks that future information technology efforts would fail.
NTIS
Information Systems ; Management Systems ; Land Management

20020008660 Environmental Protection Agency , Air Pollution Prevention and Control Div. , Research Triangle Park, NC USA

EPA's Study of the Generation and Control of Air Pollutants from the Combustion of Orimulsion(Trade Name)

Miller, C. A. ; Hall, R. E. ; Jun. 2001 ; 20p

Report No.(s): PB2001-108003 ; EPA/600/A-01/045 ; No Copyright ; Avail: National Technical Information Service (NTIS)

The paper discusses an EPA (Environmental Protection Agency) study of the generation and control of air pollutants from the combustion of Orimulsion, a high-sulfur liquid petroleum fuel composed of approximately 70% Venezuelan bitumen, 30% water, and trace amounts of surfactant. (NOTE: It is being used as the primary fuel in several utility generating stations around the world, and has been proposed, although not currently being used, as a utility fuel in the U.S.). The study included a review of previous studies of air pollution emissions from Orimulsion combustion and a series of tests that measured pollutants generated by Orimulsion in EPA's pilot-scale combustion research facilities in Research Triangle Park, N.C. Data on emissions of carbon monoxide, nitrogen oxides (NO-x), particulate matter, sulfur dioxide, and sulfur trioxide showed substantial similarity to emissions reported from high-sulfur heavy fuel oil. Control technologies were evaluated to determine their effectiveness in reducing emissions from boilers burning Orimulsion. Data from the studies indicate that properly designed, commercially available technologies can be effective in reducing pollutant emissions from Orimulsion-burning facilities. EPA's pilot-scale tests compared the generation of air pollutants from Orimulsion 100 (the now discontinued original formulation of the fuel), Orimulsion 400, and a high-sulfur No. 6 fuel oil.

NTIS

Air Pollution ; Combustion Products ; Emulsions ; Air Quality ; Electric Power Plants ; Petroleum Products

20020009128 NASA Wallops Flight Center , Wallops Island, VA USA

ECC Ozonesonde Reliability, Observations, and Comparisons with Satellite Ozone Instruments

Schmidlin, F. J. , NASA Wallops Flight Center , USA ; Northam, E. T. , Science and Engineering Services, Inc. , USA ; Ross, E. D. , Science and Engineering Services, Inc. , USA ; Schauer, A. G. , Science and Engineering Services, Inc. , USA ; [2001] ; 1p ; In English ; 15th ESA Symposium , 27-31 May 2001 , Biarritz , France ; Sponsored by European Space Agency , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Electrochemical Concentration Cell (ECC) ozone instruments depend on the quality of care exercised in their pre-flight preparation. The ozone-measuring project conducted at Goddard Space Flight Center's Wallops Flight Facility uses a number of mechanisms designed to inspect the ECC for anomalies that may interfere with the reception of valid ozone profiles. Complete electronic testing of the instrument, individually and when coupled to its radiosonde has led to exceptional monitoring of ozone for detecting long-term atmospheric changes. A number of factors are considered when preparing an ECC instrument for flight. These basically are specific calibrations of pump efficiency, volumetric flow rate, temperature of the air entering the pump, and background current. The concentration of the potassium iodide solution is also important. Wallops is the only site using a UV photometer (Dasibi) to compare ECC ozone output at various concentrations of ozone that allows adjustment to be made to offsets that may appear in the balloon-borne instrument prior to release. All of the above procedures allow identification of potential problems before release of the ECC instrument. Procedures followed at Wallops also are employed in Brazil, and Ascension Island where NASA has cooperative agreements in place to obtain ozonesondes data. All ECC instruments are prepared 3-4 weeks prior to the day of observation. We will briefly describe the instrumental tests employed. These tests have included simultaneous dual observations to compare the effect of different solution concentrations, comparison of sensors of different manufacturers, and comparisons with surface- and space-based instrumentation such as the Dobson Spectrophotometer and satellites. Vertical profiles of ozone from Arctic, mid-latitudes, and Antarctica will be discussed. Although not unusual, the data reveals ozone structure that correlate well with typical atmospheric temperatures and possibly relative humidity. Finally, vertical ozone distribution, compared with remotely measured ozone from lidar and satellite, will be discussed. Specific comparisons between ECC and HALOE measurements, integrated ECC total ozone overburden with the EP-TOMS and the Dobson, as well as comparisons with lidar are discussed. Results show agreement and some disagreement between the in situ measurements of the ECC and the remote instruments. We postulate reasons for the differences, or biases, which in spite of the excellent ECC quality control during pre-flight preparation and data analysis processes, may be due to uncertainties in both measuring systems.

Author

Electrochemical Cells ; Ozone ; Ozonometry ; Vertical Distribution ; Quality Control

20020009130 NASA Goddard Space Flight Center , Greenbelt, MD USA

"Cloud Slicing": A New Technique to Derive Upper Tropospheric Ozone from Satellite Measurements

Chandra, Sushil , NASA Goddard Space Flight Center , USA ; Ziemke, Jerald , NASA Goddard Space Flight Center , USA ; Bhartia, Pawan K. , NASA Goddard Space Flight Center , USA ; [2001 ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 25-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A new technique called "cloud slicing" is introduced in this study to determine tropospheric ozone profile information. This method is unique because all previous methods incorporating satellite data were only capable of estimating the total column of ozone in the troposphere. Cloud slicing takes advantage of the opaque property of water vapor clouds to ultraviolet wavelength radiation. Measurements of above-cloud column ozone from the Nimbus 7 total ozone mapping spectrometer (TOMS) instrument are combined together with Nimbus 7 temperature humidity and infrared radiometer (THIR) cloud-top pressure data to derive ozone column amounts in the upper troposphere. In this study, tropical TOMS and THIR data for the period 1979-1984 are analyzed. Our investigation examines several case studies and illustrates the robust nature of this new technique for future satellite missions.

Author

Satellite Observation ; Troposphere ; Ozone ; Ozonometry ; Ultraviolet Radiation ; Water Vapor

20020009137 Brookhaven National Lab. , Upton, NY USA

Representing aerosol dynamics and properties in chemical transport models by the method of moments

Schwartz, ; McGraw, ; Benkovitz, ; Wright, ; Apr. 01, 2001 ; 8p ; In English

Report No.(s): DE2001-777939 ; BNL-68149 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Atmospheric aerosols, suspensions of solid or liquid particles, are an important multi-phase system. Aerosols scatter and absorb shortwave (solar) radiation, affecting climate (Charlson et al., 1992; Schwartz, 1996) and visibility; nucleate cloud droplet formation, modifying the reflectivity of clouds (Twomey et al., 1984; Schwartz and Slingo, 1996) as well as contributing to composition of cloudwater and to wet deposition (Seinfeld and Pandis, 1998); and affect human health through inhalation (NRC, 1998). Existing and prospective air quality regulations impose standards on concentrations of atmospheric aerosols to protect human health and welfare (EPA, 1998). Chemical transport and transformation models representing the loading and geographical distribution of aerosols and precursor gases are needed to permit development of effective and efficient strategies for meeting air quality standards, and for examining aerosol effects on climate retrospectively and prospectively for different emissions scenarios. Important aerosol properties and processes depend on their size distribution: light scattering, cloud nucleating properties, dry deposition, and penetration into airways of lungs. The evolution of the mass loading itself depends on particle size because of the size dependence of growth and removal processes. For these reasons it is increasingly recognized that chemical transport and transformation models must represent not just the mass loading of atmospheric particulate matter but also the aerosol microphysical properties and the evolution of these properties if aerosols are to be accurately represented in these models. If the size distribution of the aerosol is known, a given property can be evaluated as the integral of the appropriate kernel function over the size distribution. This has motivated the approach of determining aerosol size distribution, and of explicitly representing this distribution and its evolution in chemical transport models.

NTIS

Aerosols ; Atmospheric Models ; Cloud Physics ; Size Distribution ; Solar Radiation

20020009169 NASA Wallops Flight Center , Wallops Island, VA USA

A Characterization of Vertical Ozonesonde Measurements at the Equatorial Locations of SHADOZ

Schmidlin, F. J. , NASA Wallops Flight Center , USA ; Thompson, A. M. , NASA Wallops Flight Center , USA ; Kirchhoff, V. W. J. H. , Instituto Nacional de Pesquisas Espacias , Brazil ; Hoegger, B. , Swiss Inst. of Meteorology , Switzerland ; Oltmans, S. , National Oceanic and Atmospheric Administration , USA ; [2001] ; 1p ; In English ; 15th ESA Symposium , 27-31 May 2001 , Biarritz , France ; Sponsored by European Space Agency , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Beginning in 1997 ozonesonde observations have been obtained from Equatorial locations participating in SHADOZ (Southern Hemisphere Additional Ozone) Project. Vertical ozone profiles are available from the western Pacific eastward to Kenya. Presently 10 stations provide vertical ECC ozonesonde measurements at least weekly. Statistical analysis shows the variation that occurs in the level of maximum ozone, the difference between integrated total ozone overburden from ECC and EP-TOMS observations, and with Dobson Spectrophotometers, when data are available.

Author

Ozone ; Ozonometry ; Southern Hemisphere ; Equatorial Regions

20020009493 Sandia National Labs. , Albuquerque, NM USA

Review of Chemical Sensors for In-Situ Monitoring of Volatile Contaminants

Ho, C. K. ; Itamura, M. T. ; Kelley, M. J. ; Hughes, R. C. ; Mar. 01, 2001 ; 34p ; In English

Report No.(s): DE2001-780299 ; SAND2001-0643 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Sandia National Laboratories has sponsored an LDRD (Laboratory Directed Research and Development) project to investigate and develop micro-chemical sensors for in-situ monitoring of subsurface contaminants. As part of this project, a literature search has been conducted to survey available technologies and identify the most promising methods for sensing and monitoring subsurface contaminants of interest. Specific sensor technologies are categorized into several broad groups, and these groups are then evaluated for use in subsurface, long-term applications. This report introduces the background and specific scope of the problem being addressed by this LDRD project, and it provides a summary of the advantages and disadvantages of each sensor technology identified from the literature search.

NTIS

Contaminants ; Research and Development ; Detection ; Volatility

20020009496 Argonne National Lab. , IL USA

Well-to-wheel energy use and greenhouse gas emissions of advanced fuel/vehicle systems North American analysis

Wang, M. ; Apr. 18, 2001 ; 41p ; In English

Report No.(s): DE2001-781268 ; ANL/ES/RP-104528 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

There are differing, yet strongly held views among the various ”stakeholders” in the advanced fuel/propulsion system debate. In order for the introduction of advanced technology vehicles and their associated fuels to be successful, it seems clear that four important stakeholders must view their introduction as a ”win” Society, Automobile manufacturers and their key suppliers, Fuel providers and their key suppliers, and Auto and energy company customers. If all four of these stakeholders, from their own perspectives, are not positive regarding the need for and value of these advanced fuels/vehicles, the vehicle introductions will fail. This study was conducted to help inform public and private decision makers regarding the impact of the introduction of such advanced fuel/propulsion system pathways from a societal point of view. The study estimates two key performance criteria of advanced fuel/propulsion systems on a total system basis, that is, ”well” (production source of energy) to ”wheel” (vehicle). These criteria are energy use and greenhouse gas emissions per unit of distance traveled. The study focuses on the U.S. light-duty vehicle market in 2005 and beyond, when it is expected that advanced fuels and propulsion systems could begin to be incorporated in a significant percentage of new vehicles. Given the current consumer demand for light trucks, the benchmark vehicle considered in this study is the Chevrolet Silverado full-size pickup.

NTIS

Propulsion System Configurations ; Propulsion System Performance ; Greenhouse Effect ; Exhaust Emission ; Exhaust Gases

20020009564 National Taiwan Univ. , Graduate Inst. of Environmental Engineering , Taipei, Taiwan, Province of China

Development of an Air Pollution Evaluation System by Linking Air Pollution Total Quantity Control and Land Use Management

Yu, Chien-Hwa , National Taiwan Univ. , Taiwan, Province of China ; Lin, Cheng-Fang , National Taiwan Univ. , Taiwan, Province of China ; Chen, Ching-Ho , Nanya Inst. of Tech. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 619-628 ; In English ; Copyright ; Avail: Issuing Activity

This study considers air pollution total quantity control and land use management to establish a methodology for estimating unit emission loads of land use types. An air pollution evaluation system (APES) is developed, based on air pollution evaluation theory and procedure by linking air Pollution total quantity control and land use management. The APES consists of an information management subsystem, a model management subsystem, and an evaluation subsystem. The Nankan urban area, located in northern Taiwan, is used to illustrate the capability of the APES. The analysis results indicate that the integration of GIS technology, a spreadsheet application, and an air pollution simulation model into APES has made it an effective system for facilitating the examination of a set of alternatives and generating a sustainable land use management strategy.

Author

Air Pollution ; Environmental Control ; Technology Utilization ; Information Management

20020009566 National Central Univ. , Graduate Inst. of Environmental Engineering , Chung-Li, Taiwan, Province of China

The Influence of Anaerobic Reaction Time on the Fraction of Denitrifying Phosphate Accumulating Organism in BNR Processes

You, Sheng-Jie , National Central Univ. , Taiwan, Province of China ; Ougang, Chaio-Fuei , National Central Univ. , Taiwan, Province of China ; Shen, Yu-Jr , National Central Univ. , Taiwan, Province of China ; Hsu, Chen-Lung , National Central Univ. , Taiwan, Province of China ; Chuang, Shun-Hsing , Chaoyang Univ. of Technology , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 601-606 ; In English

Contract(s)/Grant(s): NSC-89-2211-E-008-010 ; Copyright ; Avail: Issuing Activity

This study investigated the influence of' anaerobic reaction time on the fraction of denitrifying phosphate accumulating organisms (DNPAO) to total phosphate accumulating organisms (PAOs) using a series of batch experiments. The results showed that the DNPAO increased as the anaerobic reaction time increased. This implied that tile PHA (polyhydroxyalkanoates) accumulating rate of DNPAO was lower than that of non-denitrifying phosphate accumulating organisms (nonDNPAO). Thus, the DNPAO required a longer anaerobic reaction time to reach tile saturated intracellular PHA level. Furthermore, more than two hours of anaerobic hydraulic retention time is necessary when designing an enhanced DNPAO process.

Author

Phosphates ; Reaction Time ; Anaerobes

20020009590 Lawrence Livermore National Lab. , Livermore, CA USA

Health and productivity gains from better indoor environments and their implications for the U.S. Department of Energy

Fisk, W. J. ; Oct. 01, 2000 ; 31p ; In English

Report No.(s): DE2001-780590 ; LBNL-47458 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A substantial portion of the US population suffers frequently from communicable respiratory illnesses, allergy and asthma symptoms, and sick building syndrome symptoms. We now have increasingly strong evidence that changes in building design, operation, and maintenance can significantly reduce these illnesses. Decreasing the prevalence or severity of these health effects would lead to lower health care costs, reduced sick leave, and shorter periods of illness-impaired work performance, resulting in annual economic benefits for the US in the tens of billions of dollars. Increasing the awareness of these potential health and economic gains, combined with other factors, could help bring about a shift in the way we design, construct, operate, and occupy buildings. The current goal of providing marginally adequate indoor environments could be replaced by the goal of providing indoor environments that maximize the health, satisfaction, and performance of building occupants. Through research and technology transfer, DOE and its contractors are well positioned to help stimulate this shift in practice and, consequently, improve the health and economic well-being of the US population. Additionally, DOE's energy-efficiency interests would be best served by a program that prepares for the potential shift, specifically by identifying and promoting the most energy-efficient methods of improving the indoor environment. The associated research and technology transfer topics of particular relevance to DOE are identified and discussed.

NTIS

Public Health ; Productivity ; Indoor Air Pollution

20020009595 Department of Energy , Aiken, SC USA

Mobile Measurement of an Atmospheric Tracer

Milham, R. C. ; Mar. 09, 2001 ; 4p ; In English

Report No.(s): DE2001-780495 ; DP-MS-85-162 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This paper describes a mobile analyzer for sulfur hexafluoride, an atmospheric tracer. A commercial instrument is used on-board a moving vehicle to measure tracer concentrations in the parts per trillion (ppt) range. This instrument provides rapid, in-the-field data at minimum cost.

NTIS

Air Pollution ; Measuring Instruments

20020009617 Brookhaven National Lab. , Upton, NY USA

Representing aerosol dynamics and properties in chemical transport models by the method of moments

Schwartz, S. E. ; McGraw, R. ; Benkovitz, C. M. ; Wright, D. L. ; Apr. 01, 2001 ; 8p ; In English

Report No.(s): DE2001-779673 ; BNL-68149 ; No Copyright ; Avail: Department of Energy Information Bridge

Atmospheric aerosols, suspensions of solid or liquid particles, are an important multi-phase system. Aerosols scatter and absorb shortwave (solar) radiation, affecting climate and visibility; nucleate cloud droplet formation, modifying the reflectivity of clouds as well as contributing to composition of cloud-water and to wet deposition; and affect human health through inhalation.

Existing and prospective air quality regulations impose standards on concentrations of atmospheric aerosols to protect human health and welfare. Chemical transport and transformation models representing the loading and geographical distribution of aerosols and precursor gases are needed to permit development of effective and efficient strategies for meeting air quality standards, and for examining aerosol effects on climate retrospectively and prospectively for different emissions scenarios. Important aerosol properties and processes depend on their size distribution: light scattering, cloud nucleating properties, dry deposition, and penetration into airways of lungs. The evolution of the mass loading itself depends on particle size because of the size dependence of growth and removal processes. For these reasons it is increasingly recognized that chemical transport and transformation models must represent not just the mass loading of atmospheric particulate matter but also the aerosol microphysical properties and the evolution of these properties if aerosols are to be accurately represented in these models. If the size distribution of the aerosol is known, a given property can be evaluated as the integral of the appropriate kernel function over the size distribution. This has motivated the approach of determining aerosol size distribution, and of explicitly representing this distribution and its evolution in chemical transport models.
NTIS
Aerosols ; Atmospheric Models ; Air Quality ; Climate ; Method of Moments

20020009623 Brookhaven National Lab. , Upton, NY USA
Representing Aerosol Dynamics and Properties in Chemical Transport Models by the Method of Moments
Schwartz, ; McGraw, ; Benkovitz, ; Wright, ; Apr. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-777859 ; BNL-68149 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Atmospheric aerosols, suspensions of solid or liquid particles, are an important multi-phase system. Aerosols scatter and absorb shortwave (solar) radiation, affecting climate and visibility; nucleate cloud droplet formation, modifying the reflectivity of clouds as well as contributing to composition of cloudwater and to wet deposition; and affect human health through inhalation. Existing and prospective air quality regulations impose standards on concentrations of atmospheric aerosols to protect human health and welfare. Chemical transport and transformation models representing the loading and geographical distribution of aerosols and precursor gases are needed to permit development of effective and efficient strategies for meeting air quality standards, and for examining aerosol effects on climate retrospectively and prospectively for different emissions scenarios. Important aerosol properties and processes depend on their size distribution: light scattering, cloud nucleating properties, dry deposition, and penetration into airways of lungs. The evolution of the mass loading itself depends on particle size because of the size dependence of growth and removal processes. For these reasons it is increasingly recognized that chemical transport and transformation models must represent not just the mass loading of atmospheric particulate matter but also the aerosol microphysical properties and the evolution of these properties if aerosols are to be accurately represented in these models. If the size distribution of the aerosol is known, a given property can be evaluated as the integral of the appropriate kernel function over the size distribution. This has motivated the approach of determining aerosol size distribution, and of explicitly representing this distribution and its evolution in chemical transport models.
NTIS
Aerosols ; Particle Size Distribution

20020009649 Northwestern Univ. , Chicago, IL USA
Sulfation-Reduction-Reoxidation Characteristics of Sulfur Dioxide Adsorbents for the Three-Way Catalyst (TWC) Microscopic and Surface Studies ***Annual Report***
Ko, D. , Northwestern Univ. , USA ; Maggard, P. , Northwestern Univ. , USA ; Poeppelmeier, K. R. , Northwestern Univ. , USA ; June 2001 ; 30p ; In English
Report No.(s): PB2001-109062 ; CRC No. E-7a-5 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
SO2 in the engine-out exhaust gas originates from sulfur in gasoline and readily reacts with various components in the TWC and reduces their catalytic efficiency. One of the main problems is the reaction of CeO2 in the washcoat. CeO2 stores and releases oxygen, thus expanding the stoichiometric range of the exhaust gas composition for optimal conversion of hydrocarbon compounds, CO and NO-x. The main task of this research is to find SW2 absorbents that protect CeO2 and sulfate reversibly during the TWC operation. In summary, based on their bulk sulfation characteristics, CuO, Mn2O3, and CuMn2O3 all demonstrated some potential for use as a sulfur absorbent in a sulfur tolerant TWC.
NTIS
Absorbents ; Sulfation ; Exhaust Gases ; Sulfur Dioxides ; Oxidation-Reduction Reactions

20020009700 Federal Energy Technology Center , Morgantown, WV USA

Advanced hybrid particulate collector

Miller, S. J. ; Schelkoph, G. L. ; Nov. 13, 1998 ; 11p ; In English

Report No.(s): DE2001-780830 ; DE-AC22-95PC95258-09 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A new concept in particulate control, called an advanced hybrid particulate collector (AHPC), is being developed under funding from the US Department of Energy. The AHPC combines the best features of electrostatic precipitators (ESPs) and baghouses in a manner that has not been done before. The AHPC concept consists of a combination of fabric filtration and electrostatic precipitation in the same housing, providing major synergism between the two collection methods, both in the particulate collection step and in transfer of the dust to the hopper. The AHPC provides ultrahigh collection efficiency, overcoming the problem of excessive fine-particle emission with conventional ESPs, and it solves the problem of reentrainment and collection of dust in conventional baghouses.

NTIS

Electrostatic Precipitators ; Particulates ; Accumulators ; Particle Emission

20020009757 National Central Univ. , Graduate Inst. of Environmental Engineering , Chung-Li, Taiwan, Province of China

Nitrogen Removal from Activated Sludge Process (ASP) Treated Municipal Wastewater by Biofilm Channeling

Hsu, Chen-Lung , National Central Univ. , Taiwan, Province of China ; Ouyang, Chaio-Fuei , National Central Univ. , Taiwan, Province of China ; Weng, Huahn-Tyng , National Central Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 595-600 ; In English

Contract(s)/Grant(s): NSC-87-2621-P-008-011 ; Copyright ; Avail: Issuing Activity

The pathways and kinetic behaviors of nitrogen compounds have been examined in biofilm channeling for the purification of Wastewater treated by the activated sludge process (ASP) under laminar and turbulent flow conditions. Tile continuous water flow experiments show that the flow velocity will significantly influence the nitrification and denitrification conversion rates. The optimal total Kjeldahl nitrogen (TKN-N) and total nitrogen (TN-N) removal rates can be achieved during the initial turbulent flow condition. Concentrations of TKN-N and TN-N variations in the biofilm channel follow zero order kinetics. In our 54-m biofilm channel, pathways of nitrogen compound conversions demonstrate that trapped suspended solids in the biofilm form an anoxic environment and are hydrolyzed to produce a carbon source, which may be the main reason for the occurrence of denitrification. The nitrification and denitrification processes occur simultaneously in the biofilm channel.

Author

Nitrogen Compounds ; Removal ; Activated Sludge ; Waste Water ; Biofilms

20020009767 NASA Ames Research Center , Moffett Field, CA USA

Volcanoes, Polar Clouds and Arctic Ozone

Tabazadeh, Azadeh , NASA Ames Research Center , USA ; [2001] ; 1p ; In English ; Gordon Research Conference , 16-22 Jun. 2001 , Newport, RI , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Satellite observations and model calculations show 5 to 10% local column ozone loss in some tropical and mid latitude locations, following El Chichon and Mount Pinatubo eruptions. The rapid deepening of the Antarctic ozone hole in the early 1980s has also been partially attributed to chemistry on volcanic aerosols from a number of large eruptions. Here the effects of volcanoes on Arctic polar processes are explored. Large polar stratospheric cloud particles that cause denitrification cannot form in a volcanically perturbed environment. Denitrification can increase Arctic ozone loss by up to 30% in a future colder climate. However, we show that enhanced chemical processing on volcanic aerosols can increase Arctic ozone loss in a cold year by about 60% independent of denitrification. A coupled chemistry-microphysics model is used to show that widespread distribution of volcanic aerosols in 2000 could have caused severe springtime ozone depletion in the Arctic stratosphere. While, volcanic aerosols can strongly affect the current Arctic column ozone abundance in a cold year, denitrification effects on ozone can only become important in a much colder lower stratosphere.

Author

Ozone ; Polar Meteorology ; Volcanoes ; Arctic Regions ; Aerosols ; Climatology

20020010118 Brookhaven National Lab. , Upton, NY USA

Representing aerosol dynamics and properties in chemical transport models by the method of moments

Schwartz, ; McGraw, ; Benkovitz, ; Wright, ; Apr. 01, 2001 ; 8p ; In English

Report No.(s): DE2001-777886 ; BNL-68149 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Atmospheric aerosols, suspensions of solid or liquid particles, are an important multi-phase system. Aerosols scatter and absorb shortwave (solar) radiation, affecting climate (Charlson et al., 1992; Schwartz, 1996) and visibility; nucleate cloud droplet formation, modifying the reflectivity of clouds (Twomey et al., 1984; Schwartz and Slingo, 1996) as well as contributing to composition of cloud water and to wet deposition (Seinfeld and Pandis, 1998); and affect human health through inhalation (NRC, 1998). Existing and prospective air quality regulations impose standards on concentrations of atmospheric aerosols to protect human health and welfare (EPA, 1998). Chemical transport and transformation models representing the loading and geographical distribution of aerosols and precursor gases are needed to permit development of effective and efficient strategies for meeting air quality standards, and for examining aerosol effects on climate retrospectively and prospectively for different emissions scenarios. Important aerosol properties and processes depend on their size distribution: light scattering, cloud nucleating properties, dry deposition, and penetration into airways of lungs. The evolution of the mass loading itself depends on particle size because of the size dependence of growth and removal processes. For these reasons it is increasingly recognized that chemical transport and transformation models must represent not just the mass loading of atmospheric particulate matter but also the aerosol microphysical properties and the evolution of these properties if aerosols are to be accurately represented in these models. If the size distribution of the aerosol is known, a given property can be evaluated as the integral of the appropriate kernel function over the size distribution. This has motivated the approach of determining aerosol size distribution, and of explicitly representing this distribution and its evolution in chemical transport models.
NTIS
Aerosols ; Particle Size Distribution ; Solar Radiation ; Cloud Physics

20020010120 Brookhaven National Lab. , Upton, NY USA
Representing aerosol dynamics and properties in chemical transport models by the method of moments
Schwartz, ; McGraw, ; Benkovitz, ; Wright, ; Apr. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-777872 ; BNL-68149 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Atmospheric aerosols, suspensions of solid or liquid particles, are an important multi-phase system. Aerosols scatter and absorb shortwave (solar) radiation, affecting climate (Charlson et al., 1992; Schwartz, 1996) and visibility; nucleate cloud droplet formation, modifying the reflectivity of clouds (Twomey et al., 1984; Schwartz and Slingo, 1996) as well as contributing to composition of cloud water and to wet deposition (Seinfeld and Pandis, 1998); and affect human health through inhalation (NRC, 1998). Existing and prospective air quality regulations impose standards on concentrations of atmospheric aerosols to protect human health and welfare (EPA, 1998). Chemical transport and transformation models representing the loading and geographical distribution of aerosols and precursor gases are needed to permit development of effective and efficient strategies for meeting air quality standards, and for examining aerosol effects on climate retrospectively and prospectively for different emissions scenarios. Important aerosol properties and processes depend on their size distribution: light scattering, cloud nucleating properties, dry deposition, and penetration into airways of lungs. The evolution of the mass loading itself depends on particle size because of the size dependence of growth and removal processes. For these reasons it is increasingly recognized that chemical transport and transformation models must represent not just the mass loading of atmospheric particulate matter but also the aerosol microphysical properties and the evolution of these properties if aerosols are to be accurately represented in these models. If the size distribution of the aerosol is known, a given property can be evaluated as the integral of the appropriate kernel function over the size distribution. This has motivated the approach of determining aerosol size distribution, and of explicitly representing this distribution and its evolution in chemical transport models.
NTIS
Aerosols ; Size Distribution ; Particulates ; Reflectance

20020010190 Argonne National Lab. , IL USA
Atmospheric Radiation Measurement Program Facilities Newsletter
Holdridge, D. J. ; Mar. 23, 2001 ; 2p ; In English
Report No.(s): DE2001-779801 ; ANL/ER/NL-01-03 ; No Copyright ; Avail: Department of Energy Information Bridge
The February 1998 issue of this newsletter discussed the Measurement of Pollution in the Troposphere (MOPITT) instrument that was to be tested at the SGP CART site before being launched aboard a NASA satellite to make precise, detailed measurements of tropospheric carbon monoxide and methane from space. The instrument was successfully launched on NASA's Terra satellite on December 18, 1999, by an Atlas IIAS rocket from Vandenberg Air Force Base in California and began collecting data at the end of February 2000. The instrument was designed by Dr. Jim Drummond, a physicist at the University of Toronto. The MOPITT Validation Exercise (MOVE) Campaign is schedule to take place at the SGP site from April 30 to May 18, 2001. Researchers will measure carbon monoxide by using instruments onboard the DOE Cessna Citation aircraft and other instruments located at the SGP CART. The data gathered will be compared with those collected by the MOPITT instrument to validate its performance thus

far. MOPITT, which is scheduled for a five-year mission, will provide the first long-term global measurements of carbon monoxide and methane gas levels in roughly the lowest 10 miles of the atmosphere. Carbon monoxide and methane and their roles as greenhouse gases in global warming are of great interest. Greenhouse gases can trap escaping heat from Earth's surface, potentially increasing atmospheric temperatures. Carbon monoxide is a by-product of combustion, resulting primarily from industrial processing or biomass burning. Carbon monoxide levels in the atmosphere have been rising, indicating a problem. Normally, carbon monoxide is removed from the atmosphere by the hydroxyl radical, which can react with and remove many pollutants from the air.
NTIS
Atmospheric Radiation ; Carbon Monoxide ; Methane ; Radiation Measurement ; Satellite Observation

20020010203 Pacific Northwest National Lab. , Richland, WA USA
Environmental Dynamics and Simulation ***Annual Report , 1999***
Foster-Mills, N. S. ; Apr. 01, 2000 ; 5p ; In English
Report No.(s): DE2001-781057 ; No Copyright ; Avail: Department of Energy Information Bridge
Environmental Dynamics and Simulation 1999 Annual Report.
NTIS
Environment Simulation ; Environmental Quality

20020010221 Department of Energy , Aiken, SC USA
Bioremediation of Petroleum Hydrocarbon-Contaminated Soils, Comprehensive Report
Altman, D. J. ; Jan. 12, 2001 ; 280p ; In English
Report No.(s): DE2001-782038 ; WSRC-RP-2000-00975 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The US Department of Energy and the Institute for Ecology of Industrial Areas, Katowice, Poland have been cooperating in the development and implementation of innovative environmental remediation technologies since 1995. U.S. experts worked in tandem with counterparts from the IETU and CZOR throughout this project to characterize, assess and subsequently, design, implement and monitor a bioremediation system.
NTIS
Soils ; Hydrocarbons ; Contamination ; Crude Oil

20020010385 Environmental Protection Agency , Washington, DC USA
Background Information Document: National Emission Standards For Hazardous Air Pollutants (NESHAP) for the Wood Building Products (Surface Coating) Industry
May 2001 ; 146p ; In English
Report No.(s): PB2001-108769 ; EPA/453/R-00/003 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
The purpose of this document is to summarize the background information gathered during the development of the wood building products (surface coating) National Emission Standards for Hazardous Air Pollution (NESHAP). The following sections provide additional details on the background of the wood building products (surface coating) source category, a summary of existing Federal/State/local regulations, and a brief summary of the project history.
NTIS
Air Pollution ; Coatings ; Pollution Control ; Wood ; Exhaust Emission

20020010578 NASA Goddard Space Flight Center , Greenbelt, MD USA
Retrieval of Black Carbon Absorption from Proposed Satellite Measurements Over the Ocean Glint
Kaufman, Y. J. , NASA Goddard Space Flight Center , USA ; Matins, J. V. , Maryland Univ. Baltimore County , USA ; Remer, L. A. , NASA Goddard Space Flight Center , USA ; Schoeberl, M. R. , NASA Goddard Space Flight Center , USA ; Yamasoe, M. A. , Sao Paulo Univ. , Brazil ; [2001] ; 6p ; In English ; Original contains color illustrations ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Haze and air pollution includes many chemicals that together form small particles suspended in the air called aerosols. One of the main ingredients found to affect climate and human health is Black Carbon. Black particles emitted from engines that do not burn the fuel completely, e.g. old trucks. Black carbon absorption of sunlight emerges as one of the key components of man-made forcing of climate. However, global characterization of black carbon emissions, distribution and pathways in which it can affect the amount of solar radiation absorbed by the atmosphere is very uncertain. A new method is proposed to measure sunlight absorption by fine aerosol particles containing black carbon over the ocean glint from a satellite mission designed for

this purpose. The satellite will scan the same spot over the ocean in the glint plane and a plane 40 degrees off-glint a minute apart, collecting measurements of the reflected light across the solar spectrum. First the dark ocean off the glint is used to derive aerosol properties. Then the black carbon absorption is derived prop the attenuation of the bright glint by the aerosol layer. Such measurements if realized in a proposed future mission - COBRA are expected to produce global monthly climatology of black carbon absorption with high accuracy (110 to 15%) that can show their effect on climate.
Author
Carbon ; Climatology ; Glint ; Ocean Surface ; Satellite Observation ; Absorption

20020010890 Northeastern Forest Experiment Station , Publications Group , Delaware, OH USA
Database for Chemical Contents of Streams on the White Mountain National Forest
Hornbeck, J. W. ; Alexander, M. M. ; Eagar, C. ; Carlson, J. Y. ; Smith, R. B. ; September 2001 ; 22p ; In English
Report No.(s): PB2002-100521 ; FSGTR-NE-282 ; NRS/01-11 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Producing and protecting high-quality streamwater requires background or baseline data from which one can evaluate the impacts of natural and human disturbances. A database was created for chemical analyses of streamwater samples collected during the past several decades from 446 locations on the White Mountain National Forest (304,000 ha in New Hampshire and Maine). The database is described and examples illustrating how the data can be used to examine ranges, trends, and relationships are included.
NTIS
Chemical Analysis ; Data Bases ; Streams ; Forests

20020010900 NASA Goddard Space Flight Center , Greenbelt, MD USA
A Comparison of Co-located Ozonesonde and Lidar Measurements
McGee, Thomas J. , NASA Goddard Space Flight Center , USA ; Twigg, L. , NASA Goddard Space Flight Center , USA ; Sumnicht, G. , NASA Goddard Space Flight Center , USA ; Gross, M. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; NDSC 2001 Symposium , 24-27 Sep. 2001 , Arcachon , France ; No Copyright ; Avail: Issuing Activity ; Abstract Only
As part of the NDSC, the GSFC mobile Ozone Lidar instrument has participated in numerous validation campaigns around the world. During all of these campaigns, ozonesondes were flown as part of the intercomparisons. This poster summarizes the results of these campaigns, and indicates that there are some biases between the sonde and lidar measurements.
Author
Optical Radar ; Ozone ; Sondes ; Radar Measurement

20020010901 NASA Goddard Space Flight Center , Greenbelt, MD USA
Polar Ozone Losses
Newman, Paul A. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; NDSC 2001 Symposium , 24-27 Sep. 2001 , Arcachon , France ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Since the discovery of the Antarctic ozone hole, a great deal of attention has been focused on the polar regions to both identify the chemistry and physics of the large losses, and to provide an understanding of the future of polar ozone. In this review talk, I will discuss the secular trends of ozone in both the Antarctic and Arctic regions, and I will review some of the principal research results of the last few years. In particular, I will emphasize some of the results from the SOLVE-THESEO 2000 campaign that occurred over the course of the winter of 1999-2000.
Author
Antarctic Regions ; Polar Regions ; Atmospheric Chemistry ; Ozone Depletion

20020010911 NASA Ames Research Center , Moffett Field, CA USA
Environmental Perturbations Caused by the Impacts of Comets and Asteroids on Earth
Toon, Owen B. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 1994 Fall Meeting of the American Geophysical Union , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA
Contract(s)/Grant(s): RTOP 154-30-80-16 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
The extinction mechanisms proposed at the Cretaceous-Tertiary geological boundary are reviewed and related to the impact of asteroids or comets in general. For impact energies below 10(exp 4) Megatons (less than 6 x 10(exp 4) years; asteroid diameter less than 650 m), blast, earthquake, and fire may destroy local areas up to 10(exp 5) square m. Tidal waves could flood a kilometer inland over entire ocean basins. The energy range from 105 to 106 Megatons (less than 2 x 10(exp 6) years; asteroid diameter less than 3 km) is transitional. Dust lifted, sulfur released from within impacting asteroids, and soot from fires started by comets can

produce climatologically significant optical depths of 10. At energies beyond 10(exp 7) Megatons, blast and earthquake damage is regional (10(exp 6) square cm). Tsunami cresting to 100 m and flooding 20 km inland will sweep the coastal zones of the world's oceans. Fires will be set globally. Light levels may drop so low from the smoke, dust and sulfate that vision is not possible. At energies approaching 10(exp 9) Megatons the ocean surface waters may be acidified by sulfur. The combination of these effects would be devastating.
Author
Cretaceous-Tertiary Boundary ; Cometary Collisions ; Asteroid Collisions ; Earth (Planet)

20020010962 Federal Energy Technology Center , Morgantown, WV USA
Electrostatic surface structures of coal and mineral particles
Mazumder, M. K. ; Lindquist, D. A. ; Tennal, K. B. ; Apr. 01, 1999 ; 29p ; In English
Report No.(s): DE2001-780839 ; DE-FG22-96PC96202-05 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We have developed a video image analyzer for measuring the size and charge of airborne particles. Particles are illuminated by laser light and subjected to a sinusoidal electric field while images of the trajectories of the particles are captured using a video camera and a frame grabber. Analysis of the particle tracks allows the size and charge of the particles to be determined. The instrument can be used to measure size and charge spectra of charged coal and mineral particles in real time. Appendix I shows size and charge distributions of coal and flyash particles measured with the image analyzer. A second instrument, an Ultraviolet Photoelectron Spectrometer (UPS) for measuring effective work functions of insulator and semiconductor surfaces in air is under development. Work function data for individual macerals and minerals in a coal matrix will be related to triboelectric charging properties. In this instrumental method, originally developed by Kirhata, the surface of a test sample is bombarded by monochromatic ultraviolet light of known wavelength. At atmospheric pressure, the photo-ejected electrons attach to air molecules forming negative ions. The ions are attracted by an applied electric field into a detector where they are accelerated to sufficient energy that they cause momentary dielectric breakdown or discharge in the air inside the detector. The rate at which these discharges occur is proportional to the rate at which photoelectrons are generated at the sample surface. From a plot of the discharge rate as a function of photon energy the minimum energy needed to remove an electron can be determined. The mechanical components of our instrument have been completed. A number of electronic circuit difficulties remain to be solved. The counting circuits are able to produce a count rate proportional to the ion concentration generated using a corona gun. However, when the high voltage accelerating potential is applied the circuit oscillates preventing proper operation. Our current focus on this instrument is to attain stability of operation.
NTIS
Coal ; Electrostatics ; Particulates ; Surface Properties ; Image Analysis

20020011017 NASA Goddard Space Flight Center , Greenbelt, MD USA
Results and Validation of MODIS Aerosol Retrievals Over Land and Ocean
Remer, Lorraine , NASA Goddard Space Flight Center , USA ; [2001 ; 1p ; In English , 18 Apr. 2001 , Fort Collins, CO , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The MODerate Resolution Imaging Spectroradiometer (MODIS) instrument aboard the Terra spacecraft has been retrieving aerosol parameters since late February 2000. Initial qualitative checking of the products showed very promising results including matching of land and ocean retrievals at coastlines. Using AERONET ground-based radiometers as our primary validation tool, we have established quantitative validation as well. Our results show that for most aerosol types, the MODIS products fall within the pre-launch estimated uncertainties. Surface reflectance and aerosol model assumptions appear to be sufficiently accurate for the optical thickness retrieval. Dust provides a possible exception, which may be due to non-spherical effects. Over ocean the MODIS products include information on particle size, and these parameters are also validated with AERONET retrievals.
Author
Aerosols ; Imaging Spectrometers ; Oceans ; Spectroradiometers ; Atmospheric Models ; Land ; Surface Properties

20020011036 Atmospheric and Environmental Research, Inc. , Lexington, MA USA
Interannual Variability in the Meridional Transport of Water Vapor
Cohen, Judah L. , Atmospheric and Environmental Research, Inc. , USA ; Salstein, David A. , Atmospheric and Environmental Research, Inc. , USA ; Rosen, Richard D. , Atmospheric and Environmental Research, Inc. , USA ; Journal of Hydrometeorology ; December 2000 ; Volume 1 , pp. 547-553 ; In English
Contract(s)/Grant(s): NAS5-98179 ; Copyright ; Avail: Issuing Activity

The zonal-mean meridional transport of water vapor across the globe is evaluated using the National Centers for Environmental Prediction-National Center for Atmospheric Research (NCEP-NCAR) reanalysis for 1948-97. The shape of the meridional profile of the climatological mean transport closely resembles that of previous mean climate descriptions, but values tend to be notably larger than in climatologies derived from radiosonde-only-based analyses. The unprecedented length of the NCEP-NCAR dataset invites a focus on interannual variations in the zonal-mean moisture transport, and these results for northern winter are highlighted here. Although interannual variability in the transport is typically small at most latitudes, a significant ENSO signal is present, marked by a strengthening of water vapor transports over much of the winter hemisphere during warm events. Because of an increase in tropical sea surface temperatures and in the frequency of warm events relative to cold events in the latter half of the 50-yr record, this interannual signal projects onto an overall trend toward enhanced meridional moisture transports in the global hydrological cycle.
Author
Annual Variations ; Water Vapor ; Hydrological Cycle

20020011168 Office of Air Quality Planning and Standards , Research Triangle Park, NC USA
Source Characterization for Sewage Sludge Incinerators. Final Emissions Report Volume 2 of 3 Appendix A-Appendix J. Metropolitan Sewer District (MSD) Mill Creek Wastewater Treatment Plant Cincinnati, Ohio ***Final Report***
September 2000 ; 496p ; In English
Report No.(s): PB2001-108240 ; EPA/454/R-00/038C ; No Copyright ; Avail: National Technical Information Service (NTIS)
The Clean Air Act Amendments of 1990 require the U.S. Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS) to establish standards of performance for sewage sludge incineration. The test report summarizes testing of a multiple hearth incinerator at the Metropolitan Sewer District (MSD) Mill Creek Wastewater Treatment Plant in Cincinnati, Ohio in July, 1999. The emission data collected in this test program will be used by EPA/OAQPS and EPA's Office of Water (OW) to support a decision about further data gathering efforts in support of MACT (Maximum Achievable Control Technology) standards for sewage sludge incinerators. During the testing, a second EPA contractor monitored and recorded the process and emission control system operating parameters, and prepared Section 4.0, Process Description And Operation of the report. The report consists of five documents: Executive Summary Report; Volume I-Main Report; Volume II-Appendices A-J; Volume III-Appendices K-P. and a Data Quality Assessment Report. This is Volume III.
NTIS
Air Quality ; Incinerators ; Exhaust Emission ; Sewage ; Sludge ; Air Pollution ; Regulations

20020011620 Department of Energy , Richland, WA USA
Project W-420 Stack Monitoring system upgrades conceptual design report
Tuck, J. A. ; Nov. 06, 1998 ; 90p ; In English
Report No.(s): DE2001-11280 ; HNF-SD-W420-CDR-001-REV-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This document describes the scope, justification, conceptual design, and performance of Project W-420 stack monitoring system upgrades on six NESHAP-designated, Hanford Tank Farms ventilation exhaust stacks.
NTIS
Radioactive Wastes ; Systems Engineering

20020011715 Pacific Northwest National Lab. , Richland, WA USA
Adopting a Long View to Energy R and D and Global Climate Change
Doley, J. J. ; Runci, P. J. ; Aug. 09, 1999 ; 17p ; In English
Report No.(s): DE2001-9516 ; PNNL-12115 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In this paper, we present findings indicative of important, ongoing changes in the energy research and development (R&D) investment portfolios of major OECD nations. We seek to explain the drivers of these changes and discuss their implications for the worlds ability to deal with future R&D-intensive energy challenges, such as global climate change. We also consider possible implications of changes in individual countries energy R&D portfolios for international energy R&D collaboration among OECD countries themselves, and between OECD and developing countries. We conclude that the level of investment in energy R&D in the OECD is likely insufficient to meet the energy R&D challenges of climate change. A long-term, strategic approach would aim to broaden both the amount of resources devoted to energy R&D and the geographical scope of the global energy R&D

infrastructure. A successful strategy will account for large-scale changes in demographics and energy use over the coming decades will drive the development of indigenous energy R&D capabilities in developing countries.
NTIS
Energy Technology ; Research and Development ; Climate Change

20020011717 National Renewable Energy Lab. , Golden, CO USA
Calgrid photochemical modeling of air quality impacts of alternative transportation fuel use in los angeles
Moore, G. E. ; Londergan, R. J. ; Fernau, M. E. ; Nov. 19, 1998 ; 189p ; In English
Report No.(s): DE2001-9527 ; NREL/SR-540-25204 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The National Renewable Energy Laboratory has been conducting a comprehensive program to quantify and assess the air quality impacts of the emissions of ozone precursors, air toxins, and greenhouse gases from alternative fuel vehicles. This program includes both an emissions estimation component and a photochemical modeling component to study three fuels: reformulated gasoline, compressed natural gas, and 85% methanol (M85). This report describes the use of the CALGRID model in the Los Angeles modeling domain using the State-Wide Air Pollution Research Center (SAPRC90) chemical mechanism and an early version of the SAPRC93 mechanism. A variety of conclusions can be drawn from the results of this study, including results from chemical mechanism testing; development of meteorological inputs; model evaluation and comparison; and the analyses of the impacts of the emissions scenarios. The report summarizes the study's major findings in these areas.
NTIS
Air Pollution ; Air Quality ; Mathematical Models ; Gasoline

20020011738 Texas Univ. , Dept. of Chemical Engineering , Austin, TX USA
Chlorine Absorptions in S(IV) Solutions ***Final Report , Jun. 1999 - Dec. 2000***
Roy, S. ; Rochelle, G. T. ; August 2001 ; 72p ; In English
Report No.(s): PB2001-107826 ; No Copyright ; Avail: National Technical Information Service (NTIS)

The report gives results of measurements of the rate of chlorine (C12) absorption into aqueous sulfite/bisulfite-S(IV)-solutions at ambient temperature using a highly characterized stirred-cell reactor. The reactor media were 9 to 10 mM S(IV) with pHs of 3.5-8.5. Experiments were performed using 20-300 ppm C12 in nitrogen (N2) or air. C12 absorption was modeled using the theory of mass transfer with chemical reaction. C12 reacts quickly with S(IV) to form chlorine and sulfate. C12 absorbtion is enhanced by increasing pH and S(IV) concentration. The rate constant for the reaction of C12 with S(IV) was too rapid to be precisely measured using the existing stirred-cell reactor, due to mass transfer limitations. However, the most probable value of the rate constant was determined to be 2 x 10(exp 9)L/mol-s. These results are relevant to the simultaneous removal of C12, sulfur dioxide, and Hg should be possible with the injection of 1-10 ppm C12 to an existing limestone slurry scrubber. These results may also be applicable to scrubber design for removal of C12 in the pulp and paper and other industries.
NTIS
Chlorine ; Absorption ; Carbon 12 ; Sulfites ; Aqueous Solutions ; Sulfates ; Reaction Kinetics

20020011743 Oak Ridge National Lab. , TN USA
Environmental Technology Verification Report: TNT Detection Technology. Texas Instruments Spreeta (Trade Name) Sensor
Dindal, A. B. ; Banyne, C. K. ; Jenkins, R. A. ; Koglin, E. N. ; September 2001 ; 44p ; In English ; Sponsored by Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2002-100441 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Spreeta is an integrated, miniaturized sensor platform which employs surface plasmon resonance (SPR) to detect changes in refractive index within a few thousand angstroms of the active gold surface. Specificty is provided by placing a thin biofilm on the sensor surface. For example, by placing an antibody to fluorescein on the sensor surface, the binding of fluorosceinated proteins, seen as a local increase in refractive index, is simply performed. SPR has been used in this way to study biomolecular binding events for more than a decade, but Spreeta is the first miniaturized SPR platform. TNT detection is most efficiently performed by methods other than direct binding. This is because on a molecule-for-molecule basis, small molecules are much less effective than large molecules at changing refractive index; thus, any direct SPR assay can detect large molecules at a lower concentration than it can detect small molecules. For this reason, Texas Instruments has developed a robust inhibition assay in which the presence of two TNT molecules (228 daltons) effectively inhibits the binding of one antibody molecule (I 50,000 daltons). to analyze a sample, 0.5g of soil is extracted in an aqueous solution. The assay starts with a conjugate of trinitrobenzene (TNB) and bovine serum albumin on the gold sensing surface. Assays are then performed by exposing that sensing surface to an

anti-TNT antibody solution which may or may not contain free TNT. When free TNT is present, it binds to anti-TNT antibodies in solution and thereby keeps them from binding to the surface-bound TNT analog. This inhibited binding is compared to a reference run where the antibody solution did not contain free TNT. Results from this assay are reported as interval data (i.e., the concentration of TNT is between 0.3 and 0.9 rng/kg). The lowest reporting interval was 0 to 0.3 mg/kg.
NTIS
Antibodies ; Detection ; Trinitrotoluene ; Assaying ; Miniaturization ; Environment Pollution ; Surfactants

20020011746 Research Triangle Inst. , Research Triangle Park, NC USA
National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coke Ovens: Pushing, Quenching, and Battery Stacks: Background Information for Proposed Standards. Marvin Branscome and Sandra Burns, RTI and Lula Melton *Final Report*
Branscome, M. ; Burns, S. ; Melton, L. ; February 2001 ; 228p ; In English
Report No.(s): PB2002-100520 ; EPA/453/R-01/006 ; No Copyright ; Avail: National Technical Information Service (NTIS)
This document summarizes the background information used in the development of MACT standards for the coke ovens: pushing, quenching, and battery stacks source category. All references cited in this document are available in EPA Docket A-2000-34. In addition, this document will be supplemented by technical memoranda that document steps in the standards development process not covered in this compilation of background information. The remainder of this chapter provides a summary of the statutory basis for MACT standards and the selection of this source category for rulemaking. Chapter 2 provides an overview of the industry and cokemaking process. Emission points and emission control technologies and their performance are summarized in Chapter 3. Chapter 4 presents the determination of the MACT floor. Model plants (for use in estimating potential impacts) and options for emission control and monitoring are discussed in Chapter 5. Environmental and energy impacts are estimated for the model plants and for all plants nationwide in Chapter 6. The estimated costs for emission control and monitoring are given in Chapter 7. Appendices A, B, and C summarize the emissions data.
NTIS
Air Pollution ; Exhaust Emission ; Standards ; Pollution Control ; Industrial Plants

20020011861 ARCADIS Geraghty and Miller, Inc. , Research Triangle Park, NC USA
Seasonal Emissions of Ammonia and Methane from a Hog Waste Lagoon with Bioactive Cover
Natschke, D. ; Hashmonay, R. A. ; Wagoner, K. ; Harris, D. B. ; Thompson, E. L. ; 2000 ; 12p ; In English
Report No.(s): PB2002-100282 ; No Copyright ; Avail: National Technical Information Service (NTIS)
Plane-integrated (PI) open-path Fourier transform infrared spectrometry (OP-FTIR) has been used to measure the flux of ammonia and methane from a hog waste lagoon before and after the installation of a bioactive cover. A computed tomography algorithm using a smoothed basis function converts the measured PI concentrations into a plume profile. Simultaneously collected wind data are integrated across the plume to yield the emission flux. Seasonal data are reported, beginning with summer data collected before and after the cover installation through the following spring. Emission data from the naturally ventilated finishing barn feeding this lagoon are also presented.
NTIS
Emission ; Algorithms ; Wind Measurement ; Infrared Spectroscopy ; Infrared Spectra

20020011862 Georgia Inst. of Tech. , School of Civil and Environmental Engineering , Atlanta, GA USA
Initial Application of the Adaptive Grid Air Pollution Model
Odman, M. T. ; Khan, M. N. ; Srivastava, R. K. ; McRae, D. S. ; 2001 ; 14p ; In English ; NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Application , 15-19 Oct. 2001 , Louvalin-la-Neuve , Belgium
Report No.(s): PB2002-100283 ; No Copyright ; Avail: National Technical Information Service (NTIS)
The paper discusses an adaptive-grid algorithm used in air pollution models. The algorithm reduces errors related to insufficient grid resolution by automatically refining the grid scales in regions of high interest. Meanwhile the grid scales are coarsened in other parts of the domain that are of lesser interest. This ensures a near-optimal use of available computational resources at all times during the simulation. The movement of the grid is controlled by a weight function formed as a linear combination of errors in various pollutant species. The user defines which species should be included in the weight-function calculation. After a brief description of the adaptive-grid model, the paper discusses its performance in an initial application to an ozone episode that occurred in the Tennessee Valley during July 1995. A mesoscale model at 4-km resolution over the region

provided the meteorological inputs. The estimated ozone levels are compared to the observations from the Aerometric Information Retrieval System (AIRS) network for verification of the model.
NTIS
Air Pollution ; Computational Grids ; Mesoscale Phenomena ; Environment Models

20020011863 Environmental Protection Agency , National Exposure Research Lab. , Research Triangle Park, NC USA
Modeling Air Toxics and PM2-5 Concentration Fields as a Means for Facilitating Human Exposure Assessments
Ching, J. ; Lacser, A. ; Otte, T. ; Byun, D. ; Herwehe, J. ; 2001 ; 14p ; In English ; 10th ; Transport and Air Pollution , 17-19 Sep. 2001 , Boulder, CO , USA
Report No.(s): PB2002-100286 ; EPA/600/A-01/077 ; No Copyright ; Avail: National Technical Information Service (NTIS)
The capacity of the US EPA Models-3/Community Multiscale Air Quality (CMAQ) modeling system is extended to provide gridded ambient air quality concentration fields at fine scales. These fields will drive human exposure to air toxics and fine particulate matter models, and ultimately influence implementation of ambient air quality regulatory standards. Sub-grid variability of the pollutant distribution serves as ancillary information for exposure assessments and 'hot-spot' analyses to assess impacts of various sources of air toxic pollutants. This paper describes the modeling enhancements to the existing CMAQ, as well as the strategy the authors are exploring to provide the sub-grid scale details that fulfill the proposed model design requirements and functionality.
NTIS
Air Quality ; Public Health ; Environment Models ; Ambience ; Variability

20020011864 Environmental Protection Agency , National Exposure Research Lab. , Research Triangle Park, NC USA
Preliminary Evaluation of Models-3 CMAQ Using Particulate Matter Data from the IMPROVE Network
Eder, B. K. ; Mebust, M. R. ; LeDuc, S. K. ; 2001 ; 12p ; In English
Report No.(s): PB2002-100287 ; EPA/600/A-01/076 ; No Copyright ; Avail: National Technical Information Service (NTIS)
The Clean Air Act and its Amendments require the USA Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards for Particulate Matter (PM) and to assess current and future air quality regulations designed to protect human health and welfare. Air quality models, such as EPA's Models-3 Community Multiscale Air Quality model (CMAQ) (Byun and Ching, 1999), provide one of the most reliable tools for performing such assessments. CMAQ simulates air concentrations and deposition of various pollutants including PM. In order to determine its value to the air quality regulatory communities, CMAQ needs to be evaluated using observational data.
NTIS
Air Quality ; Aerosols ; Ambience ; Contaminants ; Environment Models ; Environment Protection

20020011865 Environmental Protection Agency , National Risk Management Research Lab. , Research Triangle Park, NC USA
Development and Evaluation of Mercury CEMS for Combustion Emissions Monitoring
Ryan, J. V. ; Aug. 12, 2001 ; 12p ; In English ; 17th Annual Waste Testing and Quality Assurance Symposium , 15 Aug. 2001 , Arlington, VA , USA
Report No.(s): PB2002-100290 ; EPA/600/A-01/079 ; No Copyright ; Avail: National Technical Information Service (NTIS)
Continuous emission monitoring systems (CEMS) for mercury (Hg) are receiving increased attention and focus. Their potential use as a compliance assurance tool is of particular interest. While Hg CEMs are currently used in Europe for compliance purposes, use of Hg CEMS in the USA (U.S.) has focused on combustion research and Hg control technology evaluation applications. Hg CEMS are now receiving increased attention as compliance assurance tools. Several programs exist to evaluate Hg CEM measurement performance. It is through these efforts that application-specific measurement issues are investigated. Collectively, these efforts have served to advance the state-of-the-art of the technology as evidenced by the number and types of CEMS now available and the various applications in use.
NTIS
Air Pollution ; Combustion Control ; Combustion Products ; Emission ; Mercury (Metal)

20020012217 NASA Langley Research Center , Hampton, VA USA
Observation of Pollution Plume Capping by a Tropopause Fold
Cho, John Y. N. , Massachusetts Inst. of Tech. , USA ; Newell, Reginald E. , Massachusetts Inst. of Tech. , USA ; Browell, Edward V. , NASA Langley Research Center , USA ; Grant, William B. , NASA Langley Research Center , USA ; Butler, Carolyn F. , Science Applications International Corp. , USA ; Fenn, Marta A. , Science Applications International Corp. , USA ; Geophysical Research Letters ; Sep. 01, 2001 ; ISSN 0094-8276 ; Volume 28 , No. 17 , pp. 3243-3246 ; In English ; Original contains color

illustrations
Contract(s)/Grant(s): NAG1-2306
Report No.(s): Paper-2001GL012898 ; Copyright ; Avail: Issuing Activity
Airborne lidar measurements reveal a case in which a layer of high-ozone air extruding from a tropopause fold appears to cap a pollution plume and force it to spread out in the lower troposphere. The morphology of the high-ozone layer resembles a three-dimensional model of tropopause fold evolution that produces a low-altitude potential vorticity tube. This is a mechanism that can complete the irreversible transfer of air from the stratosphere, and can also affect pollution levels at the surface if the capping layer reaches the top of the boundary layer.
Author
Plumes ; Boundary Layers ; Tropopause ; Optical Radar ; Radar Measurement

20020012223 Department of Energy , Aiken, SC USA
Determining Radionuclide Emissions from Unmonitored Sources
Thompson, M. C. ; Oct. 07, 1999 ; 14p ; In English
Report No.(s): DE2001-13801 ; WSRC-TR-95-0378-Rev-1 ; No Copyright ; Avail: Department of Energy Information Bridge
This document presents standard methods to be used in the calculation of air emissions from unmonitored sources.
NTIS
Radioactive Isotopes ; Exhaust Emission ; Environment Pollution ; Energy Technology

20020012241 Lawrence Livermore National Lab. , Livermore, CA USA
Formation of aromatics and PAH's in laminar flames
Marinov, N. M. ; Pitz, W. J. ; Westbrook, C. K. ; Apr. 01, 1999 ; 7p ; In English
Report No.(s): DE2001-13086 ; UCRL-JC-133569 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The formation of aromatics and PAH's is an important problem in combustion. These compounds are believed to contribute to the formation of soot whose emission from diesel engines is regulated widely throughout the industrial world. Additionally, the USA Environmental Protection Agency regulates the emission of many aromatics and PAH species from stationary industrial burners, under the 1990 Clean Air Act Amendments. The above emission regulations have created much interest in understanding how these species are formed in combustion systems.
NTIS
Polycyclic Aromatic Hydrocarbons ; Combustion Products ; Regulations ; Environment Protection

20020012264 Center for Mathematics and Computer Science , Amsterdam Netherlands
Numerical Time Integration for Air Pollution Models. Modelling, Analysis and Simulation
Verwer, J. G. ; Hundsdorfer, W. H. ; Blom, J. G. ; Nov. 1998 ; 66p ; In English
Report No.(s): PB2001-108513 ; MAS-R9825 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche
Due to the large number of chemical species and the three space dimensions, off-the-shelf stiff ODE integrators are not feasible for the numerical time integration of stiff systems of advection-diffusion-reaction equations from the field of air pollution modeling. This has led to the use of special time integration techniques. This paper is devoted to a survey of such techniques, encompassing stiff chemistry solvers, positive advection schemes, time or operator splitting, implicit-explicit methods and approximate matrix factorization solutions. of great importance in practice is high performance computing due to the huge problem scales, in particular for global models. We will therefore also report on experiences with vector/parallel shared memory and massively parallel distributed memory architectures and clusters of workstations. The survey is not entirely unique to air pollution models and biased towards work done at CWI over approximately the last 5 years.
NTIS
Air Pollution ; Atmospheric Models ; Diffusion ; Distributed Memory ; Environment Models ; Reaction Kinetics

20020012277 Texas Univ. , Center for Transportation Research , Austin, TX USA
Modeling Soak-Time Distribution of Trips for Mobile Source Emissions Forecasting: Techniques and Applications ***Topical Report , Sep. 1999 - May 2000***
Nair, H. S. , Texas Univ. , USA ; Bhat, C. R. , Texas Univ. , USA ; Aug. 2000 ; 42p ; In English
Report No.(s): PB2001-108554 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The soak-time of vehicle trip starts is defined as the duration of time in which the vehicle's engine is not operating and that precedes a successful vehicle start. The temporal distribution of the soak-time in an area is an important determinant of area-wide mobile source emissions. In the current paper, we formulate and implement a methodology for modeling soak-time durations. The

methodology involves estimation of models using vehicle trip data from household travel surveys and supplementary zonal demographic/land-use data. The effectiveness of the methodology lies in its easy application at the traffic zonal level within a metropolitan region to obtain zone-specific soak-time distributions by time-of-day and origin activity purpose. The methodology is applied to estimate soak-time duration models for the Dallas-Fort Worth area of Texas.
NTIS
Temporal Distribution ; Exhaust Gases ; Exhaust Emission ; Texas

20020012278 Environmental Protection Agency , National Risk Management Research Lab. , Research Triangle Park, NC USA
Chamber Simulation of Fine Particle Penetration into Houses
Mosley, R. B. ; Greenwell, D. J. ; 2001 ; 20p ; In English
Report No.(s): PB2001-108527 ; No Copyright ; Avail: National Technical Information Service (NTIS)

Exposure to fine particles of outdoor origin has garnered increased interest of late. A number of recent studies have shown a correlation of negative health effects with increases in outdoor fine particles. Since people spend up to 90% of their time indoors, the relationship between indoor and outdoor fine particles has taken on added significance. This paper describes some results from a study in which the processes of particle removal from infiltrating air by building envelopes are simulated in a chamber. The chamber consists of two compartments, each having a volume of 19 cu m. Particles with aerodynamic diameters in the range of 0.015 to 5 um are generated in one compartment and then transported through simulated leakage paths to the other compartment under the action of applied pressure differentials. The simulated leakage paths described in this paper consist of horizontal slits (0.508 mm high, 102 mm deep, and 433 mm wide) between aluminum plates. The penetration factor for each size particle is determined by simultaneously measuring the concentrations in the two compartments as a function of time. The penetration factor is obtained through a mathematical solution of the mass balance equations. The measured values of penetration are compared to predictions of a mathematical model describing deposition by the mechanisms of settling and diffusion. At applied pressures of 2 Pa, only 5% of 0.01 um particles and 60% of 0.025 um particles pass through the 0.508 mm high slits. At a pressure of 5 Pa, 30% of 0.01 um particles and 80% of 0.025 um particles pass through the slits. At 10 Pa, 54% of 0.01 um particles and 90% of 0.025 um particles pass through the slits. At 20 Pa, 72% of 0.01 um particles and 94% of 0.025 um particles pass through the slits.
NTIS
Particulates ; Penetration ; Buildings ; Indoor Air Pollution

20020012429 Atmospheric and Environmental Research, Inc. , Lexington, MA USA
Momentum and Energy Assessments with NASA and Other Model and Data Assimilation Systems ***Final Report , 14 Oct. 1998 - 14 Oct. 2001***
Salstein, David , Atmospheric and Environmental Research, Inc. , USA ; Nelson, Peter , Atmospheric and Environmental Research, Inc. , USA ; Hu, Wen-Jie , Atmospheric and Environmental Research, Inc. , USA ; November 2001 ; 70p ; In English
Contract(s)/Grant(s): NAS5-98179
Report No.(s): AER-P0785 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Aspects of the angular momentum cycle, energetics, and related diagnostics from a number of models, including some from the Goddard Laboratory for Atmospheres, and from the Atmospheric Model Intercomparison Project (AMIP) are examined. Torques that dynamically excite changes in angular momentum, including strong torques at mountains were studied. The measure of how atmospheric mass from a strong weather signal can notably change the angular momentum is studied. For AMIP, there is a spread in the angular momentum amongst models, while the GLA model does reasonably well compared to the other models in the diagnostics examined, namely angular momentum and water vapor. Trends and interannual variability in water vapor over a lengthy period was examined. The role of the diabatic heating components, especially latent heating, in the energy cycle and the terms converting available potential energy to kinetic energy, among other parts of the energy cycle, are studied. Modes of climate of the atmosphere, especially the Arctic and North Atlantic Oscillations, are analyzed as well.
Author
Angular Momentum ; Data Systems ; Kinetic Energy ; Torque ; Atmospheric Models

46
GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20020005972 Stewart Radiance Lab. , Bedford, MA USA
A Rocket Investigation of Mesospheric Eddy Diffusion Effects on Airglow and Oxygen Chemistry ***Final Report***
Ulwick, James C. , Stewart Radiance Lab. , USA ; Nov. 30, 2001 ; 22p ; In English
Contract(s)/Grant(s): NAG5-5046 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A Terrier Orion rocket was launched at 0750 Z on 02/25/98 about seven minutes after the Clemson University chemical release rocket. Measurements made of the electron density by a dc probe calibrated by a capacitance probe showed several layers of electron density on a rocket ascent in the altitude range from 90 to 110 km. Rocket descent results showed several but not all of the ascent structure. From power spectral analysis of the measured electron densities, turbulent parameters are derived Measurements were made on rocket ascent and descent by an infrared radiometer of the OH Meinel (3-1) band and O2 singlet delta emissions. Profiles of the emissions are presented and discussed on both rocket ascent and descent an enhancement of the OH emission monitored by the OH radiometer was observed above 90 km. The glow was not defected by the O2 radiometer and was significantly reduced on rocket descent. Using these data and a mechanistic analysis, a profile proportional to atomic oxygen is obtained. This profile is compared to one from the ATOX probe on the rocket. A one-dimensional (1-D) photochemical model that solves the time-dependent continuity equations is used with the rocket data to investigate the odd-oxygen concentration in the near equatorial mesosphere.
Author
Diffusion ; Oxygen ; Mesosphere ; Electron Density (Concentration) ; Time Dependence

20020005973 Communications Research Lab. , Japan
Geodetic Results from Domestic VLBI Observations
Koyama, Yasuhiro , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 13-16 ; In Japanese ; Copyright ; Avail: Issuing Activity

The 34-m and 26-m antenna systems at Kashima Space Research Center have both played important roles in the history of domestic VLBI observations for geodetic purposes in Japan. They have also contributed to the research and development of the observation systems, data-processing systems, and data-analysis systems used for these observations. This paper reviews the results and significant achievements of domestic VLBI observations.
Author
Antenna Design ; Data Processing ; Very Long Base Interferometry

20020006052 Communications Research Lab. , Japan
Radio Science Results: An Evaluation of Atmospheric Gradient Using Water Vapor Radiometers in Kashima, Japan
Ichikawa, Ryuichi , Communications Research Lab. , Japan ; Ohkubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 99-106 ; In Japanese ; Copyright ; Avail: Issuing Activity

Anisotropic mapping functions are considered a powerful tool for removing the effects of atmospheric variability from GPS and VLBI analyses. The simple linear form of atmospheric model used in the mapping functions is not always appropriate in the context of intense mesoscale phenomena. In June 1998, we initiated a field experiment for detecting and characterizing water vapor variations using water vapor radiometer (WVR) at the KSP Kashima site to validate the estimated atmospheric gradient from GPS analysis. Comparison of the mean characteristics from GPS data collected in 1998 and 1999 and the WVR observations at the same time shows common mean southeast gradient. However, comparison of the day-to-day characteristics reveals inconsistency of the phase and amplitude of the time series between both estimated vectors. Though the gradient of hydrostatic delay and the mesoscale phenomena are likely candidates to cause the inconsistency, more detailed investigation will be required.
Author
Evaluation ; Anisotropy ; Mapping ; Atmospheric Models ; Atmospheric Turbulence ; Time Series Analysis

20020006055 Communications Research Lab. , Japan

Operations and Results of J-NET (Japanese Domestic VLBI Network)

Omodaka, Toshihiro , Communications Research Lab. , Japan ; Kameya, Osamu , Communications Research Lab. , Japan ; Miyoshi, Makoto , Communications Research Lab. , Japan ; Miyaji, Takeshi , Communications Research Lab. , Japan ; Sasao, Tetsuo , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 23-29 ; In Japanese ; Copyright ; Avail: Issuing Activity

J-Net (Japanese VLBI Network) is the only Japanese one VLBI network that is available for general use by Japanese researchers. It consists of three antennas belonging to the National Astronomical Observatory, Japan (Nobeyama Radio Observatory, 45-m antenna, Mizusawa Astrogeodynamics Observatory, 10-m antenna, and Kagoshima, 6-m antenna), and one antenna belonging to the Communications Research Laboratory (Kashima Space Center, 34-m antenna) participating as the base of research collaboration in the joint venture with the National Astronomical Observatory. The J-Net started to use the 22-GHz band for general purpose observations in 1994. J-Net has been used mainly for imaging VLBI observations, with several milliarcseconds resolution, of water-vapor masers of star-forming regions and late type stars. The contribution of the J-Net to Japanese VLBI research activity has been large.
Author

Imaging Techniques ; Late Stars ; Masers ; Very Long Base Interferometry

20020006056 Geographical Survey Inst. , Very Long Baseline Interferometry Group , Japan

Geodetic VLBI Activities at GSI

Fukuzaki, Yoshihiro , Geographical Survey Inst. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 17-22 ; In Japanese ; Copyright ; Avail: Issuing Activity

The Geographical Survey Institute (GSI) has carried out a geodetic Very Long Baseline Interferometry (VLBI) experiment for the purpose of correction of the position of the geodetic control points in Japan and detection of plate motion and crustal deformation around Japan. In 1981, GSI introduced a mobile VLBI system in cooperation with the Communication Research Laboratory (CRL). From 1986 to 1993, the mobile VLBI system was used for the VEGA (VLBI Experiment for Geodetic Application) project. The most significant result of the VEGA project was the first detection of the motion of Philippine Sea plate. GSI also carried out a VLBI experiment between Japan and Korea in 1995 by transporting the mobile system with a 3.8-m antenna to Korea. Ownership of the Kashima 26m antenna was transferred from CRL to GSI in 1994. Using the Kashima 26-m antenna GSI participated in an international global experiment. The coordinates of the Kashima 26-m antenna in the International Terrestrial Reference Frame are the primary reference point of new geodetic datum. GSI now has a VLBI network consisting of five stations in Japan, and periodically carries out VLBI experiments using the network. The Kashima 26-m antenna, which is more than 30 years old, has been replaced by the Tsukuba station in the international global experiment which is now the key station of the domestic VLBI network.
Author

Crustal Fractures ; Geodesy ; Surveys ; Very Long Base Interferometry

20020006057 Communications Research Lab. , Japan

VLBI Observation Results: International VLBI Experiments

Kondo, Tetsuro , Communications Research Lab. , Japan ; Yoshino, Taizoh , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 3-11 ; In Japanese ; Copyright ; Avail: Issuing Activity

The 26-m and 34-m antennas at the Kashima Space Research Center play a big role not only in the advancement of radio astronomy in Japan, but also in the geodetic very long baseline interferometry (VLBI) field throughout the world. In 1985, the motion of the Pacific plate was successfully measured by VLBI for the first time in history. Kashima also participated in the international experiment that aimed at measuring wobbling and the rotation of the earth precisely in parallel. Since that experiment, Kashima has participated in a number of international VLBI experiments and has contributed to the construction of a terrestrial-reference frame and a celestial-reference frame. These activities related to international VLBI are reviewed.
Author

Very Long Base Interferometry ; Antenna Arrays ; Pacific Ocean ; Measurement

20020006093 NASA Goddard Space Flight Center , Greenbelt, MD USA

The EOS Aura Mission

Schoeberl, Mark R. , NASA Goddard Space Flight Center , USA ; Douglass, A. R. , NASA Goddard Space Flight Center , USA ; Hilsenrath, E. , NASA Goddard Space Flight Center , USA ; Luce, M. , NASA Goddard Space Flight Center , USA ; Barnett, J. , Oxford Univ. , UK ; Beer, R. , Jet Propulsion Lab., California Inst. of Tech. , USA ; Waters, J. , Jet Propulsion Lab., California Inst. of Tech. , USA ; Gille, J. , Colorado Univ. , USA ; Levelt, P. F. , Royal Netherlands Meteorological Inst. , Netherlands ; DeCola, P. , NASA , USA ; [2001] ; 1p ; In English ; IEEE IGARSS 2001 Meeting , 9-13 Jul. 2001 , Sydney , Australia ; Sponsored by Institute of Electrical and Electronics Engineers , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The EOS Aura Mission is designed to make comprehensive chemical measurements of the troposphere and stratosphere. In addition the mission will make measurements of important climate variables such as aerosols, and upper tropospheric water vapor and ozone. Aura will launch in late 2003 and will fly 15 minutes behind EOS Aqua in a polar sun synchronous ascending node orbit with a 1:30 pm equator crossing time.

Author

Earth Observing System (EOS) ; Stratosphere ; Troposphere ; Satellite Observation

20020006320 NASA Goddard Space Flight Center , Greenbelt, MD USA

Advances in Direct Detection Doppler Lidar Technology and Techniques

Gentry, Bruce , NASA Goddard Space Flight Center , USA ; [2001] ; 2p ; In English ; IEEE IGARSS 2001 Meeting , 9-13 Jul. 2001 , Sydney , Australia ; Sponsored by Institute of Electrical and Electronics Engineers , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

In this paper we will describe the ground based Doppler lidar system which is mounted in a modified delivery van to allow field deployment and operations. The system includes an aerosol double edge receiver optimized for aerosol backscatter Doppler measurements at 1064 nm and a molecular double edge receiver which operates at 355 nm. The lidar system will be described including details of the injection seeded diode pumped laser transmitter and the piezoelectrically tunable high spectral resolution Fabry Perot etalon which is used to measure the Doppler shift. Examples of tropospheric wind profiles obtained with the system will also be presented to demonstrate its capabilities.

Author

Doppler Effect ; Doppler Radar ; Optical Radar ; Wind Profiles ; Troposphere

20020008150 Los Alamos National Lab. , NM USA

Next-Generation Numerical Modeling: Incorporating Elasticity, Anisotropy and Attenuation

Larsen, S. ; Mar. 01, 2001 ; 5p ; In English

Report No.(s): DE2001-776109 ; LA-UR-01-1400 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A new effort has been initiated between the Department of Energy (DOE) and the Society of Exploration Geophysicists (SEG) to investigate what features the next generation of numerical seismic models should contain that will best address current technical problems encountered during exploration in increasingly complex geologies. This collaborative work is focused on designing and building these new models, generating synthetic seismic data through simulated surveys of various geometries, and using these data to test and validate new and improved seismic imaging algorithms. The new models will be both 2- and 3-dimensional and will include complex velocity structures as well as anisotropy and attenuation. Considerable attention is being focused on multi-component acoustic and elastic effects because it is now widely recognized that converted phases could play a vital role in improving the quality of seismic images. An existing, validated 3-D elastic modeling code is being used to generate the synthetic data. Preliminary elastic modeling results using this code are presented here along with a description of the proposed new models that will be built and tested.

NTIS

Seismology ; Anisotropy ; Mathematical Models ; Imaging Techniques

20020009056 Boise State Univ. , Boise, ID USA

Tomographic Inversion of Crosshole Radar Data: Confidence in Results

Clement, William P. ; Knoll, Michael D. ; Jan. 1999 ; 11p ; In English

Contract(s)/Grant(s): DAAG55-98-1-0277

Report No.(s): AD-A396112 ; ARO-37739.1-EV-DPS ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Crosshole radar tomography is increasingly being used to characterize the shallow subsurface and to monitor hydrologic processes. Although tomographic inversion provides a subsurface model, confidently interpreting the resulting image can be challenging. We conducted a simple modeling study to better understand the capabilities and limitations of tomographic inversion.

We start with a known earth model, simulate a tomography experiment, and invert the synthetic data. We investigate the effects of straight and curved ray approximations to wave propagation, regularization, grid size, and starting model. We also investigate the effects of limited ray coverage through the earth model and noise in the data. Understanding the effects of these different methods and parameterizations will help us place confidence limits on modeled features to more accurately reflect our knowledge of the subsurface.
DTIC
Tomography ; Radar ; Inversions ; Confidence Limits

20020009127 NASA Wallops Flight Center , Wallops Island, VA USA
HALOE Temperature Data Comparison with Rocket-Borne Falling Sphere Temperatures
Schmidlin, F. J. , NASA Wallops Flight Center , USA ; Remsberg, E. , NASA Langley Research Center , USA ; Beebe, A. , Science and Engineering Services, Inc. , USA ; Lingenfelser, Gretchen , Science Applications International Corp. , USA ; [2001] ; 1p ; In English ; 15th ESA Symposium , 27-31 May 2001 , Biarritz , France ; Sponsored by European Space Agency , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Recent comparison of upper stratospheric and mesospheric temperatures measured with the HALOE instrument on UARS and the rocket-borne passive inflatable falling sphere launched from Wallops Island reveals a temperature bias of up to 10 K between about 66 and 72 km. Falling sphere measurements analyzed between 1991 and 1995 were used in the comparison, however, these measurements were processed with an earlier version of the reduction software that included temperature bias in the region of 70 km. The bias arose from a discontinuity in the falling sphere drag table. This discontinuity occurs when the sphere's fall velocity changes from the supersonic to the subsonic flow regime and has been called the MACH 1 problem. Improvement to the software employed and the availability of a new atmospheric model is now used to initiate reduction of the radar tracking data. It is possible new reduction of the existing data will reduce the bias currently observed. We plan to show changes, if any, in the size of the bias between HALOE and the falling sphere temperatures after reprocessing of the sphere measurements.
Author
Halogen Occultation Experiment ; Falling Spheres ; Bias ; Atmospheric Models ; Software Engineering ; Data Reduction ; Atmospheric Temperature

20020009134 Department of Energy , Tulsa, OK USA
Outcrop Gamma-ray Analysis of the Cretaceous mesaverde Group: Jicarilla Apache Indian Reservation, New Mexico
Ridgley, J. ; Dunbar, R. W. ; Apr. 25, 2001 ; 73p ; In English
Report No.(s): DE2001-778870 ; DOE/BC/15026-3 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report presents the results of an outcrop gamma-ray survey of six selected measured sections included in the original report. The primary objective of this second study is to provide a baseline to correlate from the outcrop and reservoir model into Mesaverde strata in the San Juan Basin subsurface. Outcrop logs were generated using a GAD-6 gamma-ray spectrometer that simultaneously recorded total counts, potassium, uranium, and thorium data.
NTIS
Outcrops ; Gamma Ray Spectrometers ; Surveys ; Thorium ; Potassium

20020009135 Department of Energy , Tulsa, OK USA
Outcrop Analysis of the Cretaceous Mesaverde Group: Jicarilla Apache Reservation, New Mexico
Ridgley, J. ; Dunbar, R. W. ; Apr. 24, 2001 ; 135p ; In English
Report No.(s): DE2001-778489 ; DOE/BC/15026-2 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Field work for this project was conducted during July and April 1998, at which time fourteen measured sections were described and correlated on or adjacent to Jicarilla Apache Reservation lands. A fifteenth section, described east of the main field area, is included in this report, although its distant location precluded use in the correlations and cross sections presented herein. Ground-based photo mosaics were shot for much of the exposed Mesaverde outcrop belt and were used to assist in correlation. Outcrop gamma-ray surveys at six of the fifteen measured sections using a GAD-6 scintillometer was conducted. The raw gamma-ray data are included in this report, however, analysis of those data is part of the ongoing Phase Two of this project.
NTIS
Surveys ; Gamma Rays ; Correlation ; Outcrops

20020009153 Computational Physics, Inc. , Norwood, MA USA

Improvements to the PRISM and PIM Ionospheric Models ***Final Report***

Daniell, Robert E., Jr. ; Aug. 26, 1999 ; 28p ; In English

Contract(s)/Grant(s): F19628-95-C-0079 ; Proj-4026TAGLWUMD

Report No.(s): AD-A395668 ; AFRL-VS-TR-2000-1513 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report describes updates that have been made to the Parameterized Real-time Ionospheric Specification Model (PRISM) that is operational at the 55th Space Weather Squadron (55 SWXS). It also describes a modified TEC (Time Executed Command) data assimilation algorithm that has been implemented in a special regional version of PRISM, and which is available for implementation in the operational version. Finally, it describes several activities related to the validation of PRISM using data from a variety of sources.

DTIC

Earth Ionosphere ; Atmospheric Models

20020010116 Massachusetts Inst. of Tech. , MA USA

Large-Scale Stratospheric Transport Processes ***Final Report***

Plumb, R. Alan , Massachusetts Inst. of Tech. , USA ; Nov. 26, 2001 ; 6p ; In English

Contract(s)/Grant(s): NAG1-2027 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The paper discusses the following: 1. The Brewer-Dobson circulation: tropical upwelling. 2. Mixing into polar vortices. 3. The latitudinal structure of ”age” in the stratosphere. 4. The subtropical ”tracer edges”. 5. Transport in the lower troposphere. 6. Tracer modeling during SOLVE. 7. 3D modeling of ”mean age”. 8. Models and measurements II.

Derived from text

Upwelling Water ; Two Dimensional Models ; Troposphere ; Wave Drag ; Vortices

20020010267 Boston Univ. , Center for Space Physics , Boston, MA USA

Applications of the Global Theoretical Ionospheric Model ***Final Report , Apr. 1997-Jul. 1999***

Fox, Matthew W. ; Jul. 1999 ; 91p ; In English

Contract(s)/Grant(s): F19628-97-C-0034 ; AF Proj. SMPS

Report No.(s): AD-A396185 ; AFRL-VS-TR-2001-1616 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

In this report, we describe a number of ionospheric studies, mostly involving the Air Force Global Theoretical Ionospheric Model. All these studies are ultimately geared towards Air Force objectives of monitoring, understanding, and specifying the ionospheric environment. A new multiple-ion theoretical model has been validated in the topside specification and subsequently utilized to derive ambient space weather conditions using DMSP measurements. in addition, a version of the code has been developed to model geomagnetic disturbances at low latitudes utilizing a new empirical dynamo disturbance drift model. Applications of an empirical profile shape model have been developed its summarize profiles generated by the specification model, PIM; and towards the goal of developing a new slant to vertical TEC conversion. Finally, data analyses have been undertaken to investigate the nature of quiet-time ionospheric variations, using both middle latitude and low latitude information, and using both F region peak and profile summary parameters.

DTIC

Magnetic Disturbances ; Mathematical Models ; Atmospheric Models

20020010364 Sandia National Labs. , Albuquerque, NM USA

Cluster Analysis for CTBT Seismic Event Monitoring

Carr, D. B. ; Young, C. J. ; Aster, R. C. ; Zhang, X. ; Aug. 03, 1999 ; 11p ; In English

Report No.(s): DE2001-9576 ; SAND99-1406C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Mines at regional distances are expected to be continuing sources of small, ambiguous events which must be correctly identified as part of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) monitoring process. Many of these events are small enough that they are only seen by one or two stations, so locating them by traditional methods maybe impossible or at best leads to poorly resolved parameters. to further complicate matters, these events have parametric characteristics (explosive sources, shallow depths) which make them difficult to identify as definite non-nuclear events using traditional discrimination methods. Fortunately, explosions from the same mines tend to have similar waveforms, making it possible to identify an unknown event by comparison with characteristic archived events that have been associated with specific mines. In this study we examine the use of hierarchical cluster methods to identify groups of similar events. These methods produce dendrograms, which are tree-like structures showing the relationships between entities. Hierarchical methods are well-suited to use for event clustering because they are well documented, easy to implement, computationally cheap enough to run multiple times for a given data set, and because

these methods produce results which can be readily interpreted. to aid in determining the proper threshold value for defining event families for a given dendrogram, we use cophenetic correlation (which compares a model of the similarity behavior to actual behavior), variance, and a new metric developed for this study. Clustering methods are compared using archived regional and local distance mining blasts recorded at two sites in the western U.S. with different tectonic and instrumentation characteristics: the three-component broadband DSVS station in Pinedale, Wyoming and the short period New Mexico Tech (NMT) network in central New Mexico. Ground truth for the events comes from the mining industry and local network locations, respectively. The clustering techniques prove to be much more effective for the New Mexico data than the Wyoming data, apparently because the New Mexico mines are closer and consequently the signal to noise ratios (SNR's) for those events are higher. To verify this hypothesis we experiment with adding gaussian noise to the New Mexico data to simulate data from more distant sites. Our results suggest that clustering techniques can be very useful for identifying small anomalous events if at least one good recording is available, and that the only reliable way to improve clustering results is to process the waveforms to improve SNR. For events with good SNR that do have strong grouping, cluster analysis will reveal the inherent groupings regardless of the choice of clustering method.
NTIS
Explosions ; Broadband ; Cluster Analysis ; Random Noise ; Seismology

20020010619 Sandia National Labs. , Albuquerque, NM USA
Prototyping Regional Discrimination Tools with Matseis
Chael, E. ; Harris, M. ; Young, C. ; Mayeda, K. ; Walter, W. ; Aug. 03, 1999 ; 8p ; In English
Report No.(s): DE2001-9572 ; SAND99-1402C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
To facilitate the development testing and comparison of regional seismic discriminants, we have implemented some of the most promising techniques in Matseis, a-Matlab-based seismic processing toolkit. The existing Matseis package provides graphical tools for analyzing seismic data from a network of stations. It can access data via a CSS 3.0 database, or from static files in a format defined by the user. Waveforms are displayed in a record-section format, with overlays for IASPE191 travel-time curves. The user can pick arrivals and locate events, then show the results on a map. Tools are available for spectral and polarization measurements, as well as beam forming and f-k analysis with array data. Additionally, one has full access to the Matlab environment and any functions available there, as well as to portions of the U.S. Department of Energy Knowledge Base. Recently, we have added some new tools to Matseis for calculating regional discrimination measurements. The first of these performs Lg coda analysis as developed by Mayeda and coworkers at Lawrence Livermore National Laboratory (LLNL). Lg coda magnitudes are calculated from the amplitudes of the coda envelopes in narrow frequency bands. Ratios of these amplitudes between high- and low-frequency bands provide a spectral-ratio discriminant for regional events. The second tool we have implemented measures P/Lg phase ratios, using the MDAC technique of Taylor (Los Alamos National Laboratory) and Walter (LLNL). P and Lg amplitudes are obtained at select frequencies, then corrected for source magnitude and propagation path. Finally, we added a tool for analyzing long-period Rayleigh and Love arrivals, useful for moment:magnitude and LQ:LR discrimination. Because all these tools have been written as Matlab functions, they can be easily modified to experiment with different processing details. The performance of the discriminants can be evaluated using any event available in the database.
NTIS
Seismic Waves ; Spectrum Analysis ; Beamforming ; Seismology ; Data Processing

20020010923 Lawrence Livermore National Lab. , Livermore, CA USA
Strength and damage model for rock under dynamic loading
Antoun, T. H. ; Glenn, L. A. ; Lomov, I. N. ; Vorobiev, O. ; Jun. 14, 1999 ; 7p ; In English
Report No.(s): DE2001-9111 ; UCRL-JC-134523 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A thermodynamically consistent strength and failure model for granite under dynamic loading has been developed and evaluated. The model agrees with static strength measurements and describes the effects of pressure hardening, bulking, porous compaction, porous dilation, tensile failure, and failure under compression due to distortional deformations. This paper briefly describes the model and the sensitivity of the simulated response to variations in the model parameters and in the inelastic deformation processes used in different simulations. 1D simulations of an underground explosion in granite are used in the sensitivity study.
NTIS
Deformation ; Granite ; Dynamic Loads ; Compacting

20020010926 Lawrence Livermore National Lab. , Livermore, CA USA

Analysis of seismic events in and near Kuwait

Harris, D. B. ; Mayeda, K. M. ; Rodgers, A. J. ; Ruppert, S. D. ; May 11, 1999 ; 3p ; In English

Report No.(s): DE2001-9101 ; UCRL-ID-134207 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Seismic data for events in and around Kuwait were collected and analyzed. The authors estimated event moment, focal mechanism and depth by waveform modeling. Results showed that reliable seismic source parameters for events in and near Kuwait can be estimated from a single broadband three-component seismic station. This analysis will advance understanding of earthquake hazard in Kuwait.

NTIS

Seismology ; Kuwait

20020011608 Minnesota Univ. , Dept. of Geology and Geophysics , Minneapolis, MN USA

An Interconnected Network of Core-Forming Melts Produced by Shear Deformation

Bruhn, D. , Minnesota Univ. , USA ; Groebner, N. , Minnesota Univ. , USA ; Kohlstedt, D. L. , Minnesota Univ. , USA ; Nature ; Feb. 24, 2000 ; Volume 403 , pp. 883-886 ; In English ; Copyright ; Avail: Issuing Activity ; Abstract Only

The formation mechanism of terrestrial planetary is still poorly understood, and has been the subject of numerous experimental studies. Several mechanisms have been proposed by which metal-mainly iron with some nickel-could have been extracted from a silicate mantle to form the core. Most recent models involve gravitational sinking of molten metal or metal sulphide through a partially or fully molten mantle that is often referred to as a'magma ocean. Alternative models invoke percolation of molten metal along an interconnected network (that is, porous flow) through a solid silicate matrix. But experimental studies performed at high pressures have shown that, under hydrostatic conditions, these melts do not form an interconnected network, leading to the widespread assumption that formation of metallic cores requires a magma ocean. In contrast, here we present experiments which demonstrate that shear deformation to large strains can interconnect a significant fraction of initially isolated pockets of metal and metal sulphide melts in a solid matrix of polycrystalline olivine. Therefore, in a dynamic (nonhydrostatic) environment, percolation remains a viable mechanism for the segregation and migration of core-forming melts in a solid silicate mantle.

Author

Cores ; Deformation ; Polycrystals ; Porosity ; Silicates ; Sulfides ; Terrestrial Planets

20020011857 Geological Survey , Water Resources Div. , Tacoma, WA USA

Photogrammetric Data Set, 1957-2000, and Bathymetric Measurements for Columbia Glacier, Alaska

Krimmel, R. M. ; 2001 ; 50p ; In English

Report No.(s): PB2001-108172 ; USGS/WRI-01-4089 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Major changes in the length, speed, surface altitude, and calving rate of Columbia Glacier, Alaska have been recorded with stereo vertical photography acquired on 199 dates from 1957 to 2000. Photogrammetric analysis of this photographic record has resulted in precise measurement of these changes. From 1982 to 2000 Columbia Glacier retreated 12 kilometers, reduced its thickness by as much as 400 meters, increased its speed from about 5 to 30 meters per day, and increased its calving rate from 3 to 18 million cubic meters per day. All photogrammetric data for Columbia Glacier from 1957 to 2000 are included in this report, as well as supplemental data of ice-dammed lake surface levels, stagnant ice ablation rate, forebay bathymetry, ground control, and camera calibrations. These data are contained in 481 files, all preserved on a CD-ROM included with this report.

NTIS

Glaciers ; Bathymeters ; Photogrammetry ; Calibrating ; Ground Based Control

20020012011 Brookhaven National Lab. , Dept. of Environmental Science , Upton, NY USA

Variance Equations and Uncertainty Analysis for the Langley Technique , Chapter 4

Miller, Mark , Brookhaven National Lab. , USA ; Bartholomew, Mary Jane , Brookhaven National Lab. , USA ; Reynolds, R. M. , Brookhaven National Lab. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 22-25 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A02 , Microfiche

To accurately interpret aerosol optical thickness (AOT) data, it is necessary to understand the sources of measurement uncertainty and their impact on the geophysical values produced by the radiometer. A preliminary analysis of the variance in the measurements of aerosol optical thickness, tau(sub lambda), and the Angstrom exponent, alpha, is given in this report.

Author

Aerosols ; Analysis of Variance ; Optical Thickness

20020012012 NASA Goddard Space Flight Center , Greenbelt, MD USA

Sun and Sky Radiance Measurements and Data Analysis Protocols , Chapter 5

Frouin, Robert , Scripps Institution of Oceanography , USA ; Holben, Brent , NASA Goddard Space Flight Center , USA ; Miller, Mark , Brookhaven National Lab. , USA ; Pietras, Christophe , General Sciences Corp. , USA ; Porter, John , Hawaii Univ. , USA ; Voss, Ken , Miami Univ. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 26-42 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A02 , Microfiche

This chapter is concerned with two types of radiometric measurements essential to verify atmospheric correction algorithms and to calibrate vicariously satellite ocean color sensors. The first type is a photometric measurement of the direct solar beam to determine the optical thickness of the atmosphere. The intensity of the solar beam can be measured directly, or obtained indirectly from measurements of diffuse global upper hemispheric irradiance. The second type is a measurement of the solar aureole and sky radiance distribution using a CCD camera, or a scanning radiometer viewing in and perpendicular to the solar principal plane. From the two types of measurements, the optical properties of aerosols, highly variable in space and time, can be derived. Because of the high variability, the aerosol properties should be known at the time of satellite overpass. Atmospheric optics measurements, however, are not easy to perform at sea, from a ship or any platform. This complicates the measurement protocols and data analysis. Some instrumentation cannot be deployed at sea, and is limited to island and coastal sites. In the following, measurement protocols are described for radiometers commonly used to measure direct atmospheric transmittance and sky radiance, namely standard sun photometers, fast-rotating shadow-band radiometers, automated sky scanning systems, and CCD cameras. Methods and procedures to analyze and quality control the data are discussed, as well as proper measurement strategies for evaluation of atmospheric correction algorithms and satellite-derived ocean color.

Author

Atmospheric Optics ; Optical Thickness ; Photometers ; Radiance ; Radiometers

20020012013 General Sciences Corp. , Beltsville, MD USA

SIMBIOS Project Protocols for Processing In Situ Aerosol Optical Thickness Measurements , Chapter 6

Ainsworth, Ewa J. , General Sciences Corp. , USA ; Pietras, Christophe , General Sciences Corp. , USA ; Miller, Mark , Brookhaven National Lab. , USA ; Frouin, Robert , Scripps Institution of Oceanography , USA ; Bailey, Sean , FutureTech Corp. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 43-69 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A02 , Microfiche

In situ measurements from sun and sky radiometers are extremely useful for vicarious calibration of satellite ocean color sensors and validation of atmospheric correction algorithms. An atmospheric property which has been applied in the analyses is aerosol optical thickness (AOT). AOT values are obtained from a direct solar signal and sky radiances processed using latest radiometer calibration parameters and corrected for gas absorption and molecular scattering. AOT levels calculated from satellite sensor observations are a by-product of the atmospheric correction. In situ and satellite-obtained AOT values are quality screened and compared against each other to create a reliable set of matchups. The term 'match-ups' relates to the results of the AOT comparisons. The match-ups are explored to draw conclusions about the satellite sensor calibration and the suitability of the set of aerosol models applied in the sensor atmospheric correction.

Derived from text

Aerosols ; In Situ Measurement ; Optical Thickness ; Protocol (Computers) ; Data Processing

20020012014 FutureTech Corp. , Greenbelt, MD USA

Satellite Aerosol Optical Thickness Match-Up Procedures , Chapter 7

Bailey, Sean , FutureTech Corp. , USA ; Wang, Meng-Hua , Maryland Univ. Baltimore County , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 70-72 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A02 , Microfiche

The validation of ocean color sensors requires the use of in situ (field collected) data sets. The Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) and Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) projects have sponsored numerous principal investigators (PIs) to collect in situ optical and pigment data for the purpose of comparing values to those derived from OCTS, POLDER, MOS, SeaWiFS and future instruments in the SIMBIOS Program. The match-up design described here uses field data stored in the SeaWiFS Bio-optical Archive and Storage System (SeaBASS), match-up analysis software, and a plotting and statistics package to validate SeaWiFS derived products. A key method for validating satellite data is to compare those values with coincident measurements taken in situ. NASA has sponsored field research activities to build a database of optical, pigment, and related in situ data for use in validating the derived products.

These data, which are stored in SeaBASS, have been made available to those assisting in the SeaWiFS algorithm development and validation effort, particularly the SIMBIOS Science Team and the Moderate Resolution Imaging Spectroradiometer (MODIS) Oceans Team. This chapter discusses the match-up procedures for the validation process.
Author
Data Bases ; In Situ Measurement ; Data Correlation ; Satellite Observation ; Optical Thickness

20020012015 General Sciences Corp. , Beltsville, MD USA
Analysis of Match-Up Results , Chapter 8
Ainsworth, Ewa J. , General Sciences Corp. , USA ; Pietras, Christophe , General Sciences Corp. , USA ; Bailey, Sean , FutureTech Corp. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 73-87 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A02 , Microfiche

Match-ups between aerosol optical thickness (AOT) points obtained from in situ observations and satellite-derived AOT levels are analyzed to: (1) validate in situ AOT screening strategies; (2) verify calibration of satellite sensor near infrared bands; and (3) establish the effectiveness of the applied suite of aerosol models. The results of the match-ups are assessed using statistical estimates. However, the conclusive result appraisal is more flexible because of the uncertainties involved in comparing the two types of data and because of the uncertainties inherent in the measurements themselves. The accuracy of different in situ AOT screening strategies can only be determined approximately from the match-ups because both compared AOT measures are not absolute and are under scrutiny. A general statistical trend in the satellite band calibration is evaluated. Finally, the aerosol model suitability is estimated from the comparison of spectral distributions of AOT levels for satellite-derived and in situ measurements. Match-ups presented in this chapter have been obtained for the SeaWiFS-derived aerosol properties and AOT levels calculated from the Aerosol Robotic Network (AERONET) and Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) sun and sky radiometer data. The match-up results are not conclusive. Research into vicarious calibration of the SeaWiFS instrument using in situ AOT observations and validation of the atmospheric correction algorithm is continuing. The purpose of this chapter is to use the preliminary results to describe a variety of matchup analysis techniques which have been developed and implemented during the current study and show some graphical examples of these techniques. These analyses can be performed on any matched satellite and in situ AOT data points. They can thus apply to different ocean color sensors and sun and sky radiometers. The match-up analysis algorithms have been implemented in IDL.
Author
Calibrating ; In Situ Measurement ; Data Correlation ; Satellite Observation ; Statistical Analysis

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020006092 NASA Goddard Space Flight Center , Greenbelt, MD USA
The Aqua-Aura Train
Schoeberl, Mark , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; AIAA Meeting , 28-30 Aug. 2001 , Albuquerque, NM , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This talk will focus on the afternoon constellation of EOS platforms and the scientific benefits that arise from this formation. The afternoon EOS constellation or the ”A-train” will provide unprecedented information on clouds and aerosols. At 1:30 PM crossing time EOS-Aqua begins the train with the MODIS, CERES and AIRS instruments making aerosol, cloud, radiation budget , temperature and water vapor measurements. AMSR-E will also make total column water measurements. Following Aqua by one minute, Cloudsat will make active radar precipitation measurements as and PICASSOCENA will make lidar measurements of clouds and aerosols. Fourteen minutes later, EOS-Aura will pass through the same space making upper troposphere water vapor and ice profiles as well as some key trace gases associated with convective processes (MLS and HIRDLS). Additional measurements of aerosols will be made by Aura’s OMI instrument.
Author
Earth Observing System (EOS) ; Satellite Constellations ; Satellite Observation ; Imaging Spectrometers ; Meteorological Radar ; Radar Measurement

20020006179 NASA Goddard Space Flight Center , Greenbelt, MD USA

Absorption of Solar Radiation by Clouds: A Second Look at Irradiance Measurements

Tsay, Si-Chee , NASA Goddard Space Flight Center , USA ; King, Michael D. , NASA Goddard Space Flight Center , USA ; Cahalan, Robert F. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; Chapman Conference on Atmospheric Absorption of Solar Radiation , 13-17 Aug. 2001 , Estes Park, CO , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A decade ago, Stephens and Tsay provided an overview of the subject of absorption of solar radiation by clouds in the earth's atmosphere. They summarized the available evidence that pointed to disagreements between theoretical and observed values of cloud absorption (and reflection). At that time, a theoretician's approach (assuming perfect flux measurements) was adopted to test the model uncertainty under various hypotheses, such as the omitted large drops, excess absorbing aerosols, enhanced water vapor continuum absorption, and cloud inhomogeneity. Since then, several advances in theoretical work have been made, but a satisfactory answer for the discrepancy is still lacking. Now, we offer an experimentalist's approach (focusing on field, not laboratory) to examine the observational uncertainty under numerous field factors, such as the temperature dependence, attitude control, and sampling strategy in the spatial and spectral domain. Examples from recent field campaigns have pointed out that these sources of error may be responsible for the unacceptable level of uncertainty (e.g., as large as 20 W/square m). We give examples of each, discuss their contribution to overall uncertainty in shortwave absorption, and suggest a coordinated approach to their solution.

Author

Radiation Absorption ; Solar Radiation ; Clouds (Meteorology) ; Irradiance ; Errors

20020006180 NASA Goddard Space Flight Center , Greenbelt, MD USA

A TRMM-Calibrated Infrared Technique for Convective and Stratiform Rainfall: Analysis and Validation

Negri, Andrew , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; AMS 11th Conference on Satellite Meteorology and Oceanography , 15-18 Oct. 2001 , Madison, WI , USA ; Sponsored by American Meteorological Society , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A satellite infrared technique with passive microwave calibration has been developed for estimating convective and stratiform. rainfall. The Convective-Stratiform Technique, calibrated by coincident, physically retrieved rain rates from the TRMM Microwave Imager (TMI), has been applied to 30 min interval GOES infrared data and aggregated over seasonal and yearly periods over northern South America. The diurnal cycle of rainfall, as well as the division between convective and stratiform rainfall is presented. For the period Jan-April 1999, analysis revealed significant effects of local circulations (river breeze, land/sea breeze, mountain/valley) on both the total rainfall and it's diurnal cycle. Results compared well (a one-hour lag) with the diurnal cycle derived from TOGA radar-estimated rainfall in Rondonia. The satellite estimates revealed that the convective rain constituted 24% of the rain area while accounting for 67% of the rain volume. Estimates of the diurnal cycle (both total rainfall and convective/stratiform) for an area encompassing the Amazon Basin (3 x 10(exp 6) square km) were in phase with those from the TRMM Precipitation Radar, despite the latter's limited sampling. Results will be presented comparing the yearly (2000) diurnal cycle for large regions (including the Amazon Basin), and an intercomparison of January-March estimates for three years, 1999-2001. We hope to demonstrate the utility of using the TRMM PR observations as verification for infrared estimates of the diurnal cycle, and as verification of the apportionment of rainfall into convective and stratiform components.

Author

Rain ; Microwave Imagery ; Amazon Region (South America) ; Diurnal Variations

20020006301 NASA Goddard Space Flight Center , Greenbelt, MD USA

Tropical Rainfall Measuring Mission (TRMM) and the Future of Rainfall Estimation from Space ***Progress Report***

Kakar, Ramesh , NASA Goddard Space Flight Center , USA ; Adler, Robert , NASA Goddard Space Flight Center , USA ; Smith, Eric , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; IEEE IGARSS 2001 Meeting , 9-13 Jul. 2001 , Sydney , Australia ; Sponsored by Institute of Electrical and Electronics Engineers , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Tropical rainfall is important in the hydrological cycle and to the lives and welfare of humans. Three-fourths of the energy that drives the atmospheric wind circulation comes from the latent heat released by tropical precipitation. Recognizing the importance of rain in the tropics, NASA for the U.S.A. and NASDA for Japan have partnered in the design, construction and flight of a satellite mission to measure tropical rainfall and calculate the associated latent heat release. The Tropical Rainfall Measuring Mission (TRMM) satellite was launched on November 27, 1997, and data from all the instruments first became available approximately 30 days after launch. Since then, much progress has been made in the calibration of the sensors, the improvement of the rainfall algorithms and applications of these results to areas such as Data Assimilation and model initialization. TRMM has reduced the uncertainty of climatological rainfall in tropics by over a factor of two, therefore establishing a standard for

comparison with previous data sets and climatologies. It has documented the diurnal variation of precipitation over the oceans, showing a distinct early morning peak and this satellite mission has shown the utility of precipitation information for the improvement of numerical weather forecasts and climate modeling. This paper discusses some promising applications using TRMM data and introduces a measurement concept being discussed by NASA/NASDA and ESA for the future of rainfall estimation from space.
Author
Trmm Satellite ; Rain ; Tropical Regions

20020006311 NASA Goddard Space Flight Center , Greenbelt, MD USA
Use of Remotely-Sensed Rainfall Data in Global Modeling and Data Assimilation
Hou, Arthur , NASA Goddard Space Flight Center , USA ; Zhang, Sara , NASA Goddard Space Flight Center , USA ; DaSilva, Arlindo , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; IEEE IGARSS 2001 Meeting , 9-13 Jul. 2001 , Sydney , Australia ; Sponsored by Institute of Electrical and Electronics Engineers , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Precipitation observations derived from microwave sensors available from the Tropical Rainfall Measuring Mission (TRMM) and the proposed Global Precipitation Mission (GPM) can provide crucial information needed for improving global modeling, data assimilation, and numerical weather prediction. New methodologies are being developed at NASA to make effective use of this new data type in these applications. Currently, global analyses contain significant errors in primary hydrological fields such as precipitation and evaporation, especially in the tropics. We show that assimilating 6-h averaged TRMM rainfall retrievals improves not only the hydrological cycle but also key climate parameters such as clouds, radiation, and the upper tropospheric moisture in the analysis produced by the Goddard Earth Observing System (GEOS) Data Assimilation System. The improved analysis also leads to improved short-range forecasts in the tropics. The above results were obtained using a variational assimilation procedure that uses rainfall observations to derive moisture and temperature tendency corrections every 6 hours to compensate for errors arising from imperfect initial conditions and deficiencies in the model physics. We will describe a developmental path towards using space-borne rainfall data to empirically estimate and correct for state-dependent systematic errors in parameterized model physics. The study provides a demonstration of the potential of using remote-sensed rainfall data from microwave instruments to improve the 4-dimensional global datasets for climate analysis and numerical weather prediction.
Author
Remote Sensing ; Data Systems ; Rain ; Microwave Sensors

20020006332 National Oceanic and Atmospheric Administration , Rockville, MD USA
The USA Detailed National Report on Systematic Observations for Climate: USA Global Climate Observing System (US-GCOS) Program
Diamond, Howard ; Aug. 2001 ; 159p ; In English ; Original contains color images ; --Original contains color plates: All DTIC reproductions will be in black and white. Submitted to the Conference of the Parties to the United Nations Framework Convention on Climate Change
Report No.(s): AD-A395381 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

Since 1998, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) have noted with concern the mounting evidence of a decline in the global observing capability and have urged Parties to undertake programs of systematic observations and to strengthen their capability in the collection, exchange, and utilization of environmental data and information. It has long been recognized that the range of global observations needed to understand and monitor Earth processes contributing to climate and to assess the impact of human activities cannot be satisfied by a single program, agency, or country. The US supports the need to improve global observing systems for climate, and we join other Parties in submitting information on national plans and programs that contribute to the global capability. This report was prepared as directed by UNFCCC Decision CP/1999/L.3, which requested Annex 1 Parties to provide a detailed report on systematic observations in accordance with the UNFCCC reporting guidelines on global climate change observing systems adopted by the UNFCCC Decision CP/1999/L.4.
DTIC
Observation ; Climate Change ; Climatology ; Data Acquisition

20020006506 Naval Postgraduate School , Monterey, CA USA
Visualization and Assessment of Global Ocean Data Assimilation Experiment Profile Data for the Pacific Ocean
Anderson, Timothy A. ; Jun. 2001 ; 74p ; In English ; Original contains color images
Report No.(s): AD-A395809 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The Global Ocean Data Assimilation Experiment (GODAE) is an endeavor that will likely change the path of oceanography for many years. This attempt to assimilate, organize and provide massive quantities of widely varied oceanographic and meteorological data to the world could be a catalyst for new and innovative research opportunities. One of the data sources important to GODAE and of great possible value, the Array for Real-time Geostrophic Oceanography (ARGO), is another innovation that may lead to significant improvements in oceanographic modeling and research. The concept of thousands of autonomous floats, reporting ocean conditions to a database that can assimilate and provide this data in real or near-real time, affords countless opportunities for new methods of ocean prediction. The true test of GODAE is to assess the utility of the data available in a real world setting, and ascertain the relative usefulness as it relates to research opportunities and operational data needs. This thesis will assess the utility of the USGODAE data server by retrieving, processing, visualizing and employing the data to observe conditions in and near the Kuroshio Current. by attempting to use the data server in a method similar to future research and operational use, an understanding of its true potential may be reached.
DTIC
Data Bases ; Meteorological Parameters ; Oceanographic Parameters ; Pacific Ocean

20020006788 Scripps Institution of Oceanography , La Jolla, CA USA
A Consortium for Ocean Circulation and Climate Estimation ***Progress Report***
Stammer, Detlef ; Oct. 01, 2001 ; 8p ; In English
Contract(s)/Grant(s): N00014-99-1-1049
Report No.(s): AD-A395540 ; SIO-99-1296R1 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
We will improve the ocean general circulation models upon which assimilation is based, evaluate and improve assimilation techniques, and confront the practical problems of marshalling large data sets and carrying out routine assimilation runs. Our central technical goal is a complete global-scale ocean state estimation over at least the 15 year period 1985-2000 at 1/40 resolution with a complete error description and regional refinements to support CLIVAR and GODAE needs. We will combine all available and anticipated large-scale data sets - including TOPEX/POSEIDON, TOGA-TAO, high-resolution VOS XBT/XCTD, profiling floats, and drifters - with the dynamics embodied in a general circulation model to estimate the time-evolving, three-dimensional physical state of the full oceanic circulation. We will supplement the global state-estimates with high-resolution regional studies in support of CLIVAR's Basin-wide Extended Climate Studies (BECS) in the North Atlantic and the North Pacific. Global and regional results will be evaluated using available high-quality data sets and estimate covariance functions for processes and errors in data and models.
DTIC
Ocean Currents ; Ocean Models ; Marine Meteorology ; Climate Models

20020006838 Argonne National Lab. , IL USA
Development of a next-generation regional weather research and forecast model
Michalakes, J. ; Chen, S. ; Dudhia, J. ; Hart, L. ; Klemp, J. ; Feb. 05, 2001 ; 8p ; In English
Report No.(s): DE2001-775261 ; ANL/MCS/CP-104037 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Weather Research and Forecast (WRF) project is a multi-institutional effort to develop an advanced mesoscale forecast and data assimilation system that is accurate, efficient, and scalable across a range of scales and over a host of computer platforms. The first release, WRF 1.0, was November 30, 2000, with operational deployment targeted for the 2004-05 time frame. This paper provides an overview of the project and current status of the WRF development effort in the areas of numerics and physics, software and data architecture, and single-source parallelism and performance portability.
NTIS
Meteorology ; Weather Forecasting ; Data Systems

20020008084 Argonne National Lab. , IL USA
Application of Natural Radionuclides for Determination of Tropospheric Ozone and Aerosol Transport
Gaffney, J. S. ; Marley, N. A. ; Drayton, P. J. ; Orlandini, K. A. ; Dec. 06, 2000 ; 6p ; In English
Report No.(s): DE2001-772111 ; ANL/ER/CP-103542 ; No Copyright ; Avail: Department of Energy Information Bridge
Natural radionuclides have been proposed for use in assessing the transport of ozone and aerosols in the troposphere. For example, Be-7 is known to be produced in the upper troposphere and lower stratosphere by interactions with cosmogenic particles. Be-7 has a 53.28-day half-life and is a gamma emitter that attaches itself to fine particles in the atmosphere once it is formed. Indeed, in tropospheric aerosol samples T-Be is typically found in association with aerosol particles that are 0.3 micrometers in diameter. Some investigators have asserted that ozone from aloft can be transported into rural and urban regions during

stratospheric/tropospheric folding events, leading to increased background levels of ozone. During the Texas 2000 Air Quality study, aerosol samples with a 2.5-micrometer cutoff were collected during 12-hour cycles (day/night) for a 30-day period at the Deer Park, Texas, field site in August-September 2000. to monitor Be-7 levels, high-volume samples were collected on glass fiber filters on Julian dates 225-259. Sample collection was at a field site near a city park, away from any nearby traffic. Instruments operated at this same site during the study period included an ozone monitor (Dasibi), a nitrogen oxides instrument (API), a CO instrument (API), a nephelometer, a UV-B meter (Richardson-Berger), and a multifilter rotating shadow band radiometer (MFRSR, Yankee Environmental Systems). In addition, we made modified fast-response NO2 and peroxyacetyl nitrate (PAN) measurements by using a fast gas chromatography with luminol detection. The data show no strong correlation between observed Be-7 at this site and 12-hour maximum or 12-hour average ozone levels. Further analysis of the daytime and nighttime data indicated a weak correlation during the daytime. This may be because the transport of dry air over the area increases photochemical activity and is associated with upper-air-mass events, as indicated by increased Be-7 at the ground stations. The levels observed during the Texas Air Quality 2000 study at the Deer Park and nearby Houston sites are far more likely to reflect local photochemical formation of ozone. Indeed, the release of molecular chlorine from local sources can lead to rapid formation of peroxy radicals by the reaction of photochemically produced Cl radicals with alkanes. This reaction proceeds hundreds of times faster that the normal OH chemistry.
NTIS
Aerosols ; Air Quality ; Air Sampling ; Atmospheric Chemistry ; Beryllium 7 ; Ozone ; Troposphere

20020008131 Oak Ridge National Lab. , TN USA
Research Challenges for Carbon Sequestration in Terrestrial Ecosystems
Dahlman, R. C. ; Jan. 10, 2001 ; 6p ; In English
Report No.(s): DE2001-774672 ; P00-107148 ; No Copyright ; Avail: Department of Energy Information Bridge
Carbon sequestration is a growing research topic that addresses one important aspect of an overall strategy for carbon management to help mitigate the increasing emissions of CO2 into the atmosphere. There are estimates that terrestrial ecosystems could sequester significant quantities of carbon over the next 50 years. The impact of this sequestration could help buy time for other technologies to come on-line by delaying the need for more dramatic decreases in global emissions. There is increasing interest in scientific advances that can be used to further enhance this potential sequestration of carbon in soils. This paper summarizes current research that is addressing some of the major uncertainties in the carbon cycle and introduces new research that is being initiated specifically related to carbon sequestration in terrestrial ecosystems.
NTIS
Carbon ; Carbon Cycle ; Ecosystems

20020008136 Oak Ridge National Lab. , TN USA
Assessing Observed Temperature and Cloud Amount Trends for China Over the Last Half of the Twentieth Century: What Can the Sunshine Duration Record Tell Us
Kaiser, D. P. ; Jan. 10, 2001 ; 2p ; In English ; 12th ; 81st ; 12th Symposium on Global Change Studies
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774663 ; P00-109147 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Analyses performed in recent years have shown that temperatures over much of China have increased over the last half of the Twentieth Century, similar to most nations with adequate observational data. Most of this observed increase has been due to increases in daily minimum temperatures. Over this same period, cloud amount over China has been found to have decreased significantly. This is an interesting finding in that a trend toward less cloudiness over time would in itself be expected to cause minimum temperatures (usually occurring in the near-dawn hours) to decrease over time due to enhanced radiational cooling near the surface. Obviously the causes of increasing temperature in general over China are not well understood at this time.
NTIS
China ; Cloud Cover ; Climate Change ; Surface Temperature

20020008169 Department of Defense , Office of the Inspector General , Arlington, VA USA
Meteorological and Oceanographic Support in the Pacific Theater
Jun. 28, 2001 ; 65p ; In English
Report No.(s): AD-A395677 ; IG/DOD-D-2001-151 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This report is one in a series evaluating the effectiveness and efficiency of DoD (Department of Defense) meteorological and oceanographic support provided by the Military Departments to DoD and other governmental agencies. The overall objective of this self-initiated series of audits was to evaluate DoD meteorological and oceanographic services and support to determine

whether the Military Departments were providing the most cost-effective and nonduplicative meteorological and oceanographic services and support to DoD and other governmental agencies. Specifically, this audit focused on evaluating the Military Departments' use of DoD infrastructure to determine whether meteorological and oceanographic services were provided in the most effective and efficient manner in the Pacific theater. We also evaluated the management control program as it related to the specific audit objective.
Derived from text
Meteorology ; Oceanography ; Information Systems ; Meteorological Services ; Cost Effectiveness

20020008215 Los Alamos National Lab. , NM USA
Performance of the interactive procedures for daytime detection of dense clouds in the mti pipeline
Rohde, C. ; Hirsch, K. ; Davis, A. ; Mar. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-776395 ; LA-UR-01-1617 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Pixel-scale cloud detection relies on the simple fact that dense-enough clouds are generally brighter, whiter, and colder than the underlying surface. These plain-language statements are readily translated into threshold operations in the multispectral subspaces, thus providing a reasonable premise for searching data cubes for cloud signatures. to supplement this spectral input (VIS, NIR, and TIR channels), we remark that cloud tops are generally above most of the water vapor in the atmosphere column. An extra threshold in the MTI water vapor product can therefore be applied. This helps considerably in cases where one of the default cloud signatures becomes ambiguous. The resulting cloud mask is however still sensitive to the thresholds in brightness, whiteness, temperature, and column water content, especially since we also want to ag low-level clouds that are not-so-dense. Clouds are also generally spatially large compared to pixel size. This implies that simple spatial morphological filters can be use to remove false positives and for expansion of the cloud mask. A false positive is indeed preferable to a miss in the view of MTI's mission in support of nuclear non-proliferation; non-local cloud radiative effects can otherwise bias retrievals in adjacent cloud-free areas. Therefore we use a data analyst to ensure built-in quality control for MTI cloud masks. When looking for low-level clouds, the analyst interacts with a GUI containing histograms, a customized RGB rendering of the input data, and an RGB diagnostic cloud mask for quick evaluation of all threshold values. We use MTI data to document the performance and analyst-sensitivity to this procedure.
NTIS
Cloud Height Indicators ; Clouds (Meteorology)

20020009010 NASA Goddard Space Flight Center , Greenbelt, MD USA
Overview and Scientific Agenda of Global Precipitation Mission
Smith, Eric A. , NASA Goddard Space Flight Center , USA ; [2001] ; 2p ; In English ; European Geophysical Society XXVI General Assembly , 26-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only
This paper addresses the status of the Global Precipitation Mission (GPM) currently planned for launch in the 2007-2008 time frame. The GPM notional design involves a 9-member satellite constellation, one of which wilt be an advanced TRMM-like "core" satellite carrying a dual-frequency Ku-Ka band radar (DFPR) and a TMI-like radiometer. The other eight members of the constellation will be considered daughters of the core satellite, each carrying some type of passive microwave radiometer measuring across the 10.7 - 85 GHz ,frequency range - likely to include a combination of lightweight satellites and co-existing operational/Experimental satellites carrying passive microwave radiometers (i.e., SSM/I and AMSR-E & -F). The constellation is designed to provide no worse than 3-hour sampling at any spot on the globe using sun-synchronous orbit architecture for the daughter satellites, with the core satellite providing relevant measurements on internal cloud-precipitation microphysical processes and the "training-calibrating" information for retrieval algorithms used on daughter satellite measurements. The GPM is organized internationally, currently involving a partnership between NASA in the US, NASDA in Japan, and ESA in Europe (representing the European community nations). The mission is expected to involve additional international participants, sister agencies to the mainstream space agencies, and a diverse collection scientists from academia, government, and the private sector, A critical element in understanding the scientific thinking which has motivated the GPM project is an understanding of what scientific problems TRMM has and has not been able to address and at what scales. The TRMM satellite broke important scientific ground because it carried to space an array of rain-sensitive instruments, two of which were specifically designed for physical precipitation retrieval. These were the 9-channel TRMM Microwave Imager (TMI) and the 13.8 GHz Precipitation Radar (PR). by the same token, because TRMM is a single satellite in a low inclination, low altitude, non-sun-synchronous orbit, it cannot provide global coverage or regular diurnal sampling. These features are essential for many current scientific inquiries involving physical processes of climate and the global water cycle, the modeling of hydrometeorological-biogeochemical cycling, and coupled land-atmosphere/ocean-atmosphere exchanges. Moreover, TRMM has not been able to retrieve explicit properties of the

drop size distribution (DSD), a final major barrier to making accurate rain measurements, because the single frequency TRMM radar cannot measure differential reflectivity. which is a minimal requirement for attacking rain retrieval within the framework of extinction cross-section-dependency. GPM is expected to surmount much of the DSD retrieval problem because its core satellite wilt have the capacity to make differential reflectivity measurements with its Ku-Ka band radar (13.6 - 35 GHz) called DFPR - being developed by NASDA/CRL in Japan. This paper will provide an overview of the above issues as well as present a discussion on the expected measurement improvements.
Author
Precipitation (Meteorology) ; Satellite Constellations ; Meteorological Radar ; Satellite Observation ; Radiometers ; Microwave Radiometers ; Cloud Physics

20020009012 NASA Goddard Space Flight Center , Greenbelt, MD USA
Three Dimensional Atmospheric Radiative Transfer-Applications and Methods Comparison
Cahalan, Robert F. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 25-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We review applications of 3D radiative transfer in the atmosphere, emphasizing the wide spectrum of scales important to remote sensing and modeling of cloud fields, and the characteristic scales introduced into observed radiances and fluxes by the distribution of photon pathlengths at conservative and absorbing wavelengths. We define the ”plane-parallel bias”, which is a measure of the importance of 3D cloud structure in large-scale models, and the ”independent pixel errors” that quantify the significance of 3D effects in remote sensing, and emphasize their relative magnitude and scale dependence. A variety of approaches in current use in 3D radiative transfer, and issues of speed, accuracy, and flexibility are summarized. We also describe a recently initiated ”International Intercomparison of 3-Dimensional Radiation Codes”, or I3RC. I3RC is a 3-phase effort that has as its goals to: (1) understand the errors and limits of 3D methods; (2) provide ”baseline” cases for future 3D code development; (3) promote sharing of 3D tools; (4) derive guidelines for 3D tool selection; and (5) improve atmospheric science education in 3D radiative transfer. Selected results from Phases 1 and 2 of I3RC are discussed. These are taken from five cloud fields: a 1D field of bar clouds, a 2D radar-derived field, a 3D LANDSAT-derived field, a stratiform cloud from the model of C. Moeng, and a convective cloud from the model of B. Stevens. Computations have been carried out for three monochromatic wavelengths (one conservative, one absorptive, and one thermal) and two solar zenith angles (0, 60 degrees).
Author
Three Dimensional Models ; Radiative Transfer ; Atmospheric Models ; Cloud Physics ; Remote Sensing

20020009159 Atmospheric and Environmental Research, Inc. , Lexington, MA USA
Development and Validation of Improved Techniques for Cloud Property Retrieval from Environmental Satellites *Final Report*
Gustafson, Gary B. ; d’Entrement, Robert P. ; Nov. 17, 2000 ; 53p ; In English ; Original contains color images
Contract(s)/Grant(s): F19628-96-C-0053 ; Proj-6670
Report No.(s): AD-A395640 ; AFRL-VS-TR-2001-1549 ; No Copyright ; Avail: CASI ; A01 , Microfiche ; A04 , Hardcopy

A basic research program was conducted for the Air Force Research Laboratory (AFRL), consisting of three tasks: (1) develop extensible cloud property retrieval algorithms suitable for expanding existing cloud analysis capabilities to utilize data from new and future environmental satellite sensing systems; (2) develop advanced algorithms for retrieval of cloud properties that are insufficiently resolved to satisfy Air Force requirements using existing techniques; and (3) validate cloud property retrieval algorithms using real data from existing meteorological satellite platforms. Under task 1 a series of algorithms developed under previous AFRL programs were modified to expand capabilities in several areas including improved transmissive cirrus detection and classification, cloud phase retrieval, snow/cloud discrimination, and transition across the terminator. In task 2 new capabilities were developed to retrieve cloud radiative and microphysical properties from multispectral data available from environmental satellites including the newly launched MODIS (Moderate Resolution Imaging Spectroradiometer). Under task 3 the new algorithms were implemented in software and applied to real data acquired from the GOES (Geostationary Operational Environmental Satellite) 8 satellite in support of two field programs conducted or supported by AFRL.
DTIC
Algorithms ; Meteorology ; Meteorological Satellites ; Information Retrieval ; Clouds (Meteorology) ; Cloud Physics

20020009168 NASA Goddard Space Flight Center , Greenbelt, MD USA

Latent Heating Retrievals Using the TRMM Precipitation Radar: A Multi-Seasonal Study

Tao, Wei-Kuo , NASA Goddard Space Flight Center , USA ; Lang, S. , NASA Goddard Space Flight Center , USA ; Meneghini, R. , NASA Goddard Space Flight Center , USA ; Halverson, J. , NASA Goddard Space Flight Center , USA ; Johnson, R. , NASA Goddard Space Flight Center , USA ; Simpson, J. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 26-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Rainfall is a key link in the hydrologic cycle and is a primary heat source for the atmosphere. The vertical distribution of latent heat release, which is accompanied by rainfall, modulates the large-scale circulations of the tropics and in turn can impact midlatitude weather. This latent heat release is a consequence of phase changes between vapor, liquid, and solid water. Present largescale weather and climate models can simulate latent heat release only crudely, thus reducing their confidence in predictions on both global and regional scales. This paper represents the first attempt to use NASA Tropical Rainfall Measuring Mission (TRMM) rainfall information to estimate the four-dimensional structure of global monthly latent heating profiles over the global tropics from December 1997 to October 2000. The Goddard Convective-Stratiform. Heating (CSH) algorithm and TRMM precipitation radar data are used for this study. We will examine and compare the latent heating structures between 1997-1998 (winter) ENSO and 1998-2000 (non-ENSO). We will also examine over the tropics. The seasonal variation of heating over various geographic locations (i.e., oceanic vs continental; Indian oceans vs west Pacific; Africa vs S. America) will be also examined and compared. In addition, we will examine the relationship between latent heating (max heating level) and SST. The period of interest also coincides with several TRMM field campaigns that recently occurred over the South China Sea in 1998 (SCSMEX), Brazil in 1999 (TRMM-LBA), and in the central Pacific in 1999 (KWAJEX). Sounding diagnosed Q1 budgets from these experiments could provide a means of validating the retrieved profiles of latent heating from the CSH algorithm.

Author

Rain ; Latent Heat ; Vertical Distribution ; Tropical Regions ; Trmm Satellite

20020009202 Army Research Inst. of Environmental Medicine , Natick, MA USA

Evaluation and Refinement of the Environmental Stress Index (ESI) for Different Climatic Conditions and Distances Below and Above Sea Level

Moran, Daniel S. ; Pandolf, Kent B. ; Gonzalez, Richard R. ; Nov. 2001 ; 56p ; In English ; Original contains color images

Report No.(s): AD-A396152 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This report summarizes the evaluation and refinement of an environmental stress index (ESI) for heat stress assessment. Two independent studies containing two different databases were analyzed in order to evaluate ESI for different climatic conditions and terrestrial heights below and above sea level. The purpose of the first study was to evaluate the ESI analytically and experimentally. Meteorological measurements were taken in different climatic zones (hot/wet, hot/dry, and extremely hot/dry) at 19 different locations for 120 days.

DTIC

Heat Tolerance ; Climate

20020009538 Communications Research Lab. , Tokyo, Japan

Radio Science Results: An Evaluation of Atmospheric Gradient Using Water Vapor Radiometers in Kashima, Japan

Ichikawa, Ryuichi , Communications Research Lab. , Japan ; Okubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 97-103 ; In English ; Copyright ; Avail: Issuing Activity

With the aim of evaluating the effects of water-vapor atmospheric gradients on space geodesy technologies, observations of wet delay were performed using water vapor radiometers (WVR) over a period of about two years in Kashima, Japan. On comparing WVR gradient results with Global Positioning System (GPS) gradient results, a tendency for the gradient vector to be dominant in the southwest direction could be seen in both. On the other hand, the correlation coefficient between the two for gradient fluctuation was found to be only 0.2. This low correlation may be caused by gradients due to dry atmosphere and/or by the effects of mesoscale phenomena that are not simulated to reproduce in a gradient estimation model. In addition, for 1998 and 1999 GPS data, we examined the relationship between the use or non-use of atmospheric gradient estimation and positioning solutions and baseline-length solutions. It was found that repeatability of positioning solutions in the horizontal direction could be improved by 40% in the case of gradient estimation, but that seasonal changes were still evident.

Author

Evaluation ; Atmospheric Effects ; Water Vapor ; Radiometers ; Annual Variations ; Drying

20020009688 Argonne National Lab. , IL USA

Resolution dependence in modeling extreme weather events

Taylor, J. ; Larson, J. ; Apr. 13, 2001 ; 8p ; In English

Report No.(s): DE2001-781257 ; ANL/MCS/CP-104584 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

At Argonne National Laboratory we have developed a high performance regional climate modeling simulation capability based on the NCAR MM5v3.4. The regional climate simulation system at Argonne currently includes a Java-based interface to allow rapid selection and generation of initial and boundary conditions, a high-performance version of MM5v3.4 modified for long climate simulations on our 512-processor Beowulf cluster (Chiba City), an interactive Web-based analysis tool to facilitate analysis and collaboration via the Web, and an enhanced version of the CAVE5d software capable of working with large climate data sets. In this paper we describe the application of this modeling system to investigate the role of model resolution in predicting extreme events such as the ”Hurricane Huron” event of 11-15 September 1996. We have performed a series of ”Hurricane Huron” experiments at 80, 40, 20, and 10 km grid resolution over an identical spatiotemporal domain. We conclude that increasing model resolution leads to dramatic changes in the vertical structure of the simulated atmosphere producing significantly different representations of rainfall and other parameters critical to the assessment of impacts of climate change.

NTIS

Climate Models ; Climate Change ; Weather Forecasting

20020009752 National Yun-Lin Univ. of Science and Technology , Dept. of Environment and Safety Engineering , Taiwan, Province of China

A Study of Mean Areal Precipitation and Spatial Structure of Rainfall Distribution in the Tsen-Wen River Basin

Wen, Jet-Chau , National Yun-Lin Univ. of Science and Technology , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 649-658 ; In English

Contract(s)/Grant(s): NSC-89-2211-E-224-017 ; NSC-84-2211-E-033-004 ; Copyright ; Avail: Issuing Activity

In this paper, the kriging method with stochastics was applied ill order to Study the spatial structure of precipitation distributions. Mean areal precipitation and the spatial Structure of six storms over the Tsen-Wen River basin were examined by semivariograms of the storms. Findings revealed topographic influences on tile rainfall distributions ill tile study area. These impacts were reflected in the difference between the mean areal precipitation of the kriging and the Thiessen methods and the correlation structure (or range) of the rainfall distributions. The mean areal precipitation showed a difference of 2.5%, in favor of the kriging method. The range of the rainfall distribution averaged about 46.17-km, a very close correlation to the downstream length, 47-km, of the Tsen-Wen River. In addition, the smaller the standard deviations of the precipitation distributions, the more appropriate it is to use the assumption of the second-order stationarity for investigating the storm structures.

Author

Spatial Distribution ; Precipitation (Meteorology) ; Storms

20020010160 NASA Ames Research Center , Moffett Field, CA USA

Impact of Uncertainties and Errors in Converting NWS Radiosonde Hygristor Resistances to Relative Humidity

Westphal, Douglas L. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Chapman Conference on Water Vapor , 25-27 Oct. 1994 , Jekyll Island, GA , USA

Contract(s)/Grant(s): RTOP 460-47-00-10 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A set of 2,600 6-second, National Weather Service soundings from NASA’s FIRE-II Cirrus field experiment are used to illustrate previously known errors and new potential errors in the VIZ and SDD brand relative humidity (RH) sensors and the MicroART processing software. The entire spectrum of RH is potentially affected by at least one of these errors. (These errors occur before being converted to dew point temperature.) Corrections to the errors are discussed. Examples are given of the effect that these errors and biases may have on numerical weather prediction and radiative transfer. The figure shows the OLR calculated for the corrected and uncorrected soundings using an 18-band radiative transfer code. The OLR differences are sufficiently large to warrant consideration when validating line-by-line radiation calculations that use radiosonde data to specify the atmospheric state, or when validating satellite retrievals. In addition, a comparison of observations of RE during FIRE-II derived from GOES satellite, raman lidar, MAPS analyses, NCAR CLASS sondes, and the NWS sondes reveals disagreement in the RH distribution and underlines our lack of an understanding of the climatology of water vapor.

Author

Bias ; Errors ; Meteorological Services ; Sounding ; Radiosondes ; Humidity

20020010189 Argonne National Lab. , IL USA

Computational Design and Performance of the Fast Ocean Atmosphere Model , 1

Jacob, R. ; Schafer, C. ; Foster, I. ; Tobis, M. ; Anderson, J. ; Mar. 28, 2001 ; 10p ; In English

Report No.(s): DE2001-779796 ; ANL/MCS/CP-104448 ; No Copyright ; Avail: Department of Energy Information Bridge

The Fast Ocean Atmosphere Model (FOAM) is a climate system model intended for application to climate science questions that require long simulations. FOAM is a distributed-memory parallel climate model consisting of parallel general circulation models of the atmosphere and ocean with complete physics parameterizations as well as sea-ice, land surface, and river transport models. FOAM's coupling strategy was chosen for high throughput (simulated years per day). A new coupler was written for FOAM and some modifications were required of the component models. Performance data for FOAM on the IBM SP3 and SGI Origin2000 demonstrates that it can simulate over thirty years per day on modest numbers of processors.

NTIS

Atmospheric Models ; Climate Models ; Ocean Models ; Atmospherics ; Parallel Processing (Computers)

20020010202 Pacific Northwest National Lab. , Richland, WA USA

Hanford Site Climatological Data Summary 1999 with Historical Data

Hoitink, D. J. ; Burk, K. W. ; Ramsdell, J. V. ; May 11, 2000 ; 114p ; In English

Report No.(s): DE2001-781048 ; No Copyright ; Avail: Department of Energy Information Bridge

This document presents the climatological data measured at the Hanford Site for calendar year 1999. The information contained includes updated historical climatologies for temperature, precipitation, normal and extreme values of temperature and precipitation and other meteorological parameters.

NTIS

Atmospheric Temperature ; Climatology ; Precipitation (Meteorology) ; Meteorological Parameters

20020010255 Frontier Technology, Inc. , Beavercreek, OH USA

High Accuracy Space-Based Remote Sensing Calibration Requirements

Murdock, T. L. ; Pollack, D. B. ; March 1998 ; 32p ; In English

Report No.(s): PB2002-100413 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The need for a system of accurate radiometric calibration, traceable to the International System of Units (SI), is becoming clear as space-based and aircraft-based scientific remote sensing programs attempt to meet their measurement goals (Taylor 1995). The technical and political discussions surrounding issues such as global change and the variability of the solar constant must be based on highly accurate measurements. The goal of this paper is to begin to lay the ground work for a community consensus on the specific calibration requirements in support of some of the most stressing remote sensing measurements that are contemplated for the near future. This paper, a first step, presents a summary overview of the radiometric requirements placed on the next generation of calibration sources and the calibration transfer sensors without discussing either the details of the scientific rationale for these requirements or the details of how those measurement requirements will be met.

NTIS

Calibrating ; Radiometers ; Remote Sensing ; Climate Change ; Measuring Instruments

20020010260 Mesoscale Environmental Simulations and Operations, Inc. , Troy, NY USA

Development of Methods to Generate High Resolution Climatological Databases to Support DoD Modeling and Simulation Programs

Zack, John W. ; Bousquet, Mary D. ; Van Knowe, Glenn E. ; Waight, Kenneth T., III ; Price, Pamela E. ; March 2000 ; 104p ; In English ; Original contains color images

Contract(s)/Grant(s): F196828-97-C-0025 ; Proj-CLMS

Report No.(s): AD-A396083 ; 10054-02 ; AFRL-VS-TR-2000-1520 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

This project focuses on developing methods to simulate climate statistics at high resolution in data sparse and data rich locations. The method, given the name CLIMOD, is based on the use of a numerical-dynamical atmospheric model to generate a sample of simulated data from which climatological statistics are computed. The major objectives of the project are to: (1) demonstrate the robustness and general applicability of the method; (2) refine the CLIMOD technique to optimally blend available observations and numerically simulated climate data; (3) extend the method to complex derived climate variables; and (4) construct an integrated software package that can be applied to anyplace in the world. The work during the second year included: (1) the evaluation of the quality of both 10-year data sets subjectively and objectively using all available observational data; (2)

extensive data denial experiments to determine the impact of observed data on the simulations; and (3) the development of enhanced postprocessing methods to compute complex derived variables.
DTIC
Climatology ; Computerized Simulation ; Mathematical Models ; Data Bases

20020010571 NASA Goddard Space Flight Center , Greenbelt, MD USA
The Development of the TRMM Mission and the Reasons for its Scientific Success
Kakar, Ramesh , NASA , USA ; Adler, Robert , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 24-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A short history of the development of the TRMM mission will be described focusing on the development of the science requirements, the close collaboration between the U.S. and Japan, and the technological and scientific success of the mission. The initial TRMM science workshop was held in 1986 and with the science requirements derived from that start a set of instruments were developed to measure tropical precipitation for the first mission with that parameter as the principal focus. Implementation of the mission concept was carried out by through close cooperation between U.S. and Japanese scientists, engineers and managers. The Tropical Rainfall Measuring Mission (TRMM) has now completed three years in orbit. A short summary of research highlights will be presented and these successes will be traced back to the scientific and programmatic approaches used to develop and manage the mission. Plans for a Global Precipitation Mission (GPM) based on the successful approach used for TRMM will also be outlined.
Author
Precipitation (Meteorology) ; Trmm Satellite ; Tropical Regions ; Meteorological Instruments

20020010572 NASA Goddard Space Flight Center , Greenbelt, MD USA
TRMM Science Highlights and Status of Precipitation Estimates on Monthly and Finder Time Scales
Adler, Robert , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 26-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The Tropical Rainfall Measuring Mission (TRMM) has completed three years in orbit. A summary of research highlights will be presented focusing on application of TRMM data to topics ranging from climate analysis, through improving forecasts, to microphysical research. Monthly surface rainfall estimates over the ocean based on different instruments on TRMM currently differ by 20%. The difference is not surprising considering the different type of observations available for the first time from TRMM with both the passive and active microwave sensors. Resolving this difference will strengthen the validity and utility of ocean rainfall estimates and is the topic of ongoing research utilizing various facets of the TRMM validation and field experiment programs. The TRMM rainfall estimates are intercompared among themselves and with other estimates, including those of the standard, monthly Global Precipitation Climatology Project (GPCP) analysis. The GPCP analysis agrees roughly in magnitude with the passive microwave-based TRMM estimates which is not surprising considering GPCP over-ocean estimates are based on passive microwave observations. A three year TRMM rainfall climatology is presented based on the TRMM merged product, including anomaly fields related to the changing ENSO situation during the mission. Results of merging TRMM, other passive microwave observations, and geosynchronous infrared rainfall estimates into a global, tropical 3-hour time resolution analysis will also be described.
Author
Climatology ; Precipitation (Meteorology) ; Trmm Satellite ; Tropical Regions ; Microwave Sensors ; Temporal Resolution ; Oceans

20020010574 NASA Goddard Space Flight Center , Greenbelt, MD USA
Cross Calibration of TOMS, SBUV/2 and Sciamachy Radiances from Ground Observations
Hillsenrath, Ernest , NASA Goddard Space Flight Center , USA ; Ahmad, Ziauddin , Science and Data Systems, Inc. , USA ; [2001] ; 1p ; In English ; NDSC Conference , 24-27 Sep. 2001 , Arcachon , France ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Verification of a stratospheric ozone recovery remains a high priority for environmental research and policy definition. Models predict an ozone recovery at a much lower rate than the measured depletion rate observed to date. Therefore improved precision of the satellite and ground ozone observing systems are required over the long term to verify recovery. We have shown that validation of radiances is the most effective means for correcting absolute accuracy and long term drifts of backscatter type satellite measurements. This method by-passes the algorithms used for both satellite and ground based measurements which are

normally used to validate and correct the satellite data. Validation of radiances will also improve all higher level data products derived from the satellite observations. Backscatter algorithms suffer from several errors such as unrepresentative a-priori data and air mass factor corrections. Radiance comparisons employ forward models but are inherently more accurate and than inverse (retrieval) algorithms. A new method for satellite validation is planned which will compliment measurements from the existing ground-based networks. This method will employ very accurate comparisons between ground based zenith sky radiances and satellite nadir radiances. These comparisons will rely heavily on the experience derived from the Shuttle SBUV (SSBUV) program which provided a reference standard of radiance measurements for SBUV/2, TOMS, and GOME. This new measurement program, called ”Skyrad”, employs two well established capabilities at the Goddard Space Flight Center, 1) the SSBUV calibration facilities and 2) the radiative transfer codes used for the TOMS and SBUV/2 algorithms and their subsequent refinements. Radiative transfer calculations show that ground based zenith sky and satellite nadir backscatter ultraviolet comparisons can be made very accurately under certain viewing conditions. The Skyrad instruments (SSBUV, Brewer spectrophotometers, and possibly others) will be calibrated and maintained to a precision of a few tenths of a percent. Skyrad data will then enable long term calibration of upcoming satellite instruments such as QuickTOMS. SBUV/2s and SCIAMACHY with a high degree of precision. This technique can be further employed to monitor the performance of future instruments such as GOME-2, OMI, and OMPS. Initial ground observations taken from Goddard Space Flight Center compared with radiative transfer calculations has indicated the feasibility of this method.

Author

Algorithms ; Calibrating ; Satellite Observation ; Solar Backscatter UV Spectrometer ; Total Ozone Mapping Spectrometer ; Radiance

20020010576 Maryland Univ. Baltimore County , Joint Center for Earth Systems Technology , Catonsville, MD USA

Do Fractal Models of Clouds Produces the Right 3D Radiative Effects?

Varnai, Tamas , Maryland Univ. Baltimore County , USA ; Marshak, Alexander , Maryland Univ. Baltimore County , USA ; [2001] ; 1p ; In English ; AGU Spring Meeting , 29 May - 2 Jun. 2001 , Boston, MA , USA ; Sponsored by American Geophysical Union , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Stochastic fractal models of clouds are often used to study 3D radiative effects and their influence on the remote sensing of cloud properties. Since it is important that the cloud models produce a correct radiative response, some researchers require the model parameters to match observed cloud properties such as scale-independent optical thickness variability. Unfortunately, matching these properties does not necessarily imply that the cloud models will cause the right 3D radiative effects. First, the matched properties alone only influence the 3D effects but do not completely determine them. Second, in many cases the retrieved cloud properties have been already biased by 3D radiative effects, and so the models may not match the true real clouds. Finally, the matched cloud properties cannot be considered independent from the scales at which they have been retrieved. This paper proposes an approach that helps ensure that fractal cloud models are realistic and produce the right 3D effects. The technique compares the results of radiative transfer simulations for the model clouds to new direct observations of 3D radiative effects in satellite images.

Author

Cloud Physics ; Three Dimensional Models ; Clouds (Meteorology) ; Fractals ; Radiative Transfer ; Remote Sensing

20020010580 NASA Goddard Space Flight Center , Greenbelt, MD USA

Modeling of Convective-Stratiform Precipitation Processes: Sensitivity to Partitioning Methods

Lang, S. E. , NASA Goddard Space Flight Center , USA ; Tao, W.-K. , NASA Goddard Space Flight Center , USA ; Simpson, J. , NASA Goddard Space Flight Center , USA ; Ferrier, B. , National Centers for Environmental Prediction , USA ; [2001] ; 66p ; In English ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Six different convective-stratiform separation techniques, including a new technique that utilizes the ratio of vertical and terminal velocities, are compared and evaluated using two-dimensional numerical simulations of a tropical [Tropical Ocean Global Atmosphere Coupled Ocean Atmosphere Response Experiment (TOGA COARE)] and midlatitude continental [Preliminary Regional Experiment for STORM-Central (PRESTORM)] squall line. Comparisons are made in terms of rainfall, cloud coverage, mass fluxes, apparent heating and moistening, mean hydrometeor profiles, CFADs (Contoured Frequency with Altitude Diagrams), microphysics, and latent heating retrieval. Overall, it was found that the different separation techniques produced results that qualitatively agreed. However, the quantitative differences were significant. Observational comparisons were unable to conclusively evaluate the performance of the techniques. Latent heating retrieval was shown to be sensitive to the use of separation technique mainly due to the stratiform region for methods that found very little stratiform rain.
Author
Precipitation (Meteorology) ; Two Dimensional Models ; Air Water Interactions ; Sensitivity ; Convection ; Climate Models ; Stratification

20020010902 NASA Goddard Space Flight Center , Greenbelt, MD USA
TRMM Data Assimilation at NASA
Hou, Arthur Y. , NASA Goddard Space Flight Center , USA ; Zhang, S. , NASA Goddard Space Flight Center , USA ; daSilva, A. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; European Geophysical Society XXVI General Assembly , 25-30 Mar. 2001 , Nice , France ; Sponsored by European Geophysical Society , Unknown ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We give an overview of the research at NASA in assimilating tropical rainfall and total precipitable water (TPW) retrievals derived from the TRMM Microwave Imager (TMI) and the Special Sensor Microwave/ Imager (SSM/I) instruments. Global analyses currently contain order-one errors in the primary fields of the hydrological cycle such as precipitation, evaporation, moisture, and the related cloud fields, especially in the tropics. We show that an effective strategy to assimilate tropical rainfall data is to use observations to compensate for errors in moisture tendencies produced by the assimilation model. Results show that assimilating TMI and SSM/I surface rainrates and TPW estimates improves shortrange forecasts and reduces state-dependent systematic errors in the hydrological cycle and related climate parameters such as cloud, radiation, and the large-scale circulation in the tropics. The study provides a demonstration of the potential of using rainfall and moisture observations derived from passive microwave instruments to improve the quality of 4-dimensional global datasets for climate analysis and weather forecasting applications.
Author
Trmm Satellite ; NASA Programs ; Data Acquisition ; Climatology ; Precipitation (Meteorology)

20020011021 NASA Goddard Space Flight Center , Greenbelt, MD USA
Comparison of the Variability of Constituents from a 3D Simulation with Observations in the Tropics
Douglass, A. R. , NASA Goddard Space Flight Center , USA ; Strahan, S. E. , NASA Goddard Space Flight Center , USA ; Rood, R. B. , NASA Goddard Space Flight Center , USA ; [2001] ; 1p ; In English ; AGU Spring Meeting , 29 May - 2 Jun. 2001 , Boston, MA , USA ; Sponsored by American Geophysical Union , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Fields from chemical transport models (CTMs) driven by assimilated winds have been shown to represent many aspects of observations at middle and high latitudes. Comparisons of modeled fields with observations have been much poorer in the tropics. Noise in the tropical winds produces variability in constituents in the tropics that greatly exceeds what is observed, Constituent gradients between the tropics, subtropics and middle latitudes are weaker than observed in the lower stratosphere. Tropical transport is shown to be much more realistic using a CTM driven by winds from the assimilation system that has recently been developed by the Data Assimilation Office at Goddard Space Flight Center. The Finite Volume Community Climate Model (FV-CCM), a general circulation model model that uses the NCAR CCM physics and the Lin and Rood dynamical core, is at the core of the new assimilation system. Realistic transport in the tropics, particularly troposphere to stratosphere exchange, is an obvious requirement for realistic representation of the stratosphere to troposphere transport of ozone and other stratospheric constituents to the middle latitude upper troposphere.
Author
Tropical Regions ; Wind (Meteorology) ; Three Dimensional Models ; Simulation ; Variability ; Atmospheric General Circulation Models

20020011610 NASA Goddard Space Flight Center , Greenbelt, MD USA

The Sensitivity of West African Squall Line Water Budgets to Land Cover

Mohr, Karen I. , Albany Univ. , USA ; Baker, R. David , Austin Coll. , USA ; Tao, Wei-Kuo , NASA Goddard Space Flight Center , USA ; Famiglietti, James S. , California Univ. , USA ; [2001] ; 43p ; In English

Contract(s)/Grant(s): NGT5-81 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This study used a two-dimensional coupled land/atmosphere (cloud-resolving) model to investigate the influence of land cover on the water budgets of squall lines in the Sahel. Study simulations used the same initial sounding and one of three different land covers, a sparsely vegetated semi-desert, a grassy savanna, and a dense evergreen broadleaf forest. All simulations began at midnight and ran for 24 hours to capture a full diurnal cycle. In the morning, the latent heat flux, boundary layer mixing ratio, and moist static energy in the boundary layer exhibited notable variations among the three land covers. The broadleaf forest had the highest latent heat flux, the shallowest, moistest, slowest growing boundary layer, and significantly more moist static energy per unit area than the savanna and semi-desert. Although all simulations produced squall lines by early afternoon, the broadleaf forest had the most intense, longest-lived squall lines with 29% more rainfall than the savanna and 37% more than the semi-desert. The sensitivity of the results to vegetation density, initial sounding humidity, and grid resolution was also assessed. There were greater differences in rainfall among land cover types than among simulations of the same land cover with varying amounts of vegetation. Small changes in humidity were equivalent in effect to large changes in land cover, producing large changes in the condensate and rainfall. Decreasing the humidity had a greater effect on rainfall volume than increasing the humidity. Reducing the grid resolution from 1.5 km to 0.5 km decreased the temperature and humidity of the cold pools and increased the rain volume. Author

Atmospheric Models ; Two Dimensional Models ; Water ; Simulation ; Wind (Meteorology)

20020011611 NASA Goddard Space Flight Center , Greenbelt, MD USA

The Research of Dr. Joanne Simpson: Fifty Years Investigating Hurricanes, Tropical Clouds and Cloud Systems

Tao, W. -K. , NASA Goddard Space Flight Center , USA ; Halverson, J. , NASA Goddard Space Flight Center , USA ; Adler, R. , NASA Goddard Space Flight Center , USA ; Garstang, M. , Simpson Weather Associates, Inc. , USA ; Houze, R., Jr. , Washington Univ. , USA ; LeMone, M. , National Center for Atmospheric Research , USA ; Pielke, R., Sr. , Colorado State Univ. , USA ; Woodley, W. , Woodley Weather Consultants , USA ; [2001] ; 42p ; In English ; AMS Meteorological Monographs Symposium on Cloud Systems, Hurricanes and TRMM , USA ; Original contains color illustrations ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This AMS Meteorological Monographs is dedicated to Dr. Joanne Simpson for her many pioneering research efforts in tropical meteorology during her fifty-year career. Dr. Simpson's major areas of scientific research involved the "hot tower" hypothesis and its role in hurricanes, structure and maintenance of trade winds, air-sea interaction, and observations and the mechanism for hurricanes and waterspouts. She was also a pioneer in cloud modeling with the first one-dimensional model and had the first cumulus model on a computer. She also played a major role in planning and leading observational experiments on convective cloud systems. The launch of the Tropical Rainfall Measuring Mission (TRMM) satellite, a joint U.S.-Japan project, in November of 1997 made it possible for quantitative measurements of tropical rainfall to be obtained on a continuous basis over the entire global tropics. Dr. Simpson was the TRAM Project Scientist from 1986 until its launch in 1997. Her efforts during this crucial period ensured that the mission was both well planned scientifically and well engineered as well as within budget. In this paper, Dr. J. Simpson's nine specific accomplishments during her fifty-year career: (1) hot tower hypothesis, (2) hurricanes, (3) airflow and clouds over heated islands, (4) cloud models, (5) trade winds and their role in cumulus development, (6) air-sea interaction, (7) cloud-cloud interactions and mergers, (8) waterspouts, and (9) TRMM science, will be described and discussed. Author

Hypotheses ; Hurricanes ; Air Flow ; Clouds (Meteorology) ; Tropical Meteorology ; Air Water Interactions ; Mathematical Models

20020011854 National Defence Research Establishment , Div. of Command and Control Warfare , Linkoeping, Sweden

MAIS: An Atmosphere and Background Model for Electro-Optical Simulations ***MAIS: En Atmosfaers- Ochs Bakgrundsmodell fuer Elektrooptiska Simuleringar***

Wigren, C. ; Nov. 2000 ; 34p ; In English

Report No.(s): PB2001-108161 ; FOA-R-00-01677-616-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A model, MAIS, for creating IR-images of objects and backgrounds with atmospheric effects included, is presented. Images can be created using 2D-bitmaps, together with distance and altitude information. It is also possible to create images using a modularized 3D description of the scene. In the latter case, distance and altitude information for each individual pixel can be obtained from the 3D-model and used when effects of the atmosphere are added to the image. Thermal radiation from the surfaces

in the 3D-model is described using a homogenous surface with a fixed radiation value or by using 2D-texture mapping. The effects of the atmosphere, modeled in MAIS, are atmospheric transmission, self-emission of thermal radiation, and turbulence. MAIS can be used in OPTSIM simulations of Electro-Optical warfare duels or in OPTSIM simulations to determine the characteristic of IR warning sensor systems. In the latter case MAIS can be used even when the system is designed for sub-pixel target detection. Furthermore, when MAIS is used in a warning sensor simulation the effect of an obscuring horizon can be considered and the position of the sensor system on the platform can evaluated.
NTIS
Electro-Optics ; Atmospheric Models ; Three Dimensional Models ; Atmospheric Effects ; Thermal Radiation ; Infrared Imagery

20020011859 Forest Service , North Central Research Station , Saint Paul, MN USA
Northern Minnesota Independence Day Storm: A Research Needs Assessment
Mattson, W. J. ; Shriner, D. S. ; 2001 ; 72p ; In English
Report No.(s): PB2002-100277 ; FSGTR-NC-216 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
A massive wind and rain storm, a few minutes past noon on July 4, 1999, in northern Minnesota, created an extensive and largely unprecedented blowdown across north-central to northeastern Minnesota, Wisconsin, and southern Ontario. Over 477 thousand acres were impacted in northern Minnesota alone. Affected areas include the Chippewa and Superior National Forests (NFs), but most of the disturbance lies within the Boundary Waters Canoe Area Wilderness (BWCAW) and Quetico Provincial Park. On the Superior NF and BWCAW, the amount of downed timber in terrestrial areas was truly extensive, on a scale unseen in recent times. High speed winds associated with the storm uprooted and snapped off trees in a swath 4-12 miles wide and 30 miles long.
NTIS
Wilderness ; Boundaries ; Forests ; Storms ; Wind (Meteorology)

20020012226 Lawrence Livermore National Lab. , Livermore, CA USA
Uncertainty in dispersion forecasts using meterological ensembles
Chin, H. N. ; Leach, M. J. ; Jul. 12, 1999 ; 4p ; In English
Report No.(s): DE2001-13795 ; UCRL-JC-134884 ; No Copyright ; Avail: Department of Energy Information Bridge
The usefulness of dispersion forecasts depends on proper interpretation of results. Understanding the uncertainty in model predictions and the range of possible outcomes is critical for determining the optimal course of action in response to terrorist attacks. One of the objectives for the Modeling and Prediction initiative is creating tools for emergency planning for special events such as the upcoming Olympics. Meteorological forecasts hours to days in advance are used to estimate the dispersion at the time of the event. However, there is uncertainty in any meteorological forecast, arising from both errors in the data (both initial conditions and boundary conditions) and from errors in the model. We use ensemble forecasts to estimate the uncertainty in the forecasts and the range of possible outcomes.
NTIS
Weather Forecasting ; Climatology ; Mathematical Models ; Meteorology

20020012258 National Aerospace Lab. , Space Div. , Amsterdam, Netherlands
Lidar Performance Analysis Simulator-LIPAS ***Final Report***
Veldman, S. M. ; Knobbout, H. A. ; Stoffelen, A. ; Marseille, G. J. ; Fuchs, J. ; Feb. 2000 ; 26p ; In English
Report No.(s): PB2001-108694 ; NLR-TP-2000-043 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The Lidar Performance Analysis Simulator (LIPAS) simulates the Doppler Wind Lidar (DWL) ALADIN accommodated on the International Space Station (ISS) or on a free flying satellite. The paper describes backgrounds of the Atmospheric Dynamics Mission (ADM), including its benefits for meteorological community, and the DWL measurement technique. Furthermore it presents the objectives of the LIPAS study, and the way to come to a cost-effective simulator, that would be available on time. An overview is given for the instrument, carrier, and user interface related modules. The LIPAS results will be used to assess the meteorological utility of the DWL, and to compare different instrument concepts. Furthermore, results from the communication scenarios will give operational information. Re-using existing software in the EuroSim simulation environment has made it possible to quickly advance in the project. The LIPAS-simulator can be the basis for a framework simulator that can be tailored to a range of satellite applications.
NTIS
Meteorology ; Simulators ; Optical Radar ; Doppler Radar ; Satellite Observation

20020012426 NASA Goddard Space Flight Center , Greenbelt, MD USA

Precipitation Processes Derived from TRMM Satellite Data, Cloud Resolving Model and Field Campaigns

Tao, W.-K. , NASA Goddard Space Flight Center , USA ; Lang, S. , NASA Goddard Space Flight Center , USA ; Simpson, J. , NASA Goddard Space Flight Center , USA ; Meneghini, R. , NASA Goddard Space Flight Center , USA ; Halverson, J. , NASA Goddard Space Flight Center , USA ; Johnson, R. , NASA Goddard Space Flight Center , USA ; Adler, R. , NASA Goddard Space Flight Center , USA ; [2001] ; 6p ; In English ; 30th International Conference on Radar Meteorology , 19-24 Jul. 2001 , Munich , Germany ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Rainfall is a key link in the hydrologic cycle and is a primary heat source for the atmosphere. The vertical distribution of latent-heat release, which is accompanied by rainfall, modulates the large-scale circulations of the tropics and in turn can impact midlatitude weather. This latent heat release is a consequence of phase changes between vapor, liquid. and solid water. Present large-scale weather and climate models can simulate cloud latent heat release only crudely thus reducing their confidence in predictions on both global and regional scales. In this paper, NASA Tropical Rainfall Measuring (TRMM) precipitation radar (PR) derived rainfall information and the Goddard Convective and Stratiform Heating (CSH) algorithm used to estimate the four-dimensional structure of global monthly latent heating and rainfall profiles over the global tropics from December 1997 to October 2000. Rainfall latent heating and radar reflectively structure between ENSO (1997-1998 winter) and non-ENSO (1998-1999 winter) periods are examined and compared. The seasonal variation of heating over various geographic locations (i.e. Indian ocean vs west Pacific; Africa vs S. America) are also analyzed. In addition, the relationship between rainfall latent heating maximum heating level), radar reflectively and SST are examined.

Author

Rain ; Hydrological Cycle ; Heat Sources ; Precipitation (Meteorology) ; Annual Variations ; Convective Heat Transfer ; Latent Heat

20020012439 Pennsylvania State Univ. , Dept. of Meteorology , University Park, PA USA

Development and Testing of Coupled Land-surface, PBL and Shallow/Deep Convective Parameterizations within the MM5 ***Final Report , 1 Nov. 1997 - 31 Oct. 2000***

Stauffer, David R. , Pennsylvania State Univ. , USA ; Seaman, Nelson L. , Pennsylvania State Univ. , USA ; Munoz, Ricardo C. , Pennsylvania State Univ. , USA ; Dec. 10, 2000 ; 224p ; In English

Contract(s)/Grant(s): NAG5-6398 ; No Copyright ; Avail: CASI ; A10 , Hardcopy ; A03 , Microfiche

The objective of this investigation was to study the role of shallow convection on the regional water cycle of the Mississippi and Little Washita Basins using a 3-D mesoscale model, the PSUINCAR MM5. The underlying premise of the project was that current modeling of regional-scale climate and moisture cycles over the continents is deficient without adequate treatment of shallow convection. It was hypothesized that an improved treatment of the regional water cycle can be achieved by using a 3-D mesoscale numerical model having a detailed land-surface parameterization, an advanced boundary-layer parameterization, and a more complete shallow convection parameterization than are available in most current models. The methodology was based on the application in the MM5 of new or recently improved parameterizations covering these three physical processes. Therefore, the work plan focused on integrating, improving, and testing these parameterizations in the MM5 and applying them to study water-cycle processes over the Southern Great Plains (SGP): (1) the Parameterization for Land-Atmosphere-Cloud Exchange (PLACE) described by Wetzel and Boone; (2) the 1.5-order turbulent kinetic energy (TKE)-predicting scheme of Shafran et al.; and (3) the hybrid-closure sub-grid shallow convection parameterization of Deng. Each of these schemes has been tested extensively through this study and the latter two have been improved significantly to extend their capabilities.

Author

Convection ; Parameterization ; Three Dimensional Models ; Hydrological Cycle ; Shallow Water

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OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20020008656 Research Inst. of National Defence , Stockholm, Sweden

Methods for Data Assimilation in Oceanography

Nycander, J. , Research Inst. of National Defence , Sweden ; Dec. 1999 ; 42p ; In English

Report No.(s): PB2001-108409 ; FOA-R-99-01324-409-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

An overview of methods for oceanographic data assimilation is given. These include optimal interpolation and statistical interpolation, the method traditionally used in meteorology, which is also used operationally for ocean forecasting in several oceanographic centers. More advanced and expensive methods that are likely to be used in the future, such as variants of the Kalman filter and the adjoint method, are also described.
NTIS
Kalman Filters ; Oceanographic Parameters ; Statistical Analysis ; Data Processing

20020008666 NASA Goddard Space Flight Center , Greenbelt, MD USA
Aerosol Radiative Forcing Derived From SeaWIFS - Retrieved Aerosol Optical Properties
Chou, Mong-Dah , NASA Goddard Space Flight Center , USA ; Chan, Pui-King , Science Systems and Applications, Inc. , USA ; Wang, Menghua , NASA Goddard Space Flight Center , USA ; December 2000 ; 28p ; In English ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

To understand climatic implications of aerosols over global oceans, the aerosol optical properties retrieved from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) are analyzed, and the effects of the aerosols on the Earth's radiation budgets (aerosol radiative forcing, ARF) are computed using a radiative transfer model. It is found that the distribution of the SeaWiFS-retrieved aerosol optical thickness is distinctively zonal. The maximum in the equatorial region coincides with the Intertropical Convergence Zone, and the maximum in the Southern Hemispheric high latitudes coincides with the region of prevailing westerlies. The minimum aerosol optical thickness is found in the subtropical high pressure regions, especially in the Southern Hemisphere. These zonal patterns clearly demonstrate the influence of atmospheric circulation on the oceanic aerosol distribution. Over global oceans, aerosols reduce the annual mean net downward solar flux by 5.4 W m-2 at the top of the atmosphere and by 6.1 W m-2 at the surface. The largest ARF is found in the tropical Atlantic, Arabian Sea, Bay of Bengal, the coastal regions of Southeast and East Asia, and the Southern Hemispheric high latitudes. During the period of the Indonesian big fires (September-December 1997), the cooling due to aerosols is greater than 15 W m-2 at the top of the atmosphere and greater than 30 W m(exp -1) at the surface in the vicinity of the maritime continents. The atmosphere receives extra solar radiation by greater than 15 W m(exp -1) over a large area. These large changes in radiative fluxes are expected to have enhanced the atmospheric stability, weakened the atmospheric circulation, and augmented the drought condition during that period. It would be very instructive to simulate the regional climatic. The model-calculated clear sky solar flux at the top of the atmosphere is compared with that derived from the Clouds and the Earth's Radiant Energy System (CERES). The net downward solar flux of CERES is systematically larger than the model calculations by -3 W M-2. In the equatorial region, the CERES-derived net downward solar flux is even larger than the model calculations without including aerosols. It is possible that the CERES incorrectly identified regions of high humidity and high aerosol concentration as being cloud contaminated and, hence, overestimated the clear sky net downward solar flux.
Author
Aerosols ; Optical Properties ; Sea-Viewing Wide Field-Of-View Sensor ; Optical Thickness ; Oceans ; Atmospheric Models ; Marine Meteorology

20020009032 Oak Ridge National Lab. , TN USA
Carbon Dioxide, Hydrographic, and Chemical Data Obtained During the R/V John V. Vickers Cruise in the Pacific Ocean (WOCE Section P13, NOAA CGC92 Cruise, August 4-October 21, 1992)
Kozyr, A. ; Jan. 11, 2001 ; 132p ; In English
Report No.(s): DE2001-777689 ; ORNL/CDIAC-128 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This data documentation discusses the procedures and methods used to measure total carbon dioxide (TCO(sub 2)) and total alkalinity (TALK) at hydrographic stations during the R/V John V. Vickers oceanographic cruise in the Pacific Ocean (Section P13). Conducted as part of the World Ocean Circulation Experiment (WOCE) and the National Oceanic and Atmospheric Administration Climate and Global Change Program, the cruise began in Los Angeles, California, on August 4, 1992, with a transit line (Leg 0) to Dutch Harbor, Alaska. On August 16, the ship departed Dutch Harbor on Leg 1 of WOCE section P13. On September 15, the R/V John V. Vickers arrived in Kwajalein, Marshall Islands, for emergency repairs, and after 11 days in port departed for Leg 2 of Section P13 on September 26. The cruise ended on October 21 in Noumea, New Caledonia. Measurements made along WOCE Section P13 included pressure, temperature, salinity (measured by a conductivity, temperature, and depth sensor (CTD)), bottle salinity, bottle oxygen, phosphate, nitrate, nitrite, silicate, chlorofluorocarbons (CFC-11, CFC-12), TCO(sub 2) , and TALK. The TCO(sub 2) was measured by coulometry using a Single-Operator Multiparameter Metabolic Analyzer (SOMMA). The overall precision and accuracy of the analyses was (+-)2 (micro)mol/kg. Samples collected for TALK were measured by potentiometric titration; precision was (+-)2 (micro)mol/kg. The CO(sub 2) -related measurements aboard the

R/V John V. Vickers were supported by the U.S. Department of Energy. The WOCE Section P13 data set is available free of charge as a numeric data package (NDP) from the Carbon Dioxide Information Analysis Center. The NDP consists of two oceanographic data files, two FORTRAN 90 data-retrieval routine files, a documentation file, and this printed report, which describes the contents and format of all files as well as the procedures and methods used to obtain the data. Instructions on how to access the data are provided.
NTIS
Hydrography ; Carbon Dioxide ; Oceanographic Parameters ; Marine Meteorology

20020009129 NASA Wallops Flight Center , Wallops Island, VA USA
Combining TOPEX and SeaWinds Data to Refine Models for Ocean Surface Emissivity: Wind Vector Signatures at 18, 21 and 37 GHz
Vandemark, D. , NASA Wallops Flight Center , USA ; Tran, N. , NASA Wallops Flight Center , USA ; Ruf, C. , NASA Wallops Flight Center , USA ; [2001] ; 1p ; In English ; OAI Conference , 3-5 Apr. 2001 , Miami, FL , USA ; Sponsored by Ohio Aerospace Inst. , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

TOPEX Microwave Radiometer (TMR) brightness temperature observations at 18, 21, and 37 GHz have been collocated with near-simultaneous SeaWinds wind vector data as well as with a monthly SST climatological product. The combined data set allows us to study the dependence of ocean surface emissivity (at each frequency) upon both wind speed. Results show clear two-branch wind speed dependence; weak and linear below 6 m/s with an abrupt increase in sensitivity above that point. The analysis also shows that the zenith-directed ocean surface emissivity is polarization dependent above wind speeds of 5-6 m/s with an azimuthal variation related to the wind direction. This last result accords with recent polarimetric radiometer observations collected from aircraft. Implications of these observations to water vapor retrieval algorithms, nadir-viewing polarimetry, and ocean emission modeling will be discussed.
Author
Microwave Radiometers ; Brightness Temperature ; Sea Surface Temperature ; Ocean Surface ; Emissivity ; Wind Velocity

20020011600 National Defence Research Establishment , Div. of Systems and Underwater Technology , Stockholm, Sweden
Motionally Induced Electrical Field from a Two-Layer Channel-Flow of Rectangular or Elliptical Cross-Section; a Possibility to Resolve Baroclinic Flow Features?
Fristedt, T. ; Sigray, P. ; Oct. 2000 ; 26p ; In English
Report No.(s): PB2001-108151 ; FOA-R-00-01633-409-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The volume transports of oceanic currents can be monitored by bottom-mounted electrodes, which measure the voltage induced by the motion of sea-water across the earth's magnetic field. For homogeneous conditions this voltage is proportional to the total transport of water perpendicular to the electrical potential gradient measured by the electrodes. However, if the water column is stratified, as often proves to be the case in near-shore environments, a single pair of electrode sensors does not suffice to determine all flow variables. to further exploit the measuring technique, the present study investigates multi-layered flows through passages of both rectangular and elliptical cross-sections. Expressions describing the vertical dependence of the induced electrical fields are derived, and the results suggest that it may be possible to resolve vertical variations of the flow field (i.e. baroclinic features) by using two electrode pairs at carefully chosen cross-stream locations.
NTIS
Baroclinic Waves ; Channel Flow ; Potential Gradients ; Atmospheric Circulation ; Flow Distribution

20020012007 NASA Goddard Space Flight Center , Greenbelt, MD USA
In Situ Aerosol Optical Thickness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis
Fargion, Giulietta S. , General Sciences Corp. , USA ; Barnes, Robert , General Sciences Corp. , USA ; McClain, Charles , NASA Goddard Space Flight Center , USA ; In Situ Aerosol Optical Thickness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 ; 114p ; In English ; See also 20020012008 through 20020012017
Report No.(s): NASA/TM-2001-209982 ; Rept-2001-01672-0 ; NAS 1.15:209982 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

The purpose of this technical report is to provide current documentation of the Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) Project Office activities on in situ aerosol optical thickness (i.e., protocols, and data QC and analysis). This documentation is necessary to ensure that critical information is related to the scientific community and NASA management. This critical information includes the technical difficulties and challenges of validating and combining ocean color data from an array of independent satellite systems to form consistent and accurate global bio-optical time

series products. This technical report is not meant as a substitute for scientific literature. Instead, it will provide a ready and responsive vehicle for the multitude of technical reports issued by an operational project.
Author
Protocol (Computers) ; Sea-Viewing Wide Field-Of-View Sensor ; Satellite Observation ; In Situ Measurement ; Calibrating ; Aerosols ; Optical Thickness

20020012008 NASA Goddard Space Flight Center , Greenbelt, MD USA
SIMBIOS Sun Photometer Program , Chapter 1
McClain, Charles , NASA Goddard Space Flight Center , USA ; Fargion, Giulietta S. , General Sciences Corp. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 1-2 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A02 , Microfiche

Aerosol optical thickness (AOT) values determined from the satellite ocean color data provide useful information on the spatial and temporal distributions of aerosols and are by-products of the atmospheric corrections required to estimation of water-leaving radiances. The Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) project is using in situ atmospheric data, primarily from sun photometers, for several purposes including: (1) validation the SeaWiFS and other ocean color mission aerosol optical products, e.g., AOT and Angstrom exponent; (2) evaluation of the aerosol models currently used for atmospheric corrections; and (3) development of vicarious sensor calibration methodologies, especially for the near-infrared bands where in situ water-leaving radiance data in the visible from sites like the Marine Optical Buoy cannot be used. The principal source of in situ aerosol observations was the Aerosol Robotic Network (AERONET).
Derived from text
Aerosols ; In Situ Measurement ; Optical Thickness ; Temporal Distribution ; Data Processing

20020012016 General Sciences Corp. , Beltsville, MD USA
SeaWiFS Vicarious Calibration: An Alternative Approach Utilizing Simultaneous In Situ Observations of Oceanic and Atmospheric Optical Properties , Chapter 9
Franz, Bryan A. , General Sciences Corp. , USA ; Ainsworth, Ewa J. , General Sciences Corp. , USA ; Bailey, Sean , FutureTech Corp. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 88-96 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A02 , Microfiche

We will first describe an approach for estimating the top-of-atmosphere (TOA) reflectance using simultaneous measurements of in situ water-leaving radiance and aerosol optical thickness at the SeaWiFS wavelengths. This approach can be used to predict the radiance that should be observed in each of the eight SeaWiFS bands, thereby providing a mechanism for direct calibration of the sensor. We apply this technique to the vicarious calibration of SeaWiFS and contrast the results with those obtained for the operational SeaWiFS calibration, through comparison with independent in situ measurements of water-leaving radiances and aerosol optical thickness.
Author
Aerosols ; Optical Thickness ; Radiance ; Reflectance ; In Situ Measurement ; Data Correlation

20020012017 Science Systems and Applications, Inc. , Lanham, MD USA
SeaBASS Data File Format , Appendix A
Werdell, P. Jeremy , Science Systems and Applications, Inc. , USA ; Bailey, Sean , FutureTech Corp. , USA ; Fargion, Giulietta S. , General Sciences Corp. , USA ; In Situ Aerosol Optical Thinkness Collected by the SIMBIOS Program (1997-2000): Protocols, and and Data QC and Analysis ; March 2001 , pp. 97-101 ; In English ; See also 20020012007 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A02 , Microfiche

In an effort to ensure compatibility within the SeaBASS (SeaWIFS Bio-optical Archive and Storage System) data archive, and to facilitate the development of the expanded version of the SeaBASS database, a standard set of case-insensitive field names and units has been adopted. While the list of standardized field names is reasonably comprehensive, it cannot account for all the possible data types one might wish to provide to the SeaBASS archive. If a data type to be submitted to SeaBASS does not fall under one of the predefined standard field names, the investigator may still include the data. Note that the standardized set is updated as the need arises (e.g., a data parameter is commonly submitted or queried). Non-standard data will be archived, however,

the data values will not be ingested into the online database. The data will be retrievable, but only with the original archived file, not as a separate dataset.
Derived from text
Data Bases ; Format ; Standardization

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20020006189 Alabama Univ. , Birmingham, AL USA
Novel Vectors for Dendritic Cell Transduction ***Annual Report , 1 Jun. 2000-31 May 2001***
Strong, Theresa V. ; Jun. 2001 ; 7p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0122
Report No.(s): AD-A395592 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Dendritic cells (DCs) show promise for cancer immunotherapy due to their critical role in mediating immune response. Development of an optimal DC transduction protocol for tumor antigen presentation would represent a significant advancement in DC-based vaccination strategies. We are evaluating novel vector systems for dendritic cell transduction. Replicative RNA transcripts based on the alphavirus family are noninfectious vectors capable of directing cytoplasmic replication and high level transgene expression upon entry into the cell. We hypothesize that the augmented expression afforded by the replicative RNA system will effectively stimulate T cells. Further, we hypothesize that the cytopathic effects induced by these vectors will enhance the DC-based immune response as suggested by the 'danger' model. A second approach uses adenoviral vectors targeted to CD40 on DCs via a bispecific antibody, which we anticipate will promote maturation of the DCs. The target antigen we will evaluate is carcinoembryonic antigen (CEA). Animals will be immunized with the genetically modified DCs and induction of anti-CEA immune responses will be measured. Tumor challenge and tumor therapy experiments will be performed using a syngeneic adenocarcinoma cell line which expresses human CEA (MC38-CEA-2), and toxicity will be monitored. Both nontransgenic and CEA-transgenic mouse models will be used.
DTIC
Immune Systems ; Therapy ; Cancer ; Cells (Biology)

20020006190 Walter Reed Army Medical Center , Washington, DC USA
Operational TeleCardiology ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Vernalis, Marina N. ; Oct. 2001 ; 7p ; In English
Contract(s)/Grant(s): MIPR OEC5DTM0078
Report No.(s): AD-A395585 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

This project suffered numerous problems related to the infrastructure, administration, and technical aspects. All of these shortcomings were encountered during the actual deployment and implementation of the project.
DTIC
Medical Services ; Clinical Medicine ; Telemedicine ; Cardiology

20020006192 Madigan Army Medical Center , Takoma, WA USA
Virtual Primary Care Clinic ***Final Report , 15 Feb. 2000-2 Jun. 2001***
Rumph, Jerald ; Oct. 2001 ; 14p ; In English
Contract(s)/Grant(s): MIPR 0EC5DKM0074
Report No.(s): AD-A395531 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The problems, or challenges as I prefer to refer to them, can be fairly well encompassed within the concept of complexity. This was an ambitious project from the start, with potential to define an e-health direction for the region. It was perhaps this ambitious nature as well as a myriad of complex technical challenges to overcome that sensitized many personnel and departments. The project required discourse between various departments, each with their own agendas and priorities. It involved coordinating key MAMC Information Management functions, the MHS Information Management function of CHCS, SAIC at multiple levels, and many independent researchers in order to deliver patient care services in new ways, test new technology, and

support clinical research. These challenges are in addition to those initially described in the mid-term report of internal project leadership definition.
DTIC
Information Management ; Clinical Medicine

20020006193 Virginia Univ. , Charlottesville, VA USA
Opening of the Mitochondrial Permeability Transition Pore by Reactive Oxygen Species is a Basic Event Neurodegeneration ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Savory, John ; Jul. 2001 ; 160p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9552
Report No.(s): AD-A395522 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
This investigation focuses on mitochondrial injury in the brain and subsequent apoptosis, as a major factor in neurodegeneration. The animal model system involves the direct injection of Al maltolate directly into the brains of New Zealand white rabbits via the intracisternal route. Our hypothesis was that Al maltolate induced oxidative stress resulting in opening of the mitochondrial permeability transition pore (PTP) and release of cytochrome c. This event was predicted to induce apoptosis. Our original proposal was to emphasize the use of immunohistochemical techniques for this study with confirmation by Western blot analysis. We have now developed cell fractionation techniques to that we can obtain mitochondrial, cytoplasmic, endoplasmic reticulum and nuclear fractions, with appropriate markers, with confirmation by immunohistochemistry. We have shown, as originally proposed, that aged rabbits do indeed demonstrate opening of the PTP and cytochrome c release, whereas young adult rabbits are not affected. However, this event does not necessarily lead to caspase-3 activation and apoptosis. We have now demonstrated that the endoplasmic reticulum and caspase-12 is important in the overall process of neurodegeneration and have been able to demonstrate neuroprotection with GDNF. We have performed studies on 70 rabbits during the time period covered by this present report.
DTIC
Apoptosis ; Brain ; Cytochromes ; Mitochondria ; Permeability

20020006194 Boston Univ. , Boston, MA USA
Role of TGR-B1-Mediated Down Regulation of NF-kB/Rel Activity During Growth Arrest of Breast Cancer Cells ***Annual Report , 1 May 2000-30 Apr. 2001***
Guo, Shangqin ; Sonenshein, Gail ; May 2001 ; 39p ; In English
Contract(s)/Grant(s): DAMD17-98-1-8034
Report No.(s): AD-A395516 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The NF-Kappa B/Rel family of dimeric transcription factors has been shown to promote cell survival, and increasing evidence suggests involvement in carcinogenesis. Recently, NF-Kappa B/Rel was found to be constitutively active in the nuclei of human breast cancer cell lines, as well as in 7,12-dimethylbenz(a)anthracene (DMBA)-induced mammary tumors from Sprague-Dawley rats (S-D). Malignantly transformed human mammary epithelial cells (HMEC), derived by carcinogen treatment of non-tumorigenic parental MCF-10F cells displayed increased constitutive NF-Kappa B activation. In premalignant HMECs immortalized by carcinogen treatment in vitro, NF-Kappa B activity was dysregulated in quiescence. Furthermore, founder lines of transgenic mice with targeted ectopic expression of the c-Rel subunit in the mammary gland were established. Studies, which are still in progress, have indicated the appearance of breast tumors appear by an average of 19 months, thus confirming the role of NF-Kappa B/Rel in the pathogenesis of the mammary gland. Furthermore, our laboratory demonstrated activation of NF-Kappa B is induced upon over-expression of Her-2/neu.
DTIC
Cancer ; Carcinogens ; Mammary Glands ; Tumors

20020006195 Kentucky Univ. , Lexington, KY USA
Molecular Mechanisms of Dietary Fatty Acids on Breast Cancer Growth and Development ***Annual Report , 1 Jan. 2000-31 Jan 2001***
Kilgore, Michael W. ; Feb. 2001 ; 22p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7248
Report No.(s): AD-A395514 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The link between diet and breast cancer has been long postulated and recently, extensively investigated. Identifying a molecular mechanism linking diet and breast cancer, however, has remained elusive. Recently, we identified an isoform of the cellular receptor called the peroxisomal proliferator-activated receptor (PPAR) in several human breast cancer cell lines.

Activation of PPAR can alternatively lead to tumor induction or differentiation into a more benign state, depending on the tissue and the isoform expressed. We and others have demonstrated that human breast cancer cell lines express PPAR and that individual fatty acids are capable binding to and functioning as selective agonist or antagonist of PPAR.
DTIC
Cancer ; Diets ; Fatty Acids ; Mammary Glands

20020006198 Duke Univ. , Durham, NC USA
Long-Term Effects of Subchronic Exposure to Sarin, Alone and With Stress or Other Chemicals ***Annual Report , 25 Mar. 2000-24 Mar 2001***
Abou-Donia, Mohamed B. ; Apr. 2001 ; 172p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-98-C-8027
Report No.(s): AD-A395502 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
The key goal of this project is to investigate possible long-term effects of low-levels subclinical exposure to sarin, alone and in combination with other factors. The dose levels and routes of exposure were chosen to closely reflect those present during the Gulf War.
DTIC
Health Physics ; Exposure ; Physiological Factors ; Biological Weapons

20020006199 Israel Inst. for Biological Research , Ness-Ziona, Israel
Design and Production of an Organophosphorus-Bioscavenger Via Protein Engineering of the Human Acetylcholinesterase ***Annual Report , 1 Jun. 2000-31 May 2001***
Shafferman, Avigdor ; Jun. 2001 ; 89p ; In English
Contract(s)/Grant(s): DAMD17-00-C-0021
Report No.(s): AD-A395499 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
The design of novel biocatalysts with potential pharmacological use against organophosphate (OP) poisoning, within the mold of recombinant human acetylcholinesterase (rHuAChE), was carried out by two complementing research approaches: (a) Kinetic studies combined with mass spectrometric analysis of rHuAChE and selected mutants thereof, with a variety of OPs for better understanding of the chemical environment for the OPs in the active center of AChE. Specifically, here we report the resolution of some of the less understood reaction pathways of phosphylation, and 'aging' of the resulting acetylcholinesterase (AChE) conjugates involving phosphoroamidates (P-N agents) such as tabun and butyl-tabun. (b) Biochemical and pharmacological analyses of post-translation modifications responsible for the limited residence time of rHuAChE. An extensive structural MALDI-TOF analysis of the N-glycans of the native serum-derived bovine AChE and its recombinant counterpart, identified specific termini that could account for the observed differential behavior of these enzymes. Accordingly, we generated through a combination of biochemical and genetic manipulations, a series of recombinant enzyme products differing in sialylation as well as oligomerization. A unique hierarchical order of post-translation modifications that determine the circulatory residence time was revealed. Based on these studies a recombinant product exhibiting a pharmacodynamic profile indistinguishable from that of the native enzyme was generated.
DTIC
Acetyl Compounds ; Biochemistry ; Cholinesterase ; Organic Phosphorus Compounds ; Pharmacology ; Proteins ; Genetic Engineering

20020006200 Walter Reed Army Medical Center , Washington, DC USA
Remote Interactive Monitoring of Patients on Anticoagulant Therapy to Improve Outcome and Avoid Complications ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Calagan, Jennifer L. ; Oct. 2001 ; 8p ; In English
Contract(s)/Grant(s): MIPR OEC5DL0075
Report No.(s): AD-A395496 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
This project suffered a multitude of problems/challenges and as a result is approximately two years behind in operation. The key initial requirement was to modify the existing DCI-approved protocol to meet the provisions of the Telemedicine study. After review of the amendments, DCI felt that the changes were of a magnitude which necessitated an entirely new protocol submission. The new protocol and consent from went through a complete approval process including committee appearances, requested revisions and sample size recalculation. Some of the other requirements of the project could be pursued at the same time as the approval process was underway: most could not (e.g., staff could not be hired prior to approval being imminent, space could not be acquired until it was ready to be used. Acquiring staff was difficult as well, and chart reviews and eligibility determinations

awaited staff. As of May 2001, the first patient was enrolled into the pilot portion of the project. The pilot portion of the project will enroll and monitor 8 patients separately from the main population of 400. The official start of the one-year project starts once the 400 patient population is enrolled into the project.
DTIC
Anticoagulants ; Patients ; Telemedicine ; Detection

20020006201 Montana State Univ. , Dept. of Microbiology , Bozeman, MT USA
Peptide-Mediated Identification and Neutralization of Biological Toxins ***Final Report , 1 May 1998-30 Apr. 2001***
Pincus, Seth H. ; Apr. 2001 ; 3p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0245
Report No.(s): AD-A395495 ; ARO-37781.1-LS-DPS ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

Ricin is an A/B biological toxin, with the A chain being a ribosome-specific nuclease and the B chain a galactose-binding lectin. Because of its extreme toxicity, ricin has the potential to be used in bioterrorism. The goal of this project was to identify peptides and monoclonal antibodies that bind to ricin and can neutralize its toxic activity, either by preventing the binding of the toxin to cells or by blocking the nuclease activity. Mechanisms of neutralization were studied. We produced a panel of anti-A and anti-B chain monoclonal antibodies, and some which recognize compound epitopes on both. These antibodies have been characterized regarding their affinity, ability to neutralize ricin toxicity in vitro, mode of action, and epitope specificity. We have tested these antibodies for their ability to protect against ricin toxicity in vivo and demonstrated that some antibodies are protective, some ineffective, and some enhance ricin toxicity. The single best correlate of in vivo protection is epitope specificity. We have constructed a series of immunogens and are determining if we can produce a vaccine based upon protective epitopes.
DTIC
Galactose ; Peptides ; Toxins and Antitoxins ; Immunology ; Cloning (Biology)

20020006206 Georgetown Univ. , Medical Center , Washington, DC USA
Mechanisms for c-myc Induced Mouse Mammary Gland Carcinogenesis and for the Synergistic Role of TGF(alpha) in the Process ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Liao, Dezhong J. ; Jul. 2001 ; 168p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0270
Report No.(s): AD-A395470 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

This project aims to elucidate the cell cycle basis on which c-myc oncogene induces mammary carcinogenesis' and transforming growth factor alpha (tgf-Alpha) promotes the process. Conduction of this training project will help the P.I. to develop his career in breast cancer research. Data obtained so far have shown that c-myc transgenic mammary tumors may develop specific foci that are more aggressive than their adjacent tumor areas and thus represent a second stage of tumor progression. c-Myc may induce E2F1 and cyclin A2 to initiate the tumor development, whereas overexpression of cyclins D1 and E may occur as later events to promote tumor progression to a more aggressive phenotype. TGF-Alpha may enhance c-Myc-induced mammary carcinogenesis by inducing cyclin D1 and facilitating the loss of pRB expression, resulting in an earlier development of more aggressive tumors in tgf-Alpha/c-myc double transgeneic mice, compared to the c-myc tumors. These findings in the transgenic animals may have relevance to human breast cancer.
DTIC
Carcinogens ; Mammary Glands ; Mice ; Tumors ; Genetics

20020006207 Georgetown Univ. , Medical Center , Washington, DC USA
Cell Surface Molecules Driving Breast Cancer/Endothelial Interactions ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Al-Attar, Ali ; Jul. 2001 ; 45p ; In English
Contract(s)/Grant(s): DAMD17-99-1-9187
Report No.(s): AD-A395469 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Fibroblast growth factors (FGFs) are a family of 23 heparin-binding polypeptides with diverse biologic functions. FGF-2 is stored in an immobile, functionally inactive form in the extracellular matrix. Since FGF-2 exerts its biologic roles by binding to cell surface receptors, a major interest is how FGF-2 reaches the cell surface from its inactive pool in the extracellular matrix. While heparinases and proteases can cleave components of the extracellular matrix and thus release FGF-2, an alternative strategy is the secretion of a soluble binding protein, FGF-Binding Protein (FGF-BP). Using a number of investigative techniques, our laboratory is studying the protein-protein interactions enabling this binding protein to function in its hypothesized role, that FGF-BP can release FGF-2 from its inactive reservoir in the extracellular matrix, making FGF-2 functionally available. We have produced two recombinant FGF-BP1 proteins, have documented reversible binding to FGF-2, and have extensively studied their

protein-protein interactions. We have demonstrated that FGF-BP1 and heparansulfate compete for binding to FGF-2, and that FGF-2 can bind its receptor in the presence of FGF-BP1. We have also shown that, in numerous biologic systems, FGF-BP1 can positively modulate FGF-2 biologic activity.
DTIC
Molecules ; Proteins ; Cells (Biology) ; Polypeptides ; Fibroblasts

20020006208 Cold Spring Harbor Lab. , Cold Spring Harbor, NY USA
Cloning Components of Human Telomerase ***Final Report , 1 Jul. 1997-1 Jul 2000***
Futcher, Allen ; Aug. 2000 ; 23p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7315
Report No.(s): AD-A395468 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Telomerase is an enzyme needed to maintain telomeres, and is therefore needed for the indefinite growth of cancer cells. An anti-telomerase drug might therefore be a good anti-tumor agent. to help in finding such drugs, two-hybrid and three-hybrid screens have been done in an attempt to identify new components of the telomerase complex. The two-hybrid screen yielded no new components. The three-hybrid screen yielded multiple interactors, but it is still not clear whether these are genuine components of telomerase. The most interesting of these is poly (ADP-ribose) polymerase (PARP), which is known to be involved in DNA repair, and is a homolog of a protein known to function at telomeres. In addition, telomerase activity has been reconstituted in vitro. Finally, the role of a yeast telomerase component, Est1, was defined. Est1 is an RNA binding protein that binds the telomerase RNA, and helps bring it to the telomere. RNA binding proteins are also found in the telomerase complexes from other organisms, including mammals, and so the understanding of this yeast component may improve our understanding of human telomerase.
DTIC
Cloning (Biology) ; Enzymes ; Genetics ; Human Beings ; Molecular Biology

20020006215 Army Medical Research Inst. of Infectious Diseases , Fort Detrick, MD USA
Clinical and Epidemiologic Principles of Anthrax
Cieslak, Theodore J. ; Eitzen, Edward M., Jr ; Jan. 1999 ; 5p ; In English
Report No.(s): AD-A395418 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
Anthrax, in the minds of most military and counterterrorism planners, represents the single greatest biological warfare threat. A World Health Organization report estimated that 3 days after the release of 50 kg of anthrax spores along a 2-km line upwind of a city of 500,000 population, 125,000 infections would occur, producing 95,000 deaths. This number represents far more deaths than predicted in any other scenario of agent release. Moreover, it has been estimated that an aerial spray of anthrax along a 100-km line under ideal meteorologic conditions could produce 50% lethality rates as far as 160 km downwind. Finally, the USA chose to include anthrax in the now-defunct offensive biological weapons program of the 1950s, and the Soviet Union and Iraq also admitted to possessing anthrax weapons.
DTIC
Warfare ; Infectious Diseases ; Spores

20020006499 Air Command and Staff Coll. , Maxwell AFB, AL USA
Biological Warfare and Medical Readiness Training: A Construct from the Literature
Campbell, Elizabeth A. ; Apr. 1999 ; 40p ; In English
Report No.(s): AD-A395791 ; AU/ACSC/022/1999-04 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The survivability and function of military medical personnel is imperative to maintain good morale and fighting capability of combat troops. The fear of physical damage promotes a psychological response to the threat of biological war. This threat has the capacity to terrorize deployed medical personnel, reducing their effectiveness. Ignorance exacerbates this terror. The threat of biological warfare is high because it is a versatile weapon. Biological Warfare is highly threatening due to its ease of development and delivery. Biological weapons can be used with stealth and pose a great psychological and diplomatic threat. Biological warfare can be used as a precision weapon or for total destruction. The threat of deadly agents negatively affects performance. to effectively counteract the threat of biological weapons military medical personnel must receive focused training. On-going readiness training specifically geared toward the biological threat needs to be an integral part of medical readiness training. Knowledge is a powerful counteragent to the biological warfare threat. Training needs to encompass the affective, cognitive and psychomotor domains of learning. The ability of medics to function at a high pace without confusion under the threat

of biological warfare positively impacts the performance of combat troops. Calm and competent caregivers will diminish the panic value of biological weapons and enhance combat effectiveness.
DTIC
Biological Weapons ; Medical Personnel ; Military Operations

20020006794 Army Medical Center , Fort Gordon, GA USA
Effect of Computer Systems and Electronic Communication of Asthma Outcomes ***Final Report , 15 Feb. 2000-2 Jun. 2001***
Schmidt, Stephen L. ; October 2001 ; 12p ; In English
Contract(s)/Grant(s): MIPR 0EC5DJM0073
Report No.(s): AD-A395530 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Medical Research and Material Command, Office of Regulatory Compliance and Quality (MRMC RCQ) Review. The primary problem encountered was obtaining the RCQ review. The need for this step in the research process was part of the initial grant process. Additionally, the local Investigation Review Board (IRB) had already approved the protocol when the need for this step was communicated several months after the grant was awarded. The development and testing of the system progressed to the point of having potential patients test the system by entering baseline data, however, this progress was immediately stopped under guidance from the RCQ reviewer. The initial information was forwarded to RCQ in November of 2000, and all requested revisions were forwarded in early January of 2001. However, review is still pending at the time of this report, and therefore, the clinical trial of the system still awaits RCQ approval. This has made completion of the project un feasible due to funding short falls given this unexpected and prolonged administrative delay.
DTIC
Computers ; Asthma ; Communication Networks ; Medical Science

20020006795 Cold Spring Harbor Lab. , New York, NY USA
Adhesion-Dependent Regulation of Cell Growth and Apoptosis in Human Breast Cancer ***Annual Report , 1 Jul. 2000-1 Jul 2001***
Helfman, David M. ; August 2001 ; 18p ; In English
Contract(s)/Grant(s): DAMD17-99-1-9136
Report No.(s): AD-A395520 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The ability of a tumor cell to grow outside its local environment (metastasize) is a major problem in the development and therapeutic treatment of breast cancer. The loss of the requirement for cell-matrix interactions plays a critical role in the development of cancer. Normal epithelial cells require attachment to the extracellular matrix (ECM) not only for proliferation but also for survival, as disruption of cell-ECM interactions can result in reversible cell growth arrest and induction of apoptosis, a phenomenon termed 'anoikis'. Elucidating the mechanisms by which the interactions of cells with the ECM generate and regulate downstream signals that promote cell growth and survival is critical to understanding cancer. Activation of actomyosin contractility is an essential step during adhesion-dependent signaling. We are studying the role of specific components of the acting cytoskeleton whose expression has been implicated in the transformed phenotype. These studies will provide important new information concerning the role of these actin filament-associated proteins in adhesion-dependent cell signaling and the potential of inhibiting signal transduction pathways dependent on actomyosin contractility as a therapeutic target and adjuvant for the treatment of breast cancer, as well as other cancers.
DTIC
Cells (Biology) ; Cancer ; Apoptosis ; Mammary Glands ; Protein Crystal Growth

20020006797 Texas Univ. , M D Anderson Cancer Center , Houston, TX USA
Role of GCN5 in Estrogen Response, Tumor Suppression, and Breast Development in Mice ***Annual Report , 1 Jun. 2000-31 May 2001***
Roth Dent, Sharon Y. ; June 2001 ; 11p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0462
Report No.(s): AD-A395509 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
DNA is tightly packed into the eukaryotic nucleus in the form of chromatin. Chromatin is built of nucleosomal repeat units comprised of histone proteins and DNA. Nucleosomes are folded together into higher order structures that inhibit transcription. This proposal tests the idea that an enzyme that regulates chromatin folding through post-translational modification of the histones is important for p53 functions and for estrogen responses, as well as for normal breast development. Experiments are proposed to: (1) determine whether Gcn5 serves as a coactivator for activation of gene expression by the estrogen receptor; (2) examine biochemical, molecular, and genetic connections between Gcn5 and p53 and (3) to generate a mammary gland specific knock out'

of Gcn5 in mice to create a mouse model for Gcn5 functions in breast development and tumor formation. We have made progress towards all three aims. We have created cell lines carrying stable reporter genes carrying estrogen response elements assembled into chromatin. We have uncovered biochemical and genetic connections between Gcn5 and p53. We have generated a conditional disruption allele for Gcn5. Together these studies should provide important new information about breast cancer biology. Moreover, histone acetyltransferases may also provide novel targets in the future for development of new drug therapies or diagnostic agents, furthering our advancement towards eradication of this disease.
DTIC
Estrogens ; Cancer ; Mammary Glands ; Tumors

20020006798 Lovelace Biomedical and Environmental Research Inst. , Albuquerque, NM USA
Long-Term Effects of Subclinical Exposures to Sarin ***Final Report , 30 Sep. 1997-30 Apr. 2001***
Henderson, Rogene F. ; Apr. 2001 ; 71p ; In English
Contract(s)/Grant(s): DAMD17-97-C-7054
Report No.(s): AD-A395465 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The purpose of this study was to determine if exposure to levels of sarin causing no overt clinical symptoms would cause adverse health effects that could persist after the exposure had ended. Inhalation exposures of male Fischer 344 rats to 0, 0.2 or 0.4 mg/ml of sarin for 1 hour/day for 1, 5 or 10 days under normal and heat-stressed conditions were completed and observations made at 1 day and 1 month after the exposures. Observations for which there was no effect of sarin included body weight, respiration rate and minute volume during exposure, body temperature and activity during the 30-day recovery period, apoptosis and histopathology in the brain. Brain mRNA for IL-1Beta, TNF-alpha, and IL-6 was increased in a dose-dependent manner. The immune system was depressed as noted by a dose-dependent suppression of the response of splenic lymphocytes to the mitogen, Concanavalin A. M1 cholinergic receptor site densities, unchanged at 1 day after repeated exposures, were decreased in a dose-dependent manner in the frontal cortex, olfactory tubercle, anterior olfactory nucleus and hippocampus at 30 days after exposure. M3 receptor sites were not affected by sarin exposure alone, but in the presence of heat stress, there was an upregulation of the sites in the frontal cortex, olfactory tubercle, anterior nucleus and striatum. These effects persisted at 30 days. Although red blood cell acetylcholine esterase (AChE) was only slightly inhibited by the 1-day exposure, there were 30% and 60% inhibitions at the low and high dose, respectively, after repeated exposures. Total or broad regional sections of the brain showed no inhibition of AChE; however, autoradiographic histochemical staining for AChE indicated sarin exposure alone reduced AChE in the cerebral cortex, striatum and olfactory bulb. Sarin exposure under heat-stress reduced AChE staining in the hippocampus.
DTIC
Exposure ; Cerebral Cortex ; Histochemical Analysis ; Signs and Symptoms ; Cholinergics ; Acetyl Compounds

20020006800 Georgetown Univ. , Washington, DC USA
A Novel Serine Protease Target for Prevention of Breast Cancer by a Soy Bean-Derived Inhibitor ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Dickson, Robert B. ; Jul. 2001 ; 53p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9192
Report No.(s): AD-A395463 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
In year 2 of our studies of the inhibitory interaction between matriptase and HAI1, and between matriptase and BBI, we have built a 3-D structure of the protease domain of matriptase, based on the homology modeling using the X-ray structure of human thrombin as template. This modeled matriptase structure was used in a structure-based screening of inhibitors. Screening from the NCI small compounds database, we have developed bis-benzamidines as potent matriptase inhibitors. We have also found that, in addition to HAI1, a recently discovered natural trypsin inhibitor, SFTI, from sunflower seed, inhibits matriptase. We have found that in non-transformed mammary epithelial cells, the activated matriptase can be stimulated by lipid phosphates; the activated matriptase is then quickly bound to HAI1, and shed into media.
DTIC
Cancer ; Inhibitors ; Mammary Glands ; Protease ; Enzymes ; Prevention ; Soybeans

20020006810 Columbia Univ. , New York, NY USA
Identification of Retinoid Induced Growth Suppressing Genes ***Final Report , 1 Sep. 1997-31 Aug. 2000***
Talmage, David A. ; Sep. 2000 ; 11p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7289
Report No.(s): AD-A395643 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Breast cancer is the leading cause of female cancer deaths in this country and the incidence of new cases continues to rise. Vitamin A status is a possible factor contributing to the development of many human cancers, including those of the breast. A major question regarding the role of vitamin A and breast cancer remains unanswered. How, on a molecular level, do retinoids induce growth arrest of hormone-dependent breast cancer cells? I proposed to test the hypothesis that 'biologically active derivatives of vitamin A (retinoids) inhibit mammary carcinoma cell proliferation by disrupting one or more growth factor activated serine/threonine protein kinase signaling cascades. Targets of these signaling cascades include genes that encode proteins required for progression through the cell cycle'. Specifically, I proposed to identify and isolate genes whose expression is regulated by retinoic acid in hormone-dependent, but not hormone-independent cells, and determine if these genes encode proteins involved in cell cycle progression. As a result of these studies we demonstrated that: (1) PKC-Alpha and PTP-1C are up-regulated in retinoid treated cells; (2) PKC-Alpha mediates the anti-proliferative action of retinoids in T47D cells; (3) PKC-Alpha cooperates with retinoids to limit the proliferation of the normally retinoid resistant cell line, MDA-MB-231. In the long term, these results might open the door for developing combination therapy approaches that jointly target retinoid and PKC signaling.
DTIC
Cancer ; Genes ; Mammary Glands ; Retinene ; Cells (Biology)

20020006811 New Mexico Univ. , Albuquerque, NM USA
Multiplex PCR-Based Determination of Genetic Polymorphisms Involved in the Etiology of Breast Cancer ***Final Report , 1 Aug. 1997-31 Jul. 2000***
Herron, John R. ; Wheeler, Cosette ; Sep. 2000 ; 14p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7085
Report No.(s): AD-A395641 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Breast cancer incidence rates for New Mexico's women have risen rapidly over the last two decades, particularly in Hispanics for whom breast cancer mortality rates have doubled. Despite this fact, the causes of breast cancer in this minority population have not been adequately characterized; thus, hampering interventions to reverse these trends. We have proposed to develop novel methods to evaluate allelic polymorphisms potentially associated with breast and other forms of cancer. In the recent past, much attention has been focused on potential functional polymorphisms present in the enzymes responsible for metabolic oxidation. These enzymes play a role a role in the detoxification of xenobiotics and among others include members of the cytochrome P450 family, glutathione S-transferases class Theta and mu, and N-acetyl transferases 1 and 2. The laboratory methods currently utilized to study these polymorphic enzymes are expensive, time consuming, and cumbersome when applied to large-scale epidemiological studies. We are currently developing simplified and accurate methods based on multiplex PCR and sequence-specific hybridization which will facilitate the rapid screening of each of these polymorphic loci. These methods will facilitate the large-scale epidemiological studies needed to characterize genetic variations associated with breast cancer incidence.
DTIC
Cancer ; Etiology ; Genetics ; Mammary Glands ; Polymorphism ; Epidemiology

20020006815 California Univ. , San Francisco, CA USA
Phase I/II Pilot Study to Assess Toxicity and Efficacy of Chinese Herbs to Treat Hot Flashed and Menopausal Symptoms for Women With a History of Breast Cancer ***Annual Report , 10 Jul. 2000-9 Jul 2001***
Tripathy, Debasish ; Aug. 2001 ; 4p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0189
Report No.(s): AD-A395623 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
The goal of the study is to assess the safety and feasibility of a Chinese herbal formula, MF101, in alleviating hot flashes and other symptoms associated with menopause. Our group has experienced a delay in initiating the funded trial due to concerns raised by the Food and Drug Administration (FDA). In the original grant submitted to the Department of Defense (DoD), the population of women to be studied were women with a history of breast cancer. Because an Investigational New Drug License (IND) was obtained from the FDA for MF101, the herbal formula to be given to women participating in the study, the same grant application was submitted to the FDA. The primary concern addressed by the FDA was the potential estrogenic effects of MF101, specifically the relationship of estrogen and increased risk of breast cancer recurrence. The FDA placed a clinical hold on MF101, thereby delaying the study. Additionally, the FDA stated that safety data on hormonal drugs are obtained over a 30-day period and this time frame is enough to observe any physiologic or biological estrogenic changes. In short, it was agreed that the study would be conducted with healthy women over a 30-day period. Amendments to the protocol have been approved by the FDA. The Surgeon General's Human Subjects Research Review Board recently approved the above-mentioned changes, and suggested

further edits to the protocol and consent form. These latter edits will be submitted to the DOD this week and, following final approval, will be submitted to the UCSF Institutional Review Board. We hope to begin the study as soon as possible.
DTIC
Cancer ; Mammary Glands ; Signs and Symptoms ; Toxicity ; Females ; Clinical Medicine ; China

20020006817 Thomas Jefferson Univ. , Philadelphia, PA USA
Breast Cancer Biomarkers in Nipple Aspirates from Women Treated With Estrogen Receptor Blockers ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Sauter, Edward R. ; Jul. 2001 ; 6p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0300
Report No.(s): AD-A395618 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The purpose of our study is to determine if: (1) success in collecting nipple aspirate fluid (NAF) biomarkers increases with experience, (2) NAF biomarkers (cytology, ploidy, cell cycle parameters, and prostate-specific antigen, PSA) change in response to treatment with tamoxifen (TAM) or raloxifene (RAL), and (3) NAF biomarker changes are associated with future breast cancer risk. Our hypothesis is that NAF biomarkers will change favorably or unfavorably in response to treatment with TAM or RAL, and that the biomarker change(s) will predate clinical findings observed on mammography or physical examination. Postmenopausal women at increased breast cancer risk are enrolled in the Study of Tamoxifen and Raloxifene (STAR) trial and randomized to TAM or RAL. Prior to starting medication, subjects who elect to participate undergo breast nipple aspiration. A repeat aspiration is performed 6 months after initiating medication. This multiinstitutional trial currently involves three centers (Thomas Jefferson University, UCLA and Fox Chase Cancer Center). Enrollment to date is II, and 7 subjects have completed the trial. Analysis of the data has not yet been performed. A fourth site, MD Anderson Cancer Center, is currently considering joining the study. If our hypothesis proves correct, then nipple aspiration may provide a useful noninvasive method to evaluate response to treatment.
DTIC
Cancer ; Estrogens ; Mammary Glands ; Vacuum ; Receptors (Physiology) ; Females

20020006888 Air Univ. , Maxwell AFB, AL USA
Wait a Minute I Didn't Sign up for This!
Perdue, Dalene D. ; Apr. 2000 ; 51p ; In English ; Original contains color images
Report No.(s): AD-A394932 ; AU/ACSC/141/2000-04 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
When the medical non-combatant is denied security, safety, and rights under the Law of Armed Conflict and Geneva Convention, this tendency toward anarchy in warfare suggest that there is safety for no one. Medical non-combatants are not trained or prepared to be Prisoners of War. Medical non-combatants are not prepared or ready to face the human rights violations common to third world prisons that some Prisoners of War have endured. When both State and non-State actors disregard the legal status of medical non-combatants, these individuals face an increased danger that they may not fully understand. The increasingly common employment of dual mission aircraft lends to further confusion of the medical non-combatant status. Emerging trends in the aeromedical evacuation (AE) system suggest that by 2010 a preponderance of aeromedical crewmembers will lack sufficient training to execute their readiness mission capabilities. This paper analyzes and discusses the challenging factors facing the AE crew in the post cold war environment and the impact of those factors have on their readiness.
DTIC
Medical Services ; Safety ; Aerospace Medicine

20020006897 Mount Sinai Hospital , Amuel Lunenfield Research Inst. , Toronto, Ontario Canada
Characterization of LAF-4, a Putative Proto-Oncogene Involved in the Development of Breast Cancer ***Final Report , 1 Jul. 1999-30 Jun. 2001***
Andrulis, Irene ; Jul. 2001 ; 9p ; In English
Contract(s)/Grant(s): DAMD17-99-1-9366
Report No.(s): AD-A395591 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The long range goal of our research is to identify genes involved in the early stages of breast cancer development, specifically genes involved in the transition from hyperplasia to ductal carcinoma in-situ (DCIS) and DCIS to invasive breast cancer. The objective of this study was to investigate the role of LAF-4, a gene which we have recently identified as being transcriptionally perturbed in breast cancer, in the development of this disease. Analysis of LAF-4 expression in a group of breast tumors showed that in 24% of the ANN tumors, the level of LAF-4 mRNA was significantly higher than the highest level found in the normal tissues. In the remaining cases, the expression was barely detectable. We reviewed the histology of the cases and performed in

situ hybridization analysis to confirm that the expression originated from the mammary carcinoma cells. We are in the process of determining by microdissection at which stage in progression expression becomes elevated. by studying these transitions it will be possible to identify key genes in the progression to malignancy and develop targeted approaches to breast cancer prevention.
DTIC
Genes ; Mammary Glands ; Cancer

20020006899 Tripler Army Medical Center , Honolulu, HI USA
Low Band Telemedicine Decision Support System for Disaster Situations ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Hastings, Patricia ; Oct. 2001 ; 9p ; In English
Contract(s)/Grant(s): MIPR-OEC5DXM0079
Report No.(s): AD-A395589 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Problems encountered: 1) Poor quality of commercial wireless Internet connectivity. We frequently faced poor Internet connection with a commercial wireless Internet service provider, which frustrated users. This is anticipated to improve as service improves regionally and globally. 2) Little evidence for clinical decision making. We decided to develop a decision support system for crush injury because little epidemiological study is available for other disaster unique medical diagnoses. 3) Narrow clinical application. Considering the clinical application of such decision support systems, more benefit will be provided by decision support tools for more common diseases and injuries. Future direction includes: 1) Improve connectivity. A more stable network connection is required for clinical use of the system. Stand-alone applications that can store the data in a handheld device are necessary to develop. 2) Security and confidentiality. Security and confidentiality such as encryption, IP (internet protocol) filtering and authentification, should be considered. These issues are for the HIPAA (Health Insurance Portability and Accountability Act) regulation. 3) Wider clinical application Decision Support Systems (DSS) that will cover much wider clinical applications will be beneficial. Clinical DSS for further predictive model development is planned. 4) User interface. Development of optimal user interface for the decision support system with users is necessary.
DTIC
Decision Support Systems ; Telemedicine

20020006902 Walter Reed Army Medical Center , Washington, DC USA
Oncology Outreach Evaluation ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Goldsmith, Brian ; Oct. 2001 ; 6p ; In English
Contract(s)/Grant(s): MIPR OEC5DRM0077
Report No.(s): AD-A395583 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Shortly after the project was funded, the initial principle investigator (PI) left the military. There was a delay in locating a replacement PI. There was limited information available on the ITB system and its operation that required a combined clinical/technical team to go to TAMC to interview the developers of the system and see how the system was used. Upon arriving at TAMC, the team found that the contractor programmer no longer worked for TAMC and there was no technical documentation to describe how the system was developed. Several detailed interview revealed that the system required two separate Web/database servers along with their respective software and support. Further interviews revealed that the system required a full-time system administrator to manually process and prepare slide presentations for the actual tumor board members to view. This additional FTE requirement added approximately $120,000 to the yearly operation of the project, which was unacceptable for our application. As a result, the project objectives were modified and a video tumor board resulted. With the long-term goal of implementing a cost effective and deployable Internet Tumor Board, this project is developing a new Web-based ITB that models the success of the Teledermatology system deployed throughout the AMEDD. The new ITB is signed to utilize 14 main reusable modules that will not only facilitate the creation of this product, but will minimize the development costs of future Web-based clinical telemedicine systems.
DTIC
Medical Services ; Clinical Medicine ; Video Signals

20020006903 Walter Reed Army Medical Center , Washington, DC USA
Computerized Neuropsychological Screening of Army Aviators ***Final Report , 25 Feb. 2000-30 Sep. 2001***
Christensen, Daniel K. ; Oct. 2001 ; 8p ; In English
Contract(s)/Grant(s): MIPR 0EC5DMM0076
Report No.(s): AD-A395581 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

As described in the mid-term report, initial USAARL participation was withdrawn a few months into the project, which required methodological revisions (per WRAMC DCI) due to funding constraints. We also experienced some administrative

delays purchasing the commercial software (CogScreen and MicroCog). In addition to the problems mentioned above (and described in the mid-term report in detail) we subsequently experienced a lengthy protocol approval process involving both DCI and MRMC. We also encountered programming difficulties and delays involving ANAM2001.
DTIC
Clinical Medicine ; Neurology ; Medical Services

20020006904 Centers for Disease Control , Atlanta, GA USA
Update: Vaccine Side Effects, Adverse Reactions, Contraindications, and Precautions Recommendations to the Advisory Committee on Immunization Practices (ACIP)
Sep. 06, 1996 ; 44p ; In English
Report No.(s): AD-A395579 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report provides updated information concerning the potential adverse events associated with vaccination for hepatitis B, poliomyelitis, measles, mumps, diphtheria, tetanus, and pertussis. This information incorporates findings from a series of recent literature reviews, conducted by an expert committee at the Institute of Medicine (IOM), of all evidence regarding the possible adverse consequences of vaccines administered to children. This report contains modifications to the previously published recommendations of the Advisory Committee on Immunization Practices (ACIP) and is based on an ACIP review of the IOM findings and new research on vaccine safety. In addition, this report incorporates information contained in the 'Recommendations of the Advisory Committee on Immunization Practices: Use of Vaccines and Immune Globulins in Persons with Altered Immunocompetence' and the 'General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP)'. Major changes to the previous recommendations are highlighted within the text, and specific information concerning the following vaccines and the possible adverse events associated with their administration are included: hepatitis B vaccine and anaphylaxis; measles vaccine and (1) thrombocytopenia and (2) possible risk for death resulting from anaphylaxis or disseminated disease in immunocompromised persons; diphtheria and tetanus toxoids and pertussis vaccine (DTP) and chronic encephalopathy; and tetanus-toxoid-containing vaccines and (1) Guillain-Barre syndrome; (2) brachial neuritis; and (3) possible risk for death resulting from anaphylaxis. These modifications will be incorporated into more comprehensive ACIP recommendations for each vaccine when such statements are revised.
DTIC
Safety ; Infectious Diseases ; Vaccines ; Signs and Symptoms

20020006905 Food and Drug Administration , Washington, DC USA
How FDA Works to Ensure Vaccine Safety
Stehlin, Isadora B. ; December 1995 ; 9p ; In English
Report No.(s): AD-A395574 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The gasping for breath and desperate hacking of whooping cough. The iron lungs and braces of polio. Birth defects from rubella. For many people today, those signs of terrible diseases are the stuff of history books, thanks to vaccines. But the rare case of vaccine- associated polio or the death of an infant soon after receiving a dose of pertussis vaccine may make people wonder--are vaccines safe enough, or could they be safer? For the Food and Drug Administration's Center for Biologics Evaluation and Research (CBER), vaccine safety, along with effectiveness, is central to regulation of these preparations. Clinical Trials The first step to licensing a new vaccine is safety testing in animals. If the laboratory animals immunized with the vaccine don't have serious reactions, FDA consults with the vaccine manufacturer or sponsor on further refining of the manufacturing process. Because the weakened viruses used for vaccines are grown in animal or human cells, "we spend a tremendous amount of time studying the safety of those cells," says M. Carolyn Hardegree, M.D., director of CBER'S office of vaccine research and review.
DTIC
Diseases ; Safety ; Vaccines ; Drugs ; Dosage

20020006908 New Jersey Medical School , Newark, NJ USA
A Novel Strategy to Isolate Invasion-Inducing Proteins from Human Breast Tumors ***Annual Report , 1 Jun. 2000-31 May 2001***
Whitehead, Ian P. ; June 2001 ; 25p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0365
Report No.(s): AD-A395570 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This proposal describes the development of a screening strategy that can be applied to the identification of genes that regulate the progression of breast tumors to a metastatic state. The general approach is to make expressible cDNA libraries from highly invasive breast tumor cell lines, and to transfer these libraries (and the phenotype) to human tumor cells that normally do not

exhibit invasive properties. This report covers the first 10 months of this project and describes: (1) the construction and characterization of 6 retrovirus-based expression libraries, (2) the efficient conversion of plasmid-based libraries into libraries of high titre infectious retroviral particles, and (3) a preliminary test screen of one of the libraries. A population of 250,000 infected cells has been passed through three rounds of enrichment and analyzed for the presence of proviral inserts. A large, but manageable number of inserts have been identified by PCR and are now being recovered for further analysis. to summarize, the screening is progressing according to our original schedule, and we anticipate that some of the proviral inserts that we are currently recovering will exhibit invasive potential.
DTIC
Mammary Glands ; Genes ; Proteins ; Tumors ; Deoxyribonucleic Acid

20020006909 Centers for Disease Control , Atlanta, GA USA
General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP), Morbidity and Mortality Weekly Report, January 28, 1994. Volume 43, Number RR-1
Watson, John C. ; LeBaron, Charles W. ; Hutchins, Sonja S. ; Hadler, Stephen C. ; Hadler, Stephen C. ; Jan. 28, 1994 ; 49p ; In English
Report No.(s): AD-A395569 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Immunobiologics include antigenic substances, such as vaccines and toxoids, or antibody-containing preparations, such as globulins and antitoxins, from human or animal donors. These products are used for active or passive immunization or therapy. The following are examples of immunobiologics: (1) Vaccine: A suspension of live (usually attenuated) or inactivated microorganisms (e.g., bacteria, viruses, or rickettsiae) or fractions thereof administered to induce immunity and prevent infectious disease or its sequelae. Some vaccines contain highly defined antigens (e.g., the polysaccharide of Haemophilus influenzae type b or the surface antigen of hepatitis B): others have antigens that are complex or incompletely defined (e.g., killed Bordete Ia pertussis or live attenuated viruses); (2) Toxoid: A modified bacterial toxin that has been made nontoxic, but retains the ability to stimulate the formation of antitoxin; and (3) Immune globulin (IG): A sterile solution containing antibodies from human blood. It is obtained by cold ethanol fractionation of large pools of blood plasma and contains 15%-i 8% protein. Intended for intramuscular administration, IG is primarily indicated for routine maintenance of immunity of certain immunodeficient persons and for passive immunization against measles and hepatitis A. IG does not transmit hepatitis B virus, human immunodeficiency virus (H IV), or other infectious diseases.
DTIC
Infectious Diseases ; Vaccines ; Immunology ; Viruses

20020006911 Army Research Inst. of Environmental Medicine , Natick, MA USA
The Application of Information Mining Technology to the Army Injury and Health Outcomes Database ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Amoroso, Paul J. ; Oct. 2001 ; 39p ; In English
Contract(s)/Grant(s): MIPR 0EC5E5M0082
Report No.(s): AD-A395566 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In the first half of the grant period we faced many challenges, principally administrative in nature, and mostly related primarily to delays in the procurement of equipment, software, and the awarding of contracts. A significant amount of training was accomplished, and while the learning curve was steep, several individuals received sufficient basic instruction to at least initiate the various processes needed to successfully accomplish the objectives of the proposal. In addition, a special on-site block of instruction was arranged with SAS Institute. This instruction, known as a 'pilot' was divided into two parts; a Warehouse Administrator (WA) pilot, and an Enterprise Miner (EM) pilot. Each pilot consisted of five full days of training and hands-on assistance. The WA pilot was designed to build the TAIHOD data warehouse and to provide instruction to the designated TAIHOD Warehouse Administrator. The EM pilot, was designed to walk several members of the TAIHOD staff through the process of a data mining exercise using data from the warehouse in the TAIHOD environment. to get the full benefit of the mining pilot, it was necessary to select a topic suitable for demonstrating the various idiosyncrasies and capabilities of the software. We chose a practical, though arguably esoteric, exercise to examine data quality. Specifically, we attempted to identify patterns of gender misclassification across the various components of the database. This exercise had the potential utility of allowing us to find patterns of error in the database that, if corrected, could greatly improve the precision of certain analyses where there is ambiguity in the process of matching records. It also involved the use of multiple components of the database, including text (names). Several documents attached to this report provide substantial detail on this very much still-in-progress effort.
DTIC
Data Bases ; Data Mining ; Data Processing ; Information Systems

20020008166 Brooke Army Medical Center , Fort Sam Houston, TX USA
BAMC-DACH Pediatric Sub-Specialty Telemedicine Healthcare Program ***Final Report , 15 Feb. 2000-2 Jun. 2001***
Inscore, Stephen C. ; Oct. 2001 ; 8p ; In English
Contract(s)/Grant(s): MIPR OEC5DHM0072
Report No.(s): AD-A395689 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Tricare Region 6 Preexisting Telemedicine Model: Tricare Region 6 solution to telemedicine was in place based on an adult telemedicine software model, Apollo/CNSI (Client Network Services, Inc.) (dermatology; neurology) installed at a host of remote bases (Sheppard AFB (Air Force Base); Dyess AFB; Corpus Christi NAS; Cannon, AFB; Laughlin, AFB). The Tricare lead agent paid for two additional units in San Antonio (agreement to examine regionwide pediatric patients). Pediatric inpatient and outpatient unique telemedicine solutions were not addressed by the existing software. Apollo/CNSI has continued to modify and refine the software to make it functional and subsequently more user friendly with a minimum instruction to pediatric subspecialists. The implementation of the software was delayed by building line and land line problems. In combination it took six months to make the system fully functional. The refinement of the software is an ongoing task.
DTIC
Clinical Medicine ; Telemedicine

20020008170 McLean Hospital Corp. , Belmont, MA USA
Knock-Out and Transgenic Strategies to Improve Neural Transplantation Therapy for Parkinson's Disease ***Final Report , 15 Jun. 1999-14 Jun 2001***
Isacson, Ole ; July 2001 ; 155p ; In English
Contract(s)/Grant(s): DAMD17-99-1-9482
Report No.(s): AD-A395586 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

The remaining obstacles to achieving reliable therapeutic effects by neurotransplantation for Parkinson's disease (PD) are: (1) poor survival of grafted fetal neurons, and (2) insufficient axonal outgrowth and functional recovery. Our experiments were aimed at preventing cell death by pre-treatment of fetal cells with pharmacological inhibitors of caspases and complement inhibitors. to enhance axonal growth leading to optimal functional recovery by neuronal transplants, we employed transgenic bcl-2 overexpressing donor cells and similar molecules influencing the growth of axons in the fetal and adult CNS. Such molecules significantly improved neural transplantation outcomes and regeneration. Our results indicate that hubcl-2 expression can enhance dopaminergic axonal outgrowth in vivo. Immunophilin ligands and GDNF can also generate increased axonal elongation and branching of dopamine neurons in neural transplants.
DTIC
Transplantation ; Diseases ; Central Nervous System ; Cells (Biology)

20020008172 Army Center for Health Promotion and Preventive Medicine (Provisional) , Aberdeen Proving Ground, MD USA
Tele-Ergonomics Assessment Methodologies Study ***Final Report , 15 Feb. 2000-30 Sep. 2001***
Lopez, Mary ; October 2001 ; 21p ; In English
Contract(s)/Grant(s): MIPR 0EC5E3M0081
Report No.(s): AD-A395580 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The two primary problems encountered in this study were with the Institutional Review Board (IRB) approval and unexpected staff turnover. This minimal risk proposal was submitted to the MRMC IRB for approval as CHPPM does not have an IRB. The MRMC IRB had been used as the primary IRB in the past and it was assumed that the MRMC IRB approval was all that would be required; however, after the proposal had been reviewed, corrected and re-submitted, the PI was informed that the proposal would need to be submitted to each of the IRBs for the target bases. Since time was a concern, it was decided to re-target bases under one IRB rather than submit the proposal to four different IRBs. The target bases were changed to Fort Drum, Fort Eustis, Fort Knox, Fort Lee and Fort Bragg. All of these bases fall under the WRAMC IRB. The proposal received WRAMC IRB approval without any problem. Unfortunately, this time delay could have been avoided if the PI had been informed that the MRMC approval alone would not suffice. The unexpected staff turnover created delays in the final analysis of the data. All of the data had been collected prior to the staff member's departure; however, not all of the data had been entered for analysis and only a very few analyses had been conducted.
DTIC
Medical Science ; Human Factors Engineering

20020008173 Palo Alto Inst. for Research and Education, Inc. , Palo Alto, CA USA

Negative Regulation of Tumor Suppressor p53 Transcription in Breast Cancer Cells ***Annual Report , 1 Jul. 2000-30 Jun. 2001***

Liu, Jingwen ; July 2001 ; 37p ; In English

Contract(s)/Grant(s): DAMD17-00-1-0394

Report No.(s): AD-A395575 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Previously we showed that the transcription of the p53 gene in breast cancer cells was down regulated by OM. to elucidate the molecular mechanisms underlying the OM effect on p53 transcription, in this report, we dissected the p53 promoter region and analyzed the p53 promoter activity in breast tumor cells. We showed that deletion of the 5'-flanking region of the p53 promoter from -426 to -97 did not affect the OM effect. However, further deletion to MO completely abolished the repressive effect of OM. The p53 promoter region -96 to 41 contains NF-kB and c-myc binding sites, and a newly identified UV-inducible element PE21. Mutations to disrupt NF-kB binding or c-myc binding to the p53 promoter decreased the basal promoter activity without affecting the OM-mediated suppression, whereas mutation at the PE21 motif totally abolished the OM effect. We further demonstrated that insertion of PE21 element upstream of the thymidine kinase minimal promoter generated an OM response analogous to that of the p53 promoter. Finally, we detected the specific binding of a nuclear protein with a molecular mass of 87 kDa to the PE21 motif. Taken together, we demonstrate that OM inhibits the transcription of the p53 gene through the PE21 element. Thus, the PE21 element is functionally involved in p53 transcription regulated by UV-induction and OM suppression.

DTIC

Suppressors ; Cancer ; Cells (Biology) ; Mammary Glands ; Proteins

20020008208 NASA Ames Research Center , Moffett Field, CA USA

Microscopy in Space Research: Learning More About Gravitational Effects on Living Systems

Ross, Muriel D. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 13th Annual Symposium on Advances in Microscopy , 23-25 Sep. 1994 , NC , USA

Contract(s)/Grant(s): RTOP 199-40-12-01 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Investigators are using light, scanning and transmission electron microscopic (TEM) methods to investigate the effects of microgravity on the development, maintenance and aging of biological systems. The capabilities of the spacelab for life sciences research in space will be described. Among the many results to be discussed are the effects of microgravity on amphibian fertilization and early development, and on the rodent musculoskeletal and neural systems. Xenopus laevis eggs fertilized in space developed normally during and after an eight day spaceflight. Ultrastructural studies of rodent tissue demonstrated that spaceflight-induced atrophy of antigravity skeletal muscles renders muscle fibers susceptible to structural failure upon return to weight bearing postflight. Principle TEM changes in neuromuscular junctions are the decrease or absence of synaptic vesicles and degeneration of axon terminals. In bone, architectural rather than compositional changes may be the primary perturbation. Thus, many techniques used on Earth (such as density determinations) would not detect significant changes in bone strength. An increment in synaptic number and changes in synapse distribution occur in peripheral gravity sensors. There is a decrease in muscarinic cholinergic receptor density in the striatum. Striatal receptor changes suggest spaceflight-related alterations in motor activity. Opportunities for future life sciences research in space will be discussed.

Author

Microgravity ; Gravitational Effects ; Life Sciences ; Fertilization ; Growth ; Musculoskeletal System ; Neuromuscular Transmission

20020008243 Army Research Inst. of Environmental Medicine , Natick, MA USA

Sustaining Health & Performance in Cold Weather Operations

Castellani, John W. ; O'Brien, Catherine ; Baker-Fulco, Carol ; Sawka, Michael N. ; Young, Andrew J. ; Oct. 2001 ; 51p ; In English

Report No.(s): AD-A395745 ; USARIEM-TN/02-2 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This technical note reviews how the environment can impact soldier health and performance during cold weather operations. The physiology of cold exposure risk factors for cold injuries, clothing systems, shelter, effects of solar radiation and high altitude, food and water consumption, disease, NBC (nuclear, biological, chemical) operations, and key points for cold weather operations are presented and synthesized for unit leaders and soldiers.

DTIC

Armed Forces ; Human Performance ; Health ; Cold Weather

20020008247 Walter Reed Army Medical Center , Washington, DC USA

Use of VTC to Decrease Lost Work Days and Enhance Force Protection in Division Mental Health ***Final Report , 15 Feb. 2000-30 Sep. 2001***

Schneider, Brett J. ; Oct. 2001 ; 6p ; In English

Contract(s)/Grant(s): MIPR OEC5DFM0070

Report No.(s): AD-A395732 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The PI (Principal Investigator) did not arrive at the duty station where the study/project was to be performed until August 2000. His unit was deployed the six months prior to his arrival, making preparation or coordination of the study impossible until his arrival. There was a lengthy approval process (ten months). There was a difficult acquisition process due to the PI's being stationed overseas and needing to work with multiple organizations in Germany and continental US. Insufficient Funds also required the PI to obtain additional funding from BSB commanders locally before project could be started. Obtaining approval for this funding was also a lengthy process. Numerous military organizations not directly connected with 1st ID, Division Mental Health needed to be briefed regarding the protocol and give support in order to perform the study proposed, this often required multiple meetings, approval from Commanders, and supporting documentation.

DTIC

Coordination ; Project Management ; Mental Health

20020008249 Walter Reed Army Medical Center , Washington, DC USA

Preventing/Decreasing Running Injuries in an Active Duty Population via a Web Based Tele-Consult System ***Final Report , 15 Feb. 2000-30 Sep. 2001***

Jacobs, Mark ; Oct. 2001 ; 6p ; In English

Contract(s)/Grant(s): MIPR OEC5DEM0069

Report No.(s): AD-A395720 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The research study, set to begin in June 2001, will validate technology. The web-based consult program is tested and the database is robust. The tele-consultation software is GOTS (government-off-the-shelf). Currently, there is planned deployment to four MTF's (Medical Treatment Facility) starting with Ft. Belvoir in June, 2001. This meets a critical soldier need: Foot Injury Prevention. The need for this program is already established with historical data. The potential for AMEDD (Army Medical Department)-wide implementation is enormous, but we need additional funding. This program will help commanders develop training programs to reduce injuries. We have intellectual property with intent to file patent to possibly secure royalties to offset deployment costs. This tele-shoe clinic, once established at off-site MTF's, will usher telemedicine into military prevention program and services.

DTIC

Armed Forces (USA) ; Injuries ; Telemedicine ; Feet (Anatomy)

20020008612 Edgewood Chemical Biological Center , Research and Technology Directorate , Aberdeen Proving Ground, MD USA

Alternative Technology Program: Intravenous Toxicological Evaluation of Four VX Wastestreams in Mice ***Final Report , Aug.-Dec. 1997***

Manthei, James H. ; Way, Ruth A. ; Gaviola, Bernardita I. ; Bona, Dean M. ; Burnett, David C. ; Aug. 2001 ; 87p ; In English

Report No.(s): AD-A395767 ; ECBC-TR-173 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

The toxicological profile of a combined hydrolysate (VX/NaOH from bulk VX/ NaOH reaction was combined with a ton container clean-out rinseate) was determined intravenously in young adult Institute of Cancer Research (ICR) male mice. Testing was completed on the 'top layer (organic)', the 'bottom layer', and the homogenate of these layers. The 'top layer' was the most toxic layer with a 24-hr LD50 of 39.0 (35.9-43.1) mg/kg; the bottom layer had a 24-hr LD50 of 349.5 (321.9-389.1) mg/kg, and the homogenate 24-hr LD50 was 279.3 (227.4-303.7) mg/kg. No toxic signs were observed that could be related to either residual VX or EA 2192. With the Super Critical Water Oxidation (SCWO) post evaporator sample, a 24-hr LD50 was estimated at is greater than 40,056.0 mg/kg; and for sterile water, the 24-hr LD50 was is greater than 40,960 mg/kg in the mouse. The final SCWO toxicity data suggests the SCWO product is either equal to or slightly less toxic than sterile water for injection when administered intravenously in mice.

DTIC

Cancer ; Toxicity ; Contamination ; Intravenous Procedures

20020008616 Georgetown Univ. , Washington, DC USA

Cooperation of Bcl-XL and c-Myc in Mammary Tumorigenesis ***Final Report , 1 Aug. 1997-31 Jul. 2000***

Jamerson, Matthew ; Aug. 2000 ; 78p ; In English

Contract(s)/Grant(s): DAMD17-97-1-7110

Report No.(s): AD-A395737 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

Studies of tumor tissue taken from women with breast cancer have demonstrated that the proto-oncogene, c-myc, is more abundant than in normal breast (amplified in 16%, rearranged in 5%, and overexpressed in nearly 70% of all human breast cancers). Similar studies have shown that genes known to influence programmed cell death are also altered in breast tumors. Bcl-x(sub L), known to inhibit apoptosis, is overexpressed in some breast tumors and has been shown to be important in the regulation of apoptosis during mammary gland involution. The pro-apoptotic protein Bax has been demonstrated to be significantly reduced or altogether absent in many breast tumors and has further been shown to cooperate with tumor oncogenes in reducing the protective apoptotic effect early in mammary tumorigenesis. Our bitransgenic mouse studies with constitutive Bcl-x(sub L) expression or loss of Bax in the context of constitutive c-Myc expression have been designed to address whether modulation of c-Myc-induced apoptotic pathways will influence mammary gland development and tumorigenesis. Current data obtained from c-myc/bcl-x(sub L) and bax-knockout/c-myc mice suggest a cooperative role for these apoptosis-modulatory genes with c-Myc in mammary tumorigenesis. Utilization of these models will aid in the dissection of the role of apoptosis in the development of breast cancer.

DTIC

Cancer ; Mammary Glands ; Apoptosis ; In Vivo Methods and Tests ; Tumors

20020008618 Landstuhl Regional Medical Center , Landstuhl, Germany

LRMC Remote Teleretinology and Teleopthamology Project ***Final Report , 15 Feb. 2000-30 Sep. 2001***

Kobylarz, Erik ; Oct. 2001 ; 8p ; In English

Contract(s)/Grant(s): MIPR-OEC5DYM0080

Report No.(s): AD-A395731 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The time to diagnosis has certainly been reduced through the use of this imaging system. We have immediate results of the fluoroscein angiogram studies we perform as well as instant digital photographs we can temporally compare with those taken previously to assess and monitor the patients' ophthalmologic disease processes. The above benefit has certainly helped expedite the appropriate administration of care to our patients.

DTIC

Eye (Anatomy) ; Blood Vessels ; Cornea ; Glaucoma ; Diagnosis ; Ophthalmology ; Telemedicine

20020008665 Notre Dame Univ. , IN USA

The Role of VDR Phosphorylation in Vitamin D-Induced Apoptosis ***Annual Report , 1 Jul. 1999-30 Jun. 2000***

Narvaez, Carmen J. ; Welsh, JoEllen ; Jul. 2000 ; 31p ; In English ; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7183

Report No.(s): AD-A388510 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Vitamin D3 compounds are currently in clinical trials for human breast cancer and offer an alternative approach to anti-hormonal therapies for this disease. 1 ,25-Dihydroxyvitamin D3 (1 ,25-(OH)2 D(3)), the active form of vitamin D3, induces apoptosis in breast cancer cells and tumors, but the underlying mechanisms are poorly characterized. In these studies, we focused on the role of caspase activation and mitochondrial disruption in 1,25- (OH)2 D(3) mediated apoptosis in MCF-7 breast cancer cells in vitro. The effect of 1 ,25-(OH)2 D(3) on MCF-7 cells was compared to that of tumor necrosis factor a (TNF alpha), which induces apoptosis via a caspase-dependent pathway. Our major findings are that 1,25-(OH)2 D(3) induces apoptosis in MCF-7 cells by disruption of mitochondrial function which is associated with Bax translocation to mitochondria, cytochrome C release, and production of reactive oxygen species.

DTIC

Apoptosis ; Cancer ; In Vitro Methods and Tests ; Mammary Glands ; Phosphorylation ; Calciferol

20020008871 NASA Wallops Flight Center , Wallops Island, VA USA

Chloroplast Ultrastructure of the Alga Phaeocystis antarctica Karsten: A New Structural Model Using Electron Tomography

Moisan, Tiffany A. , NASA Wallops Flight Center , USA ; Ellisman, M. H. , San Diego Supercomputer Center , USA ; Sosinsky, G. E. , San Diego Supercomputer Center , USA ; [2001] ; 1p ; In English ; 12th International Congress on Photosynthesis , 18-23 Aug. 2001 , Brisbane , Australia ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Understanding the light-harvesting properties of algae and higher plants are a fundamental topic in photosynthesis research. Using thick sections obtained from fixed and embedded cultures of colonial P antarctica, we calculate tomographic reconstructions of individual chloroplasts under light-limiting and saturating conditions for net photosynthesis. Our goal is to gain an understanding of the continuity of thylakoid membranes and understand the spatial relationship between the pyrenoid, the starch containing organelle, and thylakoid membranes. We found that Phaeocystis showed considerable morphological and physiological flexibility in response to environmental light levels. We found that the thylakoids generally run parallel to the chloroplast membrane with many junctures and bifurcations, many of which are in contact with the chloroplast membrane itself. The considerable flexibility in the. thylakoid membranes allows for the accommodation of the pyrenoid structure. The arrangement of the thylakoids within these structures resemble those found in new structures of mitochondria cristae. We present a new structural model for algal chloroplasts which greatly revises current concepts of thylakoid membrane structure in relation to photoacclimation.
Author
Chloroplasts ; Algae ; Tomography ; Photosynthesis

20020008996 Cambridge Acoustical Associates, Inc. , Cambridge, MA USA
An Analysis of the Response of Sooty Tern Eggs to Sonic Boom Overpressures ***Final Report , Mar. 1996-Apr. 1997***
Ting, Carina ; Garrelick, Joel ; Bowles, Ann ; Apr. 1997 ; 48p ; In English
Contract(s)/Grant(s): F41624-96-C-9006 ; Proj-2103
Report No.(s): AD-A395961 ; AFRL-HE-WP-TR-2001-0123 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
It has been suggested that sonic booms caused a mass hatching failure of Sooty Terns on the Dry Tortugas, Florida. Notwithstanding that the evidence was circumstantial, this hypothesis is often quoted as proof that sonic booms harm wildlife. The mathematical analysis reported herein is performed at two levels of idealization. The first model is that of a spherical elastic shell with the embryo represented as an inertial concentric sphere and the albumen as an acoustic fluid that completely fills the intervening volume. The second, higher fidelity, model accounts for the 'egg shape' and allows for an air sac. In both cases the sonic boom is taken to be an incident acoustic wave with the classic N-wave signature. The peak responses of the egg, specifically the peak shell stress, embryo acceleration, and reactive force at the substrate upon which the egg rests, are computed as a function of the incident sonic boom overpressure and compared with damage criteria taken from the literature. It is concluded that the overpressures from supersonic military operations with existing aircraft are of insufficient level to cause avian egg damage in general and the 1970 Sooty Tern hatching failure in particular.
DTIC
Sonic Booms ; Eggs ; Environment Effects ; Birds ; Military Operations

20020009046 Rush-Presbyterian-Saint Luke's Medical Center , Chicago, IL USA
SPECT and fMRI Analysis of Motor and Cognitive Indices of Early Parkinson's Disease: The Relationship of Striatal Dopamine and Cortical Function ***Annual Report , 1 Oct. 1999-30 Sep. 2000***
Gabrieli, John D. ; Oct. 2000 ; 13p ; In English
Contract(s)/Grant(s): DAMD17-99-1-9498
Report No.(s): AD-A396129 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
No abstract.
Author
Cognition ; Dopamine ; Diseases ; Efferent Nervous Systems

20020009048 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA
A Retrospective Study: Exploring Selected Characteristics of Telenursing Triage
Lowery, Christine R. ; Nov. 05, 2001 ; 109p ; In English
Report No.(s): AD-A396126 ; AFIT-CI01-297 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
Telenursing has proliferated in the past several years. Telenursing, as with any new subspecialty of nursing practice, is experiencing growing pains and uncovering problems as the practice evolves. Researchers have referred to communication during the telephone interaction as problematic related to the fact that only verbal communication is involved. There is little known about the relationship between quality of communication and the eight symptom dimensions in telenursing. A retrospective, descriptive correlational design was used to investigate selected characteristics of telenursing triage. A sample of 93 paper, computerized telenursing triage notes were audited using the Content Analysis of Quality of Communication and Selected Variables Tool designed by the researcher. The dependent variable was the communication scores from eight symptom dimensions based on the assessment phase of the nursing process. Data were analyzed for relationships among veteran age, time of day, nurses' years of

experience, disposition of call, and symptom. This study described selected characteristics in telenursing triage and determined a relationship exists between quality of communication, nurses' years of experience, and call disposition.
DTIC
Medical Personnel ; Telemedicine ; Clinical Medicine ; Data Processing

20020009055 Hawaii Univ. , Office of Research Services , Honolulu, HI USA
UH Telemedicine Proposal ***Final Report , 9 Oct. 1998-30 Jun. 2001***
Friedman, Richard B. ; Jun. 2001 ; 42p ; In English
Contract(s)/Grant(s): DAMD17-99-2-9003
Report No.(s): AD-A396113 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The purpose of the University of Hawaii Telemedicine Project (UHTP) is to assess and establish an effective telemedicine curriculum uniquely tailored for the training of military healthcare personnel. to accomplish this task, a clinical telemedicine service was established such that a hub of physician specialists in Honolulu is available to primary care providers and patients in rural and/or remote clinics; and from this experience a web-based educational curriculum to teach military and other health care providers how to use telemedicine was designed. This Project was supported by a two-year Cooperative Agreement between the University of Hawaii John A. Burns School of Medicine (JABSOM) and the Department of Defense, USA Army Medical Research Acquisition Activity, Telemedicine and Advanced Technology Research Center (TATRC).
DTIC
Telemedicine ; Education ; Defense Program ; Clinical Medicine

20020009059 Fox Chase Cancer Center , Philadelphia, PA USA
Human Breast Cancer and Alterations in Methylthioadenosine Phosphorylase ***Annual Report , 15 may 2000-14 May 2001***
Kruger, Warren D. ; Jun. 2001 ; 15p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7077
Report No.(s): AD-A396101 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Methylthioadenosine phosphorylase (MTAP) is a key enzyme in the pathway which converts methylthioadenosine (MTA) into methionine and adenine. The MTAP gene is frequently deleted in a variety of different cancers. Our lab has found a link between loss of MTAP expression and the phenomena of methionine dependent growth, defined as the inability to grow on media containing methionine's metabolic precursor homocysteine. Thus cells lacking MTAP seem to require excess methionine for growth. Other labs have shown that cells lacking MTAP have increased sensitivity to purine biosynthetic inhibitors such as methotrexate and 5, 10-dideazatetrahydrofolate. These observations suggest that an effective two pronged strategy could be used to eliminate MTAP negative breast cancer cells in vivo. Over the past year we have created isogenic breast cancer derived cell lines, one that is deleted for MTAP and one that has had it reintroduced.
DTIC
Cancer ; Methionine ; Enzymes ; Mammary Glands ; Biosynthesis

20020009060 California Univ. , Los Angeles, CA USA
The Role of Myoepithelial Maspin in Breast Carcinoma Progression Diagnosis and Screening ***Annual Report , 3 Jul. 2000-2 Jul 2001***
Barsky, Sanford H. ; Aug. 2001 ; 125p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0176
Report No.(s): AD-A396099 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
In many glandular organs, a precancerous state is thought to exist which precedes the development of frankly invasive carcinoma. In the breast this state is recognized as DCIS and consists of a proliferation of epithelial luminal cells confined by myoepithelial cells within the ductal system (1-7). CGH and LOM studies have failed to demonstrate a difference between DCIS and invasive breast carcinoma. Our laboratory has recently demonstrated that paracrine regulation of this transition by myoepithelial cells may be the main determinant of this important step in human breast carcinoma progression. Because of their close proximity to precancerous lesions, myoepithelial cells would be expected to exert important paracrine influences on these processes. Myoepithelial cells of the breast differ from ductal cells in many ways: they lack ER- a, and its downstream genes; they synthesize the adjacent basement membrane; they rarely proliferate or fully transform and give rise rarely only to low grade benign neoplasms. Myoepithelial cells are present around normal ducts and precancerous proliferations but are absent in invasive carcinoma.
DTIC
Mammary Glands ; Cancer ; Neoplasms

20020009062 Massachusetts General Hospital , Boston, MA USA

Determination of the Molecular Mechanisms Responsible for Abnormal CD43 Expression in Breast Cancer ***Annual Report , 1 Jun. 2000-31 May 2001***

Shelley, Carl S. ; Jun. 2001 ; 11p ; In English

Contract(s)/Grant(s): DAMD17-OO-1-O255

Report No.(s): AD-A396097 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Human CD43 is a large, abundant and highly charged transmembrane molecule which inhibits intercellular interaction. Normally CD43 expression is restricted to the surface of hematopoietic cells. However, primary breast cancer tumors and their metastases also exhibit CD43 expression. Despite the linkage between breast cancer and abnormal CD43 expression, the molecular mechanisms responsible for this abnormal expression have never been investigated. The goal of this project is to elucidate these mechanisms. In the first year of the project we have shown that the breast cancer cell line MCF-7 exhibits abnormal CD43 expression. In addition, we have demonstrated that in vitro the proximal promoter region directs normal expression of the CD43 gene mediated by the transcription factors Puroc and hnRNP-K. Our results demonstrate that tissue culture cell lines can be used to test novel strategies for the treatment of breast cancer based on targeting CD43. We have determined that such strategies could now include the specific manipulation of Pura and hnRNP-K expression.

DTIC

Mammary Glands ; Cancer ; Tissues (Biology)

20020009071 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA

Two Different Epidural Analgesic Combinations: Morphine vs. Fentanyl/Bupivacaine or Fentanyl/Ropivacaine and Their Post Operative Effects

Pearce, Tori E. ; Oct. 2001 ; 49p ; In English

Report No.(s): AD-A396064 ; AFIT-CI01-273 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Postoperative pain can effect almost every organ function and may adversely influence postoperative morbidity and mortality. This study's purpose was to compare one institutions postoperative epidural opioid/local anesthetic protocol, currently fentanyl with bupivacaine or ropivacaine and compare it to the previously used morphine. Pain control efficacy and incidence of side effects were compared using a retrospective chart audit. The sample was obtained from the inpatient records of a 155-bed medical center A description of patients' age, gender, surgical procedure, opioid/local anesthetic, side effects, treatments, and occurrence of breakthrough pain were recorded using a tool adapted by Bell for a similar study and data were analyzed using the SPSS program. Data analysis revealed that differences between groups were statistically insignificant regarding age, gender, and surgery type. Occurrence of breakthrough pain and side effects were similar for fentanyl/local anesthetic and morphine. No significant respiratory depression was reported in either group. Nausea and vomiting incidence between groups was similar and seemed related to type of surgery, with a higher incidence in abdominal procedures. Pruritis and urinary retention was equal in both groups. Under-reporting and incomplete documentation, as well as the management of breakthrough pain were found to be problematic. Prospective research, ongoing education of staff and patients, and further development of the anesthesia directed pain management program at this facility is recommended.

DTIC

Pain ; Anesthetics ; Morphine ; Analgesia

20020009143 Army Center for Health Promotion and Preventive Medicine (Provisional) , Environmental Health Engine , Aberdeen Proving Ground, MD USA

Training Munitions Health Risk Assessment No. 39-EJ-1485-00: Residential Exposure from Inhalation of Air Emissions from the M855 5.56-MM Tungsten Ball Cartridge

Mobley, Joleen ; Coakley, Stafford ; Jun. 04, 2001 ; 102p ; In English

Report No.(s): AD-A395711 ; 39-EJ-1485-00 ; USAEC-CR-200153 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the 5.56mm Tungsten Ball Cartridge. This document present the evaluation of the potential for adverse human health effects to the offsite residents breathing air emissions following the use of military firing ranges during training exercises. Study results showed no potential for health risks to the hypothetical resident from inhalation of air emissions from the 5.56mm Cartridge. to conduct this study, air emissions from the 5.56mm Cartridge were collected in a test chamber (at Aberdeen Test Center, Aberdeen, MD). This information was then used in an air dispersion model to determine ambient air concentrations at a location downwind from the site where the item was activated. Modeled air concentrations were combined with exposure information to estimate the amount of substances the hypothetical resident breathes. This intake was combined with the substance's health information, to

determine if there is a potential for health risks from inhalation of these substances. The health risk included both long-term and short term exposures to the modeled substance concentrations. Study results showed no potential for health risks from inhalation of air emissions from the 5.56mm Tungsten Ball Cartridge.
DTIC
Respiration ; Public Health ; Ordnance ; Exposure ; Ammunition

20020009144 Army Center for Health Promotion and Preventive Medicine (Provisional) , Environmental Health Engine , Aberdeen Proving Ground, MD USA
Training Munitions Health Risk Assessment No. 39-EJ-1485-00: Residential Exposure from Inhalation of Air Emissions from the M855 5.56-MM Ball Cartridge
Mobley, Joleen ; Coakley, Stafford ; Chang, Hsieng-Ye ; Jun. 15, 2001 ; 168p ; In English
Report No.(s): AD-A395710 ; Rept-39-EJ-1485-00 ; USAEC-CR-200147 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following use of the 5.56mm Ball Cartridge. This document present the evaluation of the potential for adverse human health effects to the offsite residents breathing air emissions following the use of military firing ranges during training exercises. Study results showed no potential for health risks to the hypothetical resident from inhalation of air emissions from the 5.56mm Cartridge. to conduct this study, air emissions from the 5.56mm Cartridge were collected in a test chamber (at Aberdeen Test Center, Aberdeen, MD). This information was then used in an air dispersion model to determine ambient air concentrations at a location downwind from the site where the item was activated. Modeled air concentrations were combined with exposure information to estimate the amount of substances the hypothetical resident breathes. This intake was combined with the substance's health information, to determine if there is a potential for health risks from inhalation of these substances. The health risk included both long-term and short term exposures to the modeled substance concentrations. Study results showed no potential for health risks from inhalation of air emissions from the 5.56mm Ball Cartridge.
DTIC
Public Health ; Ordnance ; Exposure ; Air Quality ; Risk ; Respiration

20020009145 Army Center for Health Promotion and Preventive Medicine (Provisional) , Environmental Health Engine , Aberdeen Proving Ground, MD USA
Training Munitions Health Risk Assessment No. 39-EJ-1485-00: Residential Exposure from Inhalation of Air Emissions from the M33 .50 Caliber Ball Cartridge
Coakley, Stafford ; Change, Hsieng-Ye ; Jun. 15, 2001 ; 62p ; In English
Report No.(s): AD-A395709 ; Rept-39-EJ-1485-00 ; USAEC-CR-200143 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This assessment evaluated the potential for human health effects to offsite residents breathing air emissions following Use of the M33 .50 Caliber Ball Cartridge. This document present the evaluation of the potential for adverse human health effects to the offsite residents breathing air emissions following the use of military firing ranges during training exercises. Study results showed no potential for health risks to the hypothetical resident from inhalation of air emissions from the .50 Caliber Cartridge. to conduct this study, air emissions from the .50 Caliber Ball Cartridge were collected in a test chamber (at Aberdeen Test Center, Aberdeen, MD). This information was then used in an air dispersion model to determine ambient air concentrations at a location downwind from the site Where the item was activated. Modeled air concentrations were combined with exposure information to estimate the amount of substances the hypothetical resident breathes. This intake was combined with the substance's health information, to determine if there is a potential for health risks from inhalation of these substances. The health risk included both long-term and short term exposures to the modeled substance concentrations. Study results showed no potential for health risks from inhalation of air emissions from the .50 Caliber Ball Cartridge.
DTIC
Public Health ; Cartridges ; Respiration ; Risk ; Ordnance ; Exposure

20020009155 Brookhaven National Lab. , Upton, NY USA
The Problem of Development
Caspari, Ernst ; Apr. 15, 1964 ; 19p ; In English
Report No.(s): AD-A395654 ; BNL-976(T-411) ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The great progress that has taken place in biology during the past ten years has given us a deeper understanding of the activities of cells in chemical terms. This period of progress began with the introduction of bacteria and viruses as materials for genetic

studies. This paper will deal with the specific problem of how we can account for the regulated changes in cellular activity and structure which take place in the development of a multicellular animal or plant.
Derived from text
Cells (Biology) ; Activation (Biology) ; Genetics ; Biological Evolution ; Growth

20020009158 Institute of Cancer Research. Royal Cancer Hospital , London, UK
Early Changes in Apoptosis and Proliferation to Predict Response and Resistance to Chemotherapy in the Treatment of Breast Cancer ***Final Report , 1 Sep. 1997-30 Jan. 2001***
Dowsett, Mitchell ; February 2001 ; 51p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7335
Report No.(s): AD-A395642 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The project had two interconnecting aims: (1) to confirm and extend the observations, that apoptosis is increased and proliferation is decreased in primary breast cancer shortly after chemo and endocrine therapy, such that the predictive power of these changes for clinical response can be assessed, (2) to develop an automated method for analyzing apoptosis in fine needle aspirates (FNAs) taken from breast carcinomas. In the final period of this grant we have found that induction of apoptosis does not occur in response to all hormonal agents for breast cancer treatment: in contrast to tamoxifen, aromatase inhibitors reduce the apoptotic index in the first two weeks of treatment. In chemotherapy-treated patients a significant relationship between apoptosis and response to treatment was found in a pilot study. The deficits of flow cytometry led us to evaluate laser scanning cytometry (LSC) for measuring a variety of biomarkers in fine needle aspirates, including apoptosis. A good relationship was found between levels of Ki67 as measured by LSC and measurements made by visual microscopy. Application of this method to clinical samples for apoptosis measurement will require the elimination of artifacts. Changes in proliferation are a useful intermediate end-point for response. Apoptotic changes may be similarly useful for chemotherapy but technical challenges remain to simplify its analysis.
DTIC
Clinical Medicine ; Pathology ; Chemotherapy ; Cancer ; Apoptosis ; Mammary Glands

20020009161 Army Medical Command , Falls Church, VA USA
Detailed Safety Review of Anthrax Vaccine Adsorbed
Oct. 10, 2001 ; 31p ; In English
Report No.(s): AD-A395627 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
To date, 18 human studies have assessed the safety of anthrax vaccination. These studies, some stretching back almost 50 years, reported adverse events after vaccination in varying degrees of detail. The following sections report the design characteristics of these studies, the number of men and women participating, and their specific findings. Among the studies described below, one of two vaccine formulations was used. The Brachman study and the early Fort Detrick studies used anthrax vaccine manufactured according to the original 1950s formula developed at Fort Detrick, Maryland (sometimes called the 'Merck vaccine'). Research on this vaccine has been repeatedly accepted by the Food and Drug Administration (FDA) as relevant to the understanding of the safety profile of the current anthrax vaccine, developed in the 1950s. In the 1960s, the production process for anthrax vaccine was improved to increase the concentration of the active ingredient, known as 'protective antigen' (increasing the vaccine's potency), and to decrease the amount of other bacterial components in the vaccine (e.g., proteins called edema factor or lethal factor), thus increasing purity. This purer, more potent vaccine, manufactured in Lansing, Michigan, was licensed by the National Institute of Health (NIH) in 1970. Responsibility for vaccine regulation migrated from NIH to the Food and Drug Administration in 1972.
DTIC
Bacteria ; Infectious Diseases ; Vaccines ; Clinical Medicine

20020009164 Texas Univ. , Health Science Center , San Antonio, TX USA
Role of Autocrine Motility Factor in Osteolytic Metastasis ***Annual Report , 1 Apr. 2000-31 Mar. 2001***
Chirgwin, John M. ; April 2001 ; 83p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8245
Report No.(s): AD-A395620 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
Autocrine motility factor (AMF) is expressed by human breast cancer cells, such as MCF7 where its expression is stimulated by heregulin. Tumor cells constitutively secreting mouse AMF caused periosteal new bone formation in two different models of metastasis, an osteoblastic response similar to what is found with about 15% of breast cancers metastatic to bone. Whenever serum AMF concentrations were significantly increased, the animals displayed tumor-associated weight loss (cachexia), a major cause of morbidity and mortality in advanced disease. The effects of AMF on bone were independent of PTHrP, which plays a central

role in osteolytic bone metastases. We also have determined the clearance rate of AMF from the mouse circulation. The species-specific effects of AMF remain little understood; so we undertook to clarify the stucture-function relationships involved. We cloned, sequenced, and expressed rabbit AMF, for which the x ray crystallographic data were already partially solved. These results have been published. We also developed a recombinant protein expression system for the mouse and human factors, which we now prepare in 100mg batches. The human factor has been crystallized and the x ray structure solved to 1.8A.
DTIC
Bones ; Mammary Glands ; Osteoblasts ; Cancer

20020009172 Centers for Disease Control , Atlanta, GA USA
Human Ingestion of Bacillus Anthracis-Contaminated Meat: Minnesota, Aug. 2000
Sep. 15, 2000 ; 7p ; In English
Report No.(s): AD-A395885 ; No Copyright ; Avail: Defense Technical Information Center (DTIC)

Anthrax is a zoonotic disease caused by the spore-forming bacterium B. anthracis. Human disease usually occurs through cutaneous exposure to infected animal tissue or products. Rarely, inhalation or ingestion of B. anthracis spores also leads to anthrax. In the USA during the early part of the 20th century, approximately 130 human cases occurred annually (1); two cutaneous infections have been reported since 1992. Before this exposure, no animal anthrax cases had been reported in northern Minnesota since recordkeeping began in 1909. However, in adjacent areas of North Dakota during 2000, 120--150 cattle have died of anthrax (L. Schuler, North Dakota state veterinarian, personal communication, 2000), and 11 farms have reported anthrax-related cattle deaths in nearby Manitoba, Canada (figure 1) (J.G. Spearman, Manitoba Department of Agriculture, personal communication, 2000). Gastrointestinal anthrax in humans occurs 1--7 days after eating raw or undercooked meat from infected animals (2), and two forms of gastrointestinal disease have been reported (3). Disease affecting the distal gastrointestinal tract results in nausea, anorexia, and fever followed by abdominal pain and bloody stool. The case fatality rate among reported cases ranges from 25%--60% (2). Gastrointestinal anthrax never has been documented in the USA because livestock are vaccinated for anthrax in areas where the disease is endemic; animals routinely are inspected by federal and state meat inspectors before, during, and after slaughter; and raw meat is eaten infrequently. Anthrax has not been documented among the persons exposed to B. anthracis-contaminated meat described in this report; however, a serologic test to determine presence of infection is pending.
DTIC
Bacillus ; Gastrointestinal System ; Ingestion (Biology) ; Minnesota ; Infectious Diseases ; Contamination

20020009199 Wayne State Univ. , Detroit, MI USA
Novel and Selective Inactivators for Matrix Metalloproteases Involved in Breast Cancer Metastasis ***Final Report , 13 Jun. 1997-13 Jun 2001***
Mobashery, Shahriar ; Jul. 2001 ; 93p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7174
Report No.(s): AD-A396155 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

The research was a multidisciplinary and multifaceted endeavor on matrix metalloproteases (MMPs) as target for intervention of cancer. The specific targets were gelatinases, MMP-2 and MMP-9, two members of the MMP family We generated three-dimensional computational models for gelatinases (and other MMPs) that have been made available to the scientific community. The structural knowledge and sequence information were used collectively to address the issue of evolution of MMPs and their diversification of function. Furthermore, we investigated the issues of inhibition (binding) of MMPs by tissue protein inhibitors, the TIMPs, in an extensive investigation with homogeneous preparations of the proteins. This knowledge was used in de novo design of synthetic inhibitors for gelatinases that are highly specific for these enzymes over the other related MMPs. One synthetic inhibitor proved to be highly potent and selective inhibitor for gelatinases. This is the first mechanism-based inhibitor for targeting of MMPs, and it shows a number of features (discussed herein) that sets it apart from the known MMP inhibitors.
DTIC
Mammary Glands ; Cancer ; Enzymes

20020009203 Minnesota Univ. , Minneapolis, MN USA
Prevention of Breast Cancer in IGFBP ***Annual Report , 1 Jun. 2000-31 May 2001***
Yee, Douglas A. ; Jun. 2001 ; 5p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0349
Report No.(s): AD-A396151 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

In this proposal, we hypothesize that inhibition of IGF action by IGFBP-1 will prevent breast cancer in a SV40 Tag transgenic model of breast cancer. We will test this hypothesis with two specific aims: (1) to inhibit-IGF action at the mammary epithelial cell by creating transgenic mice that express IGFBP-1 under the control of the whey acidic protein (WAP) promoter and (2) to test the ability of IGFBP-1 to suppress tumorigenesis by mating these animals with C3/Tag transgenic mice. to achieve these goals, we have created the expression vector, injected the construct into mice, and now have our first generation of mice. Of the animals we have analyzed, approximately 25% have the transgene. We are currently in the process of mating the F1 generation and determining if we have achieved IGFBP-1 expression in the mammary gland.
DTIC
Insulin ; Mammary Glands ; Cancer

20020009206 Baylor Coll. of Medicine , Houston, TX USA
Intermediate Molecular Biomarkers for the Protective Effect of Pregnancy Against Breast Cancer ***Annual Report , 15 Apr. 2000-14 Apr 2001***
Ginger, Melanie R. ; Rosen, Jeffrey M. ; May 2001 ; 69p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0137
Report No.(s): AD-A396145 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Epidemiological studies have consistently shown an early full-term pregnancy is protective against breast cancer. We hypothesize that the hormonal milieu that is present during pregnancy results in persistent changes in the pattern of gene expression in the mammary gland leading to permanent changes in cell fate that determine the subsequent proliferative response of the gland. To investigate this hypothesis, we have used suppression subtractive hybridization (SSH) to identify genes that are persistently up-regulated in the glands of estrogen and progesterone-treated Wistar-Furth rats 28 days subsequent to steroid hormone treatment compared to age-matched virgins. Using this approach, a number of genes displaying persistent altered expression in response to prior treatment with estrogen and progesterone were identified. Two markers have been characterized in greater detail - RbAp46, and a novel gene that specifies a non-coding RNA (designated GB7). Both were persistently up-regulated in the lobules of the regressed gland and required prior treatment with both estrogen and progesterone for maximal persistent expression. RbAp46 has been implicated in a number of complexes involving chromatin remodeling - thus suggesting a mechanism whereby epigenetic factors responsible for persistent changes in gene expression may be related to the determination of cell fate. These results provide the first support on the molecular level for the hypothesis that hormone-induced persistent changes in gene expression are present in the involuted mammary gland and can affect the response of mammary epithelial cells to carcinogenic insults. In addition, we have developed methods for culturing mammary epithelial cells from the rat and transducing them with a retrovial construct expressing a gene of interest (e.g. RbAp46).
DTIC
Pregnancy ; Mammary Glands ; Cancer

20020009207 National Inst. of Environmental Health Sciences , Research Triangle Park, NC USA
The Development of BRCA2-Deficient Mice ***Final Report , 16 Jul. 1997-15 Jul 2001***
Bennett, L. M. ; Aug. 2001 ; 15p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7027
Report No.(s): AD-A396144 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Women who inherit a BRCA1 or BRCA2 mutation have an 80-90% chance of developing breast cancer. Gene targeting techniques were used to create a BRCA2-deficient mouse. A portion of exon 10 was replaced with the Neo gene resulting in premature truncation of the protein product. Examination of normal mammary ductal development in 129(+/+) and 129(+/BRCA2-) mice revealed phenotypic differences between the two genotypic classes. 129(+/+) and 129(+/BRCA2-) mice and several inbred mouse strains were used to study the effect of genetic background on radiation induced mammary tumor induction. BALB/c and SWR mice are susceptible to radiation induced mammary tumorigenesis and C57BL/6, FVB/N and C3H mice are relatively resistant. While FVB/N mice do not develop tumors, radiation treatment has a dramatic effect on ductal morphogenesis. to date, no mammary tumors have been observed in the 129(+/+) and 129(+/BRCA2-) mice. BRCA2-deficient mice were crossed to p53 mutant mice to generate four genotypic classes of offspring. A study is in progress to assess the consequences of harboring mutation in the two tumor suppressor genes with and without radiation exposure. The mammary tumor susceptible BALB/c and resistant C57BL/6 mouse strains being used to make mice congenic for the BRCA2 mutation.
DTIC
Mammary Glands ; Cancer ; Genes ; Genetic Engineering

20020009209 University of South Florida , Tampa, FL USA

Does Use of Tetracyclines Among Veterans Increase Their Risk for Melanoma

Fagan, Nancy K. ; Aug. 2001 ; 135p ; In English

Report No.(s): AD-A396140 ; AFIT-CI-1-289 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

Studies have shown that people who have experienced episodes of acute exposure to ultraviolet radiation, resulting in severe sunburns, have an increased risk of melanoma skin cancers. Sunburns are photosensitive reactions to sunlight. Ingested chemicals, such as tetracycline antibiotics, can also cause photosensitive reactions. The tetracycline molecules in the skin absorb normally harmless doses of visible and UV light, clinically causing an acute inflammatory response (erythema) or ”exaggerated sunburn”. Although photosensitivity is a well-recognized adverse event of the tetracycline class of antibiotics (studies reporting 3 to 90% of users experienced symptoms), the extent to which these widely prescribed antibiotics increase the risk for melanoma has not been examined. Studies in animals and humans have suggested that other photosensitizers (flouroquinolones, psoralens) enhance UV-associated skin carcinogenesis. The objective of this case control study was to explore the association between tetracycline antibiotics and risk of melanoma in a cohort of White and Hispanic White male patients seen at a Florida veterans’ hospital from 1994 to 2000.

DTIC

Cancer ; Tetracyclines ; Skin (Anatomy)

20020009545 NASA Ames Research Center , Moffett Field, CA USA

Advanced Biotelemetry Systems for Space Life Sciences

Hines, John W. , NASA Ames Research Center , USA ; [1994] ; 2p ; In English ; 1995 AIAA/NASA Life Sciences and Space Medicine Conference , 3-5 Apr. 1995 , Houston, TX , USA ; Sponsored by NASA , USA

Contract(s)/Grant(s): RTOP 106-20-08-01 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The Sensors 2000! Program at NASA-Ames Research Center is developing an Advanced Biotelemetry System (ABTS) for Space Life Sciences applications. This modular suite of instrumentation is planned to be used in operational spaceflight missions, ground-based research and development experiments, and collaborative, technology transfer and commercialization activities. The measured signals will be transmitted via radio-frequency (RF), electromagnetic or optical carriers and direct-connected leads to a remote ABTS receiver and data acquisition system for data display, storage, and transmission to Earth. Intermediate monitoring and display systems may be hand held or portable, and will allow for personalized acquisition and control of medical and physiological data.

Derived from text

Aerospace Engineering ; Amplitude Modulation ; Biochemistry ; Bioinstrumentation ; Countermeasures ; Data Acquisition ; Character Recognition

20020009559 NASA Ames Research Center , Moffett Field, CA USA

Noninvasive Intracranial Pressure and Tissue Oxygen Measurements for Space and Earth

Hargens, A. R. ; Ballard, R. E. ; Murthy, G. ; Watenpaugh, D. E. ; [1994] ; 2p ; In English ; AIAA/NASA Life Sciences and Space Medicine Conference , 3-6 Apr. 1995 , Houston, TX , USA ; Sponsored by NASA , USA

Contract(s)/Grant(s): RTOP 199-14-12-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The paper discusses the following: Increasing intracranial pressure in humans during simulated microgravity. and near-infrared monitoring of model chronic compartment syndrome in exercising skeletal muscle. Compared to upright-seated posture, 0 deg. supine, 6 deg. HDT, and 15 deg. HDT produced TMD changes of 317 +/- 112, 403 +/- 114, and 474 +/- 112 n1 (means +/- S.E.), respectively. Furthermore, postural transitions from 0 deg. supine to 6 deg. HDT and from 6 deg. to 15 deg. HDT generated significant TMD changes (p less than 0.05). There was no hysteresis when postural transitions to HDT were compared to reciprocal transitions toward upright seated posture. Currently, diagnosis of chronic compartment syndrome (CCS) depends on measurement of intramuscular pressure by invasive catheterization. We hypothesized that this syndrome can be detected noninvasively by near-infrared (NIR) spectroscopy, which tracks variations in muscle hemoglobin/myoglobin oxygen saturation. CCS was simulated in the tibialis anterior muscle of 7 male and 3 female subjects by gradual inflation of a cuff placed around the leg to 40 mmHg during 14 minutes of cyclic isokinetic dorsiflexion exercise. On a separate day, subjects underwent the identical exercise protocol with no external compression. In both cases, tissue oxygenation (T(sub O2) was measured in the tibialis anterior by NIR spectroscopy and normalized to a percentage scale between baseline and a T(sub O2) nadir reached during exercise to ischemic exhaustion. Over the course of exercise, T(sub O2) declined at a rate of 1.4 +/- 0.3% per minute with model CCS, yet did not decrease during control exercise. Post-exercise recovery of T(sub O2) was slower with model CCS (2.5 +/- 0.6 min) than in control (1.3 +/- 0.2 min). These results demonstrate that NIR spectroscopy can detect muscle deoxygenation caused by

pathologically elevated intramuscular pressure in exercising skeletal muscle. Consequently, this technique shows promise as a noninvasive diagnostic tool for CCS.
Derived from text
Deoxygenation ; Hemoglobin ; Hysteresis ; Intracranial Pressure ; Males ; Microgravity ; Musculoskeletal System

20020009656 Southern Research Inst. , Birmingham, AL USA
Synthesis of Carbocyclic 3-Deazaadenosine Analogs as Potential Agents Against Poxvirus ***Final Report***
Secrist, John A., III ; Oct. 2000 ; 16p ; In English
Contract(s)/Grant(s): DAMD17-99-2-9050
Report No.(s): AD-A396181 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Our goal has been the development of new agents against the poxvirus models of variola virus, directing our efforts foward new carbocyclic 3-deazaadenosine (CADO) analogs and adenosine N' -oxide analogs. CADO and some of its analogs (such as the 5'-carboxamide congener) had previously been shown to be active against a number of viruses including vaccinia virus. Based upon the knowledge of CADO and the metabolism of nucleosides in general, we targeted three distinct classes of potentially enhanced agents: (1) CADO analogs with selected alterations at C-5'; (2) similar analogs based on 4'-thio-3-deazaadenosine; and (3) CADO prodrugs resulting from 5'-O-acylation. In the term of this project, we were successful in preparing and delivering more CADO and one of our CADO congeners, the 5'-O-benzoate of CADO.
DTIC
Nucleosides ; Viruses

20020009660 Arizona Univ. , Tucson, AZ USA
A Molecular Model for Repression of BRCA-1 Transcription by the Aryl Hydrocarbon Receptor ***Annual Report , 1 Jul. 2000-30 Jun. 2001***
Romagnolo, Donato F. ; Jul. 2001 ; 93p ; In English
Contract(s)/Grant(s): DAMD17-00-1-0130
Report No.(s): AD-A396170 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
The purpose of this project is to investigate whether or not loss of expression of the BRCA-1 gene in breast epithelial cells exposed to polycyclic aromatic hydrocarbons (PAHs) is mediated by the aryl hydrocarbon receptor (AhR). The scope of the project is to examine whether or not the AhR complexed with the AhR-nuclear transporter (ARNT) protein, binds to several xenobiotic responsive elements (XRE) strategically located at -539 bp (CCGTGGAA=Cyp1A1-like) and +20base pairs (bp) (GCGTG=XRE-1) from the transcription start site on exon-1A. Two additional XREs (GCGTG) have been localized at -107 bp in the intervening sequence upstream (XRE-2) and +218 bp (XRE-3) into exon-1B. Findings of these experiments were: 1) Confirmed in transfection experiments(a)pyrene represses transcription at the BRCA-1 promoter; 2) Developed mutation constructs for CYP1A1, XRE-1, XRE-2 and double and triple mutants; 3) Developed deletion constructs for CYP1A1, XRE-1 and XRE-2; 4) Observed that the CYP1A1 element may be required (positive element) for constitutive activity of the BRCA-1 promoter and that the XRE-1 and XRE-2 may be negative cis-acting elements on basal BRCA-1 transcription. Finally, we report that the XRE-1 may act as a repressor of BRCA-1 transcription under conditions of estrogen stimulation.
DTIC
Proteins ; Clinical Medicine ; Radicals ; Genes ; Cancer ; Mammary Glands ; Polycyclic Aromatic Hydrocarbons

20020009663 New Mexico State Univ. , Las Cruces, NM USA
New Rhenium Radiopharmaceuticals for the Selective Imaging and Therapy of Breast Cancer ***Final Report , 12 May 1997-12 May 2001***
Arterburn, Jeffrey B. ; Jun. 2001 ; 38p ; In English ; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7120
Report No.(s): AD-A396163 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Several novel rhenium-estradiol complexes were synthesized as potential radiopharmaceuticals for the imaging and therapy of breast cancer. Novel palladium catalyzed carbon-carbon and carbon-nitrogen bond-forming chemistry was developed to synthesize phenyl and pyridyl hydrazine derivatives. Polymer-supported hydrazine derivatives were effective labeling substrates for synthesizing organoimidorhenium estradiol complexes. The estradiol-rhenium complexes were fully characterized structurally. The solubility and stability of the organoimidorhenium complexes in aqueous systems was investigated.

Pyridylhydrazine derivatives of estradiol were found to form stable rhenium(I) carbonyl complexes, and are excellent candidates for continued investigation as diagnostic and therapeutic radiopharmaceuticals for breast cancer.
DTIC
Organometallic Compounds ; Rhenium ; Cancer ; Mammary Glands ; Radioactive Isotopes ; Pharmacology

20020009667 Arkansas Univ. for Medical Sciences , Little Rock, AR USA
Magnetic Resonance-Guided Interstitial Laser Photocoagulation for the Treatment of Breast Cancer ***Final Report, 1 Aug. 1997-1 Aug 2000***
Harms, Steven ; Sep. 2000 ; 37p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7087
Report No.(s): AD-A396157 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This study explored the use of MRI directed laser ablation as a potential non-surgical treatment method for malignant breast neoplasms. RODEO MRI was used to determine lesion extent and interactively coordinate therapy. MR compatible needles were placed with stereotaxic guidance. Biopsy proven malignant breast lesions (30 patients) were treated with a bare tip fiber connected to a diode laser operating at 805 nm for a total of 600-seconds/treatment zone. The effectiveness was established with H & E and PCNA stains. A total of 68 treatment zones were performed. Surgery (18 mastectomy, 12 lumpectomy) was performed between 2 hours and three days following laser treatment. Serial sectioning of the surgical specimens and stains of the ablation zones correlated in size with the hypointense zones seen on MRI. The average ablation zone size was 10 mm in diameter. Effective cell death was demonstrated in 60/68 zones on PCNA stains. Three patients had minor skin burns that were removed at surgery. Interactive MRI can be used to coordinate interstitial laser photocoagulation therapy. Laser thermal ablation can effectively destroy malignant breast neoplasms. MRI directed laser therapy offers the potential for treatment of small breast neoplasms without the disfigurement associated with breast conservation surgery.
DTIC
Magnetic Resonance ; Cancer ; Mammary Glands ; Diagnosis

20020009678 Centers for Disease Control , Atlanta, GA USA
Suspected Brucellosis Case Prompts Investigation of Possible Bioterrorism-Related Activity: New Hampshire and Massachusetts, 1999
MMWR ; Jun. 16, 2000 ; Volume 49 , No. 23 , pp. 509-512 ; In English
Report No.(s): AD-A396037 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Brucella species, particularly B. melitensis and B. suis, are potential agents of biological terrorism. This report describes the public health and law enforcement assessment of a suspected case of brucellosis in a woman, in which the atypical clinical presentation and suspicious circumstances surrounding the case raised the possibility of biological terrorism. Although the investigation did not identify evidence of biological terrorism, the safe resolution of the case illustrates the value of integrated clinical, public health, and law enforcement biological terrorism preparedness and response.
DTIC
Terrorism ; Biological Weapons ; Organizations

20020009749 Environmental Protection Agency , Global Programs Div. , Washington, DC USA
Human Health Effects of Ozone Depletion From Stratospheric Aircraft ***Final Report***
September 2001 ; 138p ; In English ; Original contains color illustrations
Contract(s)/Grant(s): NASA Order C-30039-J ; EPA-80938647 ; RTOP 714-01-20
Report No.(s): NASA/CR-2001-211160 ; E-13018 ; NAS 1.26:211160 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
This report presents EPA's initial response to NASA's request to advise on potential environmental policy issues associated with the future development of supersonic flight technologies. Consistent with the scope of the study to which NASA and EPA agreed, EPA has evaluated only the environmental concerns related to the stratospheric ozone impacts of a hypothetical HSCT fleet, although recent research indicates that a fleet of HSCT is predicted to contribute to climate warming as well. This report also briefly describes the international and domestic institutional frameworks established to address stratospheric ozone depletion, as well as those established to control pollution from aircraft engine exhaust emissions.
Author
Ozone Depletion ; Stratosphere ; Supersonic Transports ; Environment Effects ; Environment Management ; Man Environment Interactions

20020010243 NASA Ames Research Center , Moffett Field, CA USA

Role of Growth Hormone, Exercise and Serum Phosphorus in Unloaded Bone of Young Rats

Arnnaud, Sara B. , NASA Ames Research Center , USA ; Harper, J. S. , NASA Ames Research Center , USA ; Gosselink, K. L. , NASA Ames Research Center , USA ; Navidi, M. , NASA Ames Research Center , USA ; Fung, P. , NASA Ames Research Center , USA ; Grindeland, R. E. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Aerospace Medical Association Meeting , 7-11 May 1995 , Anaheim, CA , USA ; Sponsored by Aerospace Medical Association , USA

Contract(s)/Grant(s): RTOP 199-26-12-02 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Growth hormone, known to be stimulated by exercise, is suppressed in rats after space flight and in a ground-based model in which the hind-limbs are unloaded (S). to determine the role of GH in the osteopenia of unloaded bones of S rats, young males were treated with GH combined with insulin-like growth factor-1 (IGF-1), a peptide that mediates the local actions of the hormone. 200 g rats, hypophysectomized (hypox) 17 d earlier, were treated with 1 mg/kg/d GH/IGF-1 (H) or saline (C) in 3 divided daily doses x10 d. Hind-limb bones were unloaded (S), ambulated (A) or exercised (X) by climbing a ladder while carrying a weight. Growth was monitored daily. Tibial growth plate (Tepi) was measured with a micrometer, and femoral (F) area, length, and mineral content (BMC) by DEXA. Parameters of calcium metabolism were measured by autoanalyzer and calciotropic hormones by radioimmunoassay. F bone density, g/square cm, (BMD) or BW were not affected by S in Hypox. However, FBMD was lower in S+H than A+H (p is less than 0.002) and H stimulated whole body growth in S (5.2 g/d) and SX (5.6 g/d) to a lesser extent than in A (6.6 g/d) (p is less than 0.05). Adjusted for BW, Tepi showed the greatest increase in S+H+X (64%), the next highest increase in S+H (50%) and no change in S+X. F area, length and BMC/100 g BW were lower in all H groups than respective C's. by multiple regression analysis, serum phosphorus (Pi) which correlated with Tepi (r = 0.88, p is less than 0.001) and was inversely related to FBMC (r = -0.68, p is less than 0.001) proved to be the most significant determinant of BMC. This illustrates the dependence of osteopenia in S on GH, the maximizing effect of X for epiphyseal growth and the major role of Pi metabolism on BMC in weight bearing bone during growth.

Author

Physical Exercise ; Phosphorus ; Bones ; Bone Demineralization ; Pituitary Hormones

20020010263 Texas Univ. , Southwestern Medical Center , Dallas, TX USA

Isolation of Factors that Disrupt Critical Protein/Protein Interactions within the Telomerase Holoenzyme for Use in Breast Cancer Therapeutics ***Annual Report , 1 Jun. 2000-31 May 2001***

White, Michael A. ; June 2001 ; 5p ; In English

Contract(s)/Grant(s): DAMD17-00-1-0441

Report No.(s): AD-A396100 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

While not expressed in most adult human tissues, high levels of telomerase activity are present in most cancers. Expression of telomerase in many primary cell cultures is sufficient to bypass normal senescence. Cellular senescence can act as a terminal growth-control checkpoint preventing the progression of pre-cancerous cells to malignancy. Blockade of telomerase activity in breast neoplasias should reintroduce this checkpoint resulting in replication-dependent senescence of proliferating cells. Therefore, telomerase antagonists could potentially control growth and metastasis of residual cancer cells after surgery and chemotherapy. We have identified the molecular chaperones p23, and hsp9O as proteins that bind to the catalytic subunit of telomerase. Blockade of this interaction inhibits assembly of active telomerase in vitro. Therefore, we anticipate that small molecules that bind hTERT and prevent association with p23 will act as telomerase antagonists in cells. We have used selective screens of a library of structurally constrained poly-peptides for those that disrupt hTERT/p23 complexes by binding directly to hTERT. Peptides isolated from this screen will be tested for inhibitory effects on telomerase activity, telomerase maintenance, and proliferative capacity. We predict that introduction of telomerase antagonists in breast cancer cells will result in the replication-dependent senescence of these cells.

DTIC

Aging (Biology) ; Cancer ; Isolation ; Mammary Glands ; Peptides ; Proteins ; Enzymes

20020010264 Toronto Hospital , Toronto, Ontario Canada

Dominant-Active Alleles of Rbi as Universal Tumor Suppressors of Mammary Carcinoma ***Final Report , 1 Sep. 1997-31 Dec. 2000***

Zacksenhaus, Eldad ; Jan. 2001 ; 26p ; In English

Contract(s)/Grant(s): DAMD17-97-1-7321

Report No.(s): AD-A396149 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The retinoblastoma tumor suppressor, Rb, regulates cellular proliferation, differentiation and survival, and is functionally inactivated by mutations or phosphorylation in most human cancers. While the activation of endogenous Rb by dephosphorylation

is thought to provide an effective approach to suppress normal as well as neoplastic cell proliferation, the inhibition of apoptosis by Rb may have detrimental consequences in vivo. to test these paradigms, we targeted phosphorylation-resistant, constitutively active Rb alleles, Rb-DELTA-Ks, to the mouse mammary gland under control of the MMTV-LTR and WAP promoters. Here we show that pubescent MMTV-LTR-Rb-DELTA-Ks initially displayed reduced epithelial cell proliferation and delayed growth and branching of the ductal tree. Post-puberty transgenic mice exhibited alveolar outgrowth, precocious expression of the milk gene beta-Casein and extended survival of differentiated epithelial cells. Strikingly, multiple MMTV-LTR-Rb-DELTA-K and WAP-Rb-DELTA-K transgenic females developed focal preneoplastic lesions within 10-15 months and some presented with full-blown mammary adenocarcinoma. Expression of the Rb-DELTA-K transgene in these breast tumors was greatly reduced. The observations that both activation and inactivation of Rb can induce cancer in experimental mouse models, as is the case with its major partner, E2F1, have direct implications for cancer therapy.
DTIC
Cancer ; Cells (Biology) ; Mammary Glands ; Regeneration (Physiology) ; Suppressors ; Tumors ; Neoplasms

20020010265 Missouri Univ. , Columbia, MO USA
Breast Cancer Associated Estrogen Receptors: Catechol Estrogen Receptors in ER-Minus Mice ***Final Report , 1 Sep. 1997-1 Sep 2000***
Lubahn, Dennis B. ; Oct. 2000 ; 32p ; In English
Contract(s)/Grant(s): DAMD17-97-1-7171
Report No.(s): AD-A396166 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Previous studies suggest the presence of a distinct non-ER-alpha/ER-beta estrogen-signaling pathway in the ER-alpha-KO mouse. to further characterize the receptor mechanism regulating these novel 4OHE2-induced responses, we have synthesized (3H)4OHE2 (4-hydroxy-estradiol) and (3H)4OHEl (4-hydroxyestrone) using a cytochrome P450-mediated enzymatic procedure. Using ER-alpha-KO cellular cytosolic extracts, (3H)4OHE2 specific binding was competed with various unlabeled catechol estrogen compounds but not unlabeled 17-beta-E2 and ICI 182, 780. (3H)4OHE2 binding studies indicated significant binding differences among various tissues in WT (wild-type), ER-alpha-KO and ArKO (aromatase knockout) female mice which may indicate regulation by either E2 or ER-square. In WT and ER-alpha-KO mice, the highest concentrations of specific (3H)4OHE2 binding were found in the bladder, lung, and skeletal muscle. Interestingly, the highest concentrations of specific (3H)4OHE2 binding among ArKO tissues were found in the mammary, uterus, and ovary. Scatchard analysis of (3H)4OHE1 binding in ER-alpha-KO mice identified a single class of high-affinity (Kd = 1.7 nM), saturable binding sites in several tissues not competed by E2. Collectively, our results suggest the interaction of these radiolabeled catechol estrogen compounds with a putative mouse 'ER-gamma' protein. Efforts to clone this 'ER-gamma' are ongoing.
DTIC
Cancer ; Estrogens ; Mammary Glands ; Receptors (Physiology)

20020010577 NASA Goddard Space Flight Center , Greenbelt, MD USA
Implementing a Nitrogen-Based Model for Autotrophic Respiration Using Satellite and Field Observations
Choudhury, Bhaskar J. , NASA Goddard Space Flight Center , USA ; [2001] ; 70p ; In English ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The rate of carbon accumulation by terrestrial plant communities in a process-level, mechanistic modeling is the difference of the rate of gross photosynthesis by a canopy (A(sub g)) and autotrophic respiration (R) of the stand. Observations for different biomes often show that R to be a large and variable fraction of A(sub g), ca. 35% to 75%, although other studies suggest the ratio of R and A(sub g) to be less variable. Here, R has been calculated according to the two compartment model as being the sum of maintenance and growth components. The maintenance respiration of foliage and living fine roots for different biomes has been determined objectively from observed nitrogen content of these organs. The sapwood maintenance respiration is based on pipe theory, and checked against an independently derived equation considering sapwood biomass and its maintenance coefficient. The growth respiration has been calculated from the difference of A(sub g) and maintenance respiration. The A(sub g) is obtained as the product of biome-specific radiation use efficiency for gross photosynthesis under unstressed conditions and intercepted photosynthetically active radiation, and adjusted for stress. Calculations have been done using satellite and ground observations for 36 consecutive months (1987-1989) over large contiguous areas (ca. 10(exp 5) sq km) of boreal forests, crop land, temperate deciduous forest, temperate grassland, tropical deciduous forest, tropical evergreen forest, tropical savanna, and tundra. The ratio of annual respiration and gross photosynthesis, (R/A(sub g)), is found to be 0.5-0.6 for temperate and cold adopted biome areas, but somewhat higher for tropical biome areas (0.6-0.7). Interannual variation of the fluxes is found to be generally less than 15%. Calculated fluxes are compared with observations and several previous estimates. Results of sensitivity analysis are presented for

uncertainties in parameterization and input data. It is found that uncertainty in determining maintenance respiration for tropical biomes is such that R/A(sub g) for these biomes could be similar to that for temperate biomes.
Author
Forests ; Environmental Monitoring ; Respiration ; Plants (Botany) ; Photosynthesis ; Ecosystems ; Carbon Cycle

20020011213 Lawrence Livermore National Lab. , Livermore, CA USA
Three Dimensional Monte-Carlo Modeling of Laser-Tissue Interaction
Gentile, N. A. ; Kim, B. M. ; London, R. A. ; Trauner, K. B. ; Mar. 12, 1999 ; 9p ; In English
Report No.(s): DE2001-9656 ; UCRL-JC-133637 ; REPT-97-ERD-056 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A full three dimensional Monte-Carlo program was developed for analysis of the laser-tissue interactions. This project was performed as a part of the LATIS3D (3-D Laser-Tissue interaction) project. The accuracy was verified against results from a public domain two dimensional axisymmetric program. The code was used for simulation of light transport in simplified human knee geometry. Using the real human knee meshes which will be extracted from MRI images in the near future, a full analysis of dosimetry and surgical strategies for photodynamic therapy of rheumatoid arthritis will be followed.
NTIS
Electromagnetic Interactions ; Monte Carlo Method ; Simulation ; Three Dimensional Models ; Knee (Anatomy)

20020011682 NASA Glenn Research Center , Cleveland, OH USA
The Development of Surface Roughness and Implications for Cellular Attachment in Biomedical Applications
Banks, Bruce , NASA Glenn Research Center , USA ; Miller, Sharon , NASA Glenn Research Center , USA ; deGroh, Kim , NASA Glenn Research Center , USA ; Chan, Amy , Ohio Aerospace Inst. , USA ; Sahota, Mandeep , Cleveland State Univ. , USA ; November 2001 ; 13p ; In English ; 2001 Fall Meeting of the Materials Research Society , 26-30 November 2001 , Boston, MA , USA ; Sponsored by Materials Research Society , USA
Contract(s)/Grant(s): RTOP 251-30-07
Report No.(s): NASA/TM-2001-211288 ; E-13092 ; NAS 1.15:211288 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The application of a microscopic surface texture produced by ion beam sputter texturing to the surfaces of polymer implants has been shown to result in significant increases in cellular attachment compared to smooth surface implants in animal studies. A collaborative program between NASA Glenn Research Center and the Cleveland Clinic Foundation has been established to evaluate the potential for improving osteoblast attachment to surfaces that have been microscopically roughened by atomic oxygen texturing. The range of surface textures that are feasible depends upon both the texturing process and the duration of treatment. to determine whether surface texture saturates or continues to increase with treatment duration, an effort was conducted to examine the development of surface textures produced by various physical and chemical erosion processes. Both experimental tests and computational modeling were performed to explore the growth of surface texture with treatment time. Surface texturing by means of abrasive grit blasting of glass, stainless steel, and polymethylmethacry I ate surfaces was examined to measure the growth in roughness with grit blasting duration by surface profilometry measurements. Laboratory tests and computational modeling was also conducted to examine the development of texture on Aclar(R) (chlorotfifluoroethylene) and Kapton(R) polyimide, respectively. For the atomic oxygen texturing tests of Aclar(R), atomic force microscopy was used to measure the development of texture with atomic oxygen fluence. The results of all the testing and computational modeling support the premise that development of surface roughness obeys Poisson statistics. The results indicate that surface roughness does not saturate but increases as the square root of the treatment time.
Author
Osteoblasts ; Surface Roughness ; Attachment ; Cells (Biology)

20020011855 National Defence Research Establishment , Div. of Human Sciences , Linkoeping, Sweden
Effects of Hypergravity and Anti-G-Suit Pressurization on Intrapulmonary Gas Mixing and Gas Trapping ***Luftvaecsavstaengningar Och Ventilationseffektivitet Vid Oekad G-belastning Och Trycksaettning av en Anti-G-Draekt***
Groenkvist, M. ; Bergsten, E. ; Eiken, O. ; Koelegard, R. ; Lindborg, B. ; Dec. 2000 ; 24p ; In English
Report No.(s): PB2001-108165 ; FOA-R-00-01678-720-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The purpose of this study was to assess the effects of hypergravity and AGS pressurization on the resting lung volume, on the efficiency of intrapulmonary gas mixing and on gas trapping in the lungs, using an inert gas washout method. The authors

report the results from tidal multiple-breadth washin/washouts of the inert marker gas SF(sub 6) in 12 seated health males exposed to +1 to +3Gz in a human centrifuge and who carried a full-coverage AGS pressurized to 0, 6 or 12 kPa.
NTIS
Lungs ; High Gravity Environments ; Gas Exchange ; Rare Gases

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20020006513 Army Research Inst. of Environmental Medicine , Natick, MA USA
Effects of a World Record Unsupported Ski Trek Across Greenland (The G2 Expedition) on Physical Performance and Body Composition
Frykman, P. N. ; Harman, E. A. ; Patton, J. F. ; Opstad, P. K. ; Hoyt, R. W. ; Aug. 2001 ; 38p ; In English
Report No.(s): AD-A395843 ; USARIEM-T02-1 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Prolonged exhaustive physical exertion is often predicted to result in reduced performance capacity (”overtraining”), through mechanisms of tissue breakdown and inadequate time for full recuperation. This is of importance in military operations, where sustained performance is a typical requirement. We had the opportunity to test the hypothesis that highly motivated men pushed to the limits of their endurance capacity would suffer physical breakdown. Two, 25 year old, Norwegian Navy, Sea, Air and Land Soldiers, (SEALS) completed an unsupported 2928 kilometer south-to-north ski-trek across Greenland in 86 days. The trek involved ski-marching, for 9 hours a day, pulling sleds (150 kg starting load) with all of their food, fuel and supplies. Both SEALs ate an energy-dense diet estimated at 6000 kcal per day. The two volunteers were tested 14 days pre- and 4 days post-trek using anthropometric, physiological, and performance measures. Pre-trek testing showed them to be aerobically and anaerobically fit and to have high lean body masses. Total daily energy expenditure (TDEE), based on doubly-labeled water, reached 6750 and 8260 kcal/d for the two men during the most demanding phase of the trek and other samples showed TDEEs of; 3500 to 4940 kcal/d. Both men lost body weight, with the changes primarily reflecting loss of fat energy stores, finishing the trek with fat stores of approximately 13% body fat. Most physical performance measures showed no significant loss of physical capacity as a result of prolonged exertion. However, anaerobic tests were significantly impaired following the trek, probably reflecting a detraining effect and possibly including some component of fast twitch muscle loss as previously reported in other prolonged military ski treks.
DTIC
Physical Work ; Stress (Physiology) ; Physical Exercise ; Physiological Effects ; Biological Effects

20020007928 NASA Ames Research Center , Moffett Field, CA USA
Autogenic Feedback Training Applications for Man in Space
Cowings, Patricia S. , NASA Ames Research Center , USA ; [1994] ; 6p ; In English ; 41st Annual Meeting of Society of Nuclear Medicine Meeting , 5-8 Jun. 1994 , Orlando, FL , USA ; Sponsored by Society of Nuclear Medicine , USA
Contract(s)/Grant(s): RTOP 199-70-12-14 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Finding an effective treatment for the motion sickness-like symptoms that occur in space has become a high priority for NASA. This paper reviews the back-round research and procedures of an experiment designed to prevent space motion sickness in shuttle crewmembers. The preventive method used, Autogenic - Feedback Training (AFT) involves training subjects to control voluntarily several of their own physiological responses to environmental stressors. AFT has been used reliably to increase tolerance to motion sickness during around based tests in over 300 men and women under a variety of conditions that induce motion sickness, and preliminary evidence from space suggests that AFT may be an effective treatment for space motion sickness as well. Other applications of AFT described include; (1) a potential treatment for post flight orthostatic intolerance, a serious biomedical problem resulting from long duration exposure to micro-g and (2) improving pilot performance during emergency flying conditions.
Author
Aerospace Medicine ; Exposure ; Feedback ; Human Beings ; Motion Sickness ; Physiological Responses

20020008745 Army Research Inst. of Environmental Medicine , Natick, MA USA

Warfighter Physiological Status Monitoring (WPSM): Energy Balance and Thermal Status During a 10-Day Cold Weather U.S. Marine Corps Infantry Officer Course Field Exercise

Hoyt, Reed W. ; Buller, Mark J. ; DeLany, James P. ; Stultz, Dean ; Warren, Kevin ; Oct. 2001 ; 59p ; In English

Report No.(s): AD-A396133 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Energy balance and thermal status was assessed in 14 male U.S. Marine Corps volunteers (age = 25 +/- 3 y MEAN +/- SD; ht = 178 +/- 5 Cm; wt = 81.0 +/- 4.1 kg; % body fat = 15 +/- 3; load = 42.6 +/- 3.2 kg) during a 10-day field exercise (FEX) at Quantico, VA. Question: Does intense physical activity, limited sleep, and restricted rations, combined with cold/damp weather, result in excessively negative energy balance and hypothermia? Total daily energy expenditure and water turnover were measured by doubly labeled water; daily food intake was assessed by ration wrapper collection; daily activity logs were maintained; weather data were collected with an automated weather station. Each volunteer wore wearable sensors that collected body core temperature, heart rate, activity patterns, and geolocation. Energy expenditure = 5378 +/- 678 kcal/d (22.51 +/- 2.84 MJ/d); energy intake 1333 +/- 196 kcal/d (5.58 +/- 0.82 MJ/d); water turnover = 3.23 +/- 0.38 L/d. Carbohydrate intake was inadequate at 168 +/ - 30 g/man/d. Rapid decreases in core temperature (approx. 0.8 C/h) were sometimes evident during inactivity/sleep. (1) One MRE ration per day provided inadequate carbohydrate - an additional 225 g/d of carbohydrate was needed to meet the minimum 400 g/d requirement, and (2) additional sleeping gear is needed to avoid rapid decreases in core temperature and sleep disruption. DTIC

Energy Budgets ; Meteorological Parameters ; Physical Exercise ; Cold Weather ; Stress (Physiology) ; Warfare

20020009005 Wyle Labs., Inc. , Arlington, VA USA

The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 3. Hybrid Own-Home Experiment ***Final Report , Nov. 1992-Dec. 1993***

Stusnick, Eric ; Bradley, Kevin A. ; Bossi, Marcelo A. ; Molino, John A. ; Rickert, David G. ; Dec. 1993 ; 110p ; In English ; Prepared in collaboration with Tech-U-Fit Corp., Alexadria, VA

Contract(s)/Grant(s): F33615-89-C-0574 ; Proj-7757

Report No.(s): AD-A395911 ; WR-93-22 ; AFRL-HE-WP-TR-2001-0130 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

This report presents the results of the third in a proposed sequence of studies to investigate human annoyance to noise from low altitude military training route (MTR) flight operations. The sequence ranges from laboratory studies, in which the physical and social parameters are well controlled, but highly artificial, to field attitudinal surveys, in which these parameter are largely uncontrolled, but the setting is natural. In this third study, subjects were exposed to both real and recorded MTR noise events in their own homes for a period of four weeks. In the laboratory study it was found that MTR sounds having onset rates faster than 30 dB/second caused annoyance beyond what would be expected from the corresponding sound exposure level (SEL). The best fit to the data was found to be an onset rate adjustment to SEL, which has the form of a linear relation on a dB versus log (rate) scale, from 0 dB at a rate of 30 dB/ second to 11 dB at 150 dB/second. The rented home study confirmed the laboratory onset rate adjustment, although the adjustment was found to begin at 15 dB/ second rather than at 30 dB/second. The present study continued to confirm the existence of an onset rate effect. It also confirmed the equal energy principle. However, it did not show any dependence of annoyance on the sporadicity of the events.

DTIC

Noise Pollution ; Aircraft Noise ; Psychoacoustics ; Noise Intensity

20020009651 Oregon Health Sciences Univ. , Portland, OR USA

Telemedicine for the Medicare Population: Pediatric, Obstetric, and Clinician-Indirect Home Interventions , No. 24 , Evidence/Report/Technology Assessment, Supplement

Hersh, W. , Oregon Health Sciences Univ. , USA ; Aug. 2001 ; 122p ; In English

Contract(s)/Grant(s): 290-97-0018

Report No.(s): PB2001-109046 ; No Copyright ; Avail: CASI ; A02 , Microfiche ; A06 , Hardcopy

The goal of this report is to extend our original evidence report on the efficacy of telemedicine by extending the assessment to the pediatrics and obstetrics populations along with receiving home telemedicine where the health care provider was involved in an indirect manner. As with the initial report, which covered telemedicine for the Medicare population, we assessed telemedicine services that substitute for face-to-face medical diagnosis and treatment and focused on three distinct telemedicine study areas-store and forward, self-monitoring/testing, and clinician-interactive services. We conducted a search in the peer-reviewed literature for studies assessing the efficacy and cost of telemedicine in the study areas and designated populations.

The search focused on peer-reviewed articles in the MEDLINE, CINAHL, and HealthSTAR databases. We also identified relevant articles through hand searching and reference lists in key papers.
NTIS
Telemedicine ; Medical Services

20020009762 Lockheed Martin Engineering and Science Services , Moffett Field, CA USA
Electroencephalographic Monitoring of Cognitive Fatigue
Montgomery, Leslie D. , Lockheed Martin Engineering and Science Services , USA ; Montgomery, Richard W. , Management Analytic Associates , USA ; Ku, Yu-Tsuan E. , Lockheed Martin Engineering and Science Services , USA ; Luna, Bernadette , NASA Ames Research Center , USA ; [2001] ; 1p ; In English ; AsMA Annual Scientific Meeting , 6-10 May 2001 , Reno, NV , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Mental exhaustion often poses a serious risk, even when performance is not apparently degraded. When such fatigue is associated with sustained performance of a single type of cognitive task it may be related to the metabolic energy required for sustained activation of cortical fields specialized for that task. The objective of this study was to adapt EEG to monitor cortical energy dissipation at a functionally specialized site over a long period of repetitive performance of a cognitive task.
Author
Electroencephalography ; Fatigue (Biology) ; Neurology ; Cognitive Psychology

20020010134 Vanderbilt Univ. Hospital , Nashville, TN USA
Setting Criteria and Agenda for Quality Improvement Research. Abstract, Executive Summary and Final Report of Conference
Speroff, T. , Vanderbilt Univ. Hospital , USA ; 2001 ; 38p ; In English
Report No.(s): PB2002-100033 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The primary aims of the conference were to (1) develop a conceptual framework that distinguishes quality improvement research as a discipline in healthcare and that provides quality improvement researchers with a rationale for this pathway of academic pursuit and (2) define standards of methodologic rigor that enable reviewers to critically and appropriately appraise the contribution of a quality improvement research initiative and determine whether a manuscript is suitable for publication. The Conference was held as part of the International Scientific Symposium on Improving Quality and Value in Healthcare on December 8, 1999 at the Institute for Healthcare Improvement National Forum on Quality Improvement in Health Care. Authors were selected for their expertise in content area, peer-recognition as researchers, and reputation as leaders in quality improvement.
NTIS
Conferences ; Quality Control ; Evaluation ; Medical Services

20020010913 NASA Ames Research Center , Moffett Field, CA USA
Quantification of Daily Physical Activity
Whalen, Robert , NASA Ames Research Center , USA ; Breit, Greg , NASA Ames Research Center , USA ; Quintana, Jason , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; International Symposium on Physical Loading, Exercise and Bone , 17-19 Nov. 1994 , Iampere , Finland ; Sponsored by Institute for Health Promotion Research , Finland
Contract(s)/Grant(s): RTOP 199-26-12-34 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The influence of physical activity on the maintenance and adaptation of musculoskeletal tissue is difficult to assess. Cumulative musculoskeletal loading is hard to quantify and the attributes of the daily tissue loading history affecting bone metabolism have not been completely identified. By monitoring the vertical component of the daily ground reaction force (GRFz), we have an indirect measure of cumulative daily lower limb musculoskeletal loading to correlate with bone density and structure. The objective of this research is to develop instrumentation and methods of analysis to quantify activity level in terms of the daily history of ground reaction forces.
Author
Physical Exercise ; Metabolism ; Musculoskeletal System

20020010914 NASA Ames Research Center , Moffett Field, CA USA
Assessment of Long Bone Flexural Properties from Bone Densitometry
Whalen, Robert , NASA Ames Research Center , USA ; Cleek, Tammy , NASA Ames Research Center , USA ; Katz, BethAnn , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; International Symposium on Physical Loading, Exercise and Bone , 17-19 Nov. 1994 , Iampere , Finland ; Sponsored by Institute for Health Promotion , Finland
Contract(s)/Grant(s): RTOP 199-26-12-34 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

While bone densitometry is the accepted non-invasive method of quantifying bone mineral content in bones, its assessment of bone structural properties is less well understood. The objective of our current work is to compare cross-section shape or areal properties of long bones computed from densitometry data with cross-section flexural properties obtained from surface strain measurements.
Author
Bones ; Density Measurement ; Bone Mineral Content

20020011169 National Inst. of Health , Office of the Director , Bethesda, MD USA
Agenda for Research on Women's Health for the 21st Century , Volume 7 , New Frontiers in Women's Health
2001 ; 50p ; In English
Report No.(s): PB2001-108247 ; NIH/PUB-01-4391 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report summarizes thousands of issues and questions raised by more than 1,500 women's health professionals and advocates throughout the United States. Their recommendations for addressing the major diseases and health risks affecting women create a comprehensive map for scientific inquiry in the 21st century. Their common concerns reflect emerging directions for women's health research as it explores new frontiers in women's unique experience of health and disease.
NTIS
Females ; Health ; Medical Services ; Clinical Medicine

20020011739 National Inst. of Health , National Inst. on Alcohol Abuse and Alcoholism , Bethesda, MD USA
Alcohol Research and Health, Volume 25, Number 2, 2001. Chronobiology: Circadian Rhythms and Alcohol Use
Welsh, D. M. ; 2001 ; 72p ; In English
Report No.(s): PB2001-109024 ; NIH/PUB-01-3466 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Contents include the following: Overview of Circadian Rhythms; Alcohol's Interactions With Circadian Rhythms: A Focus on Body Temperature; Sleep, Sleepiness, and Alcohol Use; Alcohol's Effect on Sleep in Alcoholics; Alcohol, Antidepressants, and Circadian Rhythms: Human and Animal Models; Developmental Alcohol and Circadian Clock Function; Chronobiological Regulation of Alcohol Intake.
NTIS
Alcohols ; Health ; Psychotropic Drugs ; Central Nervous System ; Circadian Rhythms

20020012539 NASA Ames Research Center , Moffett Field, CA USA
NAPS as an Alertness Management Strategy
Rosekind, Mark R. , NASA Ames Research Center , USA ; Smith, Roy M. , San Jose State Univ. , USA ; Miller, Donna L. , Sterling Software, Inc. , USA ; Co, Elizabeth L. , San Jose State Univ. , USA ; Gregory, Kevin B. , Sterling Software, Inc. , USA ; Gander, Philippa H. , San Jose State Univ. , USA ; Lebacqz, J. Victor , NASA Ames Research Center , USA ; [2001] ; 4p ; In English ; Work Hours. Sleepiness and Accidents Symposium , 8-10 Sep. 1994 , Sweden
Contract(s)/Grant(s): RTOP 505-64-58 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
Today, 24-hour operations are necessary to meet the demands of our society and the requirements of our industrialized global economy. These around-the-clock demands pose unique physiological challenges for the humans who remain central to safe and productive operations. Optimal alertness and performance are critical factors that are increasingly challenged by unusual, extended, or changing work/rest schedules. Technological advancements and automated systems can exacerbate the challenges faced by the human factor in these environments. Shift work, transportation demands, and continuous operations engender sleep loss and circadian disruption. Both of these physiological factors can lead to increased sleepiness, decreased performance, and a reduced margin of safety. These factors can increase vulnerability to incidents and accidents in operational settings. The consequences can have both societal effects (e.g., major destructive accidents such as Three Mile Island, Exxon Valdez, Bhopal) and personal effects (e.g., an accident driving home after a night shift).
Author
Alertness ; Physiological Factors ; Safety ; Human Performance ; Wakefulness ; Rest

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20020006172 NASA Ames Research Center , Moffett Field, CA USA

Fatigue Countermeasures: Alertness Management in Flight Operations

Co, E. L. , NASA Ames Research Center , USA ; Rosekind, M. R. , NASA Ames Research Center , USA ; Johnson, J. M. , NASA Ames Research Center , USA ; Weldon, K. J. , NASA Ames Research Center , USA ; Smith, R. M. , NASA Ames Research Center , USA ; Gregory, K. G. , NASA Ames Research Center , USA ; Miller, D. L. , NASA Ames Research Center , USA ; Gander, P. H. , NASA Ames Research Center , USA ; Lebacqz, J. V. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Southern California Safety Institute Meeting , USA ; Sponsored by Southern California Safety Inst. , USA

Contract(s)/Grant(s): RTOP 505-64-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Since 1980, the NASA Ames Fatigue Countermeasures Program has studied the effects and impact of fatigue on flight operations . Sleep loss and circadian disruption are two of the primary physiological factors that underlie fatigue in flight operations. The Program has developed an array of fatigue countermeasure recommendations that can be used to combat the effects of fatigue and continues to research potential new countermeasures. For example, one such strategy involved a NASA/FAA study on the effects of planned cockpit rest to improve crewmember alertness and performance. Based partly on the study results, the FAA is currently reviewing a proposed Advisory Circular for controlled rest on the flight deck. Since there is no simple answer to the issue of fatigue in aviation, an Education and Training Module has been developed to provide the industry with pertinent information on sleep, circadian rhythms, how flight operations affect these physiological factors, and recommendations for fatigue countermeasures. The Module will be updated as the Program's continued research efforts uncover new information and develop new countermeasure strategies,

Author

Fatigue (Biology) ; Countermeasures ; Alertness ; Flight Operations

20020006176 NASA Ames Research Center , Moffett Field, CA USA

Perceptual Repetition Blindness Effects

Hochhaus, Larry , Oklahoma Univ. , USA ; Johnston, James C. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English

Contract(s)/Grant(s): RTOP 505-64-13 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The phenomenon of repetition blindness (RB) may reveal a new limitation on human perceptual processing. Recently, however, researchers have attributed RB to post-perceptual processes such as memory retrieval and/or reporting biases. The standard rapid serial visual presentation (RSVP) paradigm used in most RB studies is, indeed, open to such objections. Here we investigate RB using a "single-frame" paradigm introduced by Johnston and Hale (1984) in which memory demands are minimal. Subjects made only a single judgement about whether one masked target word was the same or different than a post-target probe. Confidence ratings permitted use of signal detection methods to assess sensitivity and bias effects. In the critical condition for RB a precue of the post-target word was provided prior to the target stimulus (identity precue), so that the required judgement amounted to whether the target did or did not repeat the precue word. In control treatments, the precue was either an unrelated word or a dummy (XXXX). Results of five experiments show that perceptual sensitivity is strikingly and significantly reduced in the RB condition relative to both baseline control conditions. The data show RB can be obtained under conditions in which memory problems are minimal and where perceptual sensitivity is assessed independently of biases.

Author

Blindness ; Human Performance ; Perception ; Words (Language) ; Psychology

20020006183 NASA Ames Research Center , Moffett Field, CA USA

Effects of Body Orientation and Retinal Image Pitch on the Perception of Gravity-Referenced Eye Level (GREL)

Cohen, Malcolm M. , NASA Ames Research Center , USA ; Guzy, Larry T. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Aerospace Medical Association Meeting , 7-11 May 1995 , Anaheim, CA , USA ; Sponsored by Aerospace Medical Association , USA

Contract(s)/Grant(s): RTOP 199-16-12-08 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

It has been asserted that the pitch orientation of a visual array and of an observer's body jointly determine the perception of GREL. The current study formally tests this assertion over an extended range with multiple combinations of visual and body pitch orientations. Ten subjects were individually secured in a Circolectric bed surrounded by a room (pitchroom) with walls that could be pitched at various angles with respect to gravity. The bed and the walls of the room were independently adjusted to each of five positions relative to gravitational vertical: -15, -7.5, 0, +7.5, and +15 degrees, yielding 25 combinations of body x room pitch

angles, and retinal image pitch (RIP) conditions ranging from -30 to +30 degrees. Each subject set a target to apparent GREL while viewing it against a background of two electroluminescent strips on the outer edges of the far wall of the room. As determined by ANOVA, the orientation of the room, and its interaction with that of the observer, significantly altered GREL (p less than 0.01). Regression analysis showed that GREL was best described as a linear summation of the weighted independent contributions from a body-referenced mechanism (B) and a visual mechanism given by the orientation of the background array on the retina (RIP). The equation for this relationship is: GREL = .74 (B) +.64 (RIP) - 1.42; r-squared = .994.
Author
Eye (Anatomy) ; Gravitation ; Retinal Images ; Human Body ; Visual Perception

20020009546 NASA Ames Research Center , Moffett Field, CA USA
Hemodynamic Responses to Head and Neck Cooling
Ku, Yu-Tsuan E. , Bionetics Corp. , USA ; Carbo, Jorge E. , Sterling Federal Systems, Inc. , USA ; Montgomery, Leslie D. , NASA Ames Research Center , USA ; Webbon, Bruce W. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 1995 Annual Scientific Meeting of the Aerospace Medical Association , 7-11 May 1995 , Anaheim, CA , USA ; Sponsored by Aerospace Medical Association , USA
Contract(s)/Grant(s): RTOP 199-61-62 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Personal thermoregulatory systems which provide head and neck cooling are used in the industrial and aerospace environments to alleviate thermal stress. However, little information is available regarding the physiologic and circulatory changes produced by routine operation of these systems. The objective of this study was to measure the scalp temperature and circulatory responses during use of one commercially available thermal control system. The Life Support Systems, Inc. Mark VII portable cooling system and a liquid cooling helmet were used in this study. Two EEG electrodes and one skin temperature transducer were placed on the anterior midline of the scalp to measure the scalp blood and temperature. Blood flow was measured using a bipolar impedance rheograph. Ten subjects, seated in an upright position at normal room temperature, were tested at high, medium, moderate, moderate-low and low coolant temperatures. Scalp blood flow was recorded continuously using a computer data acquisition system with a sampling frequency of 200 Hz. Scalp temperature and cooling helmet Inlet temperature was logged periodically during the test period. This study quantifies the effect of head cooling upon scalp temperature and blood flow. These data may also be used to select operational specifications of the head cooling system for biomedical applications such as the treatment of migraine headaches, scalp cooling during chemotherapy, and cooling of multiple sclerosis patients.
Author
Blood Circulation ; Cooling Systems ; Data Acquisition ; Headache ; Hemodynamic Responses ; Thermal Stresses

20020010906 NASA Ames Research Center , Moffett Field, CA USA
Constraints on Neural Mechanisms Underlying the Spatial Integration of Speed Information
Verghese, Preeti , NASA Ames Research Center , USA ; Stone, Leland S. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 24th Annual Meeting of the Society of Neuroscience , 13-18 Nov. 1994 , Miami Beach, FL , USA ; Sponsored by Society of Neuroscience , USA
Contract(s)/Grant(s): RTOP 199-16-12-37 ; RTOP 199-14-12-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We measured human ability to integrate speed information presented simultaneously at multiple locations in the visual field. Observers did a two-interval forced-choice speed discrimination task with n grating patches in each interval at 4deg eccentricity from fixation. In the first (integration) paradigm, all gratings in each interval moved at the same speed and observers were asked to pick the interval containing the faster gratings. Speed discrimination improved as the number of gratings in each interval increased. The observed decrease in threshold is not due simply to an increase in the effective area because performance with a single grating two, four, or six times the area of the original grating showed no such improvement. Furthermore, the improvement with n was still observed even when the speeds of the individual gratings in each interval were independent samples from a Gaussian distribution and the grating directions were balanced (i.e. equal numbers of gratings moved to the left and right). These results indicate that the neural mechanisms responsible for the integration of speed information act as if each patch provides an independent sample of speed, independent of grating direction. The results are not consistent with simple summation across space by a directionally selective mechanism with a large receptive field. in the second (search) paradigm, only one of the gratings in an interval moved faster and observers were asked to pick this interval. In this case, thresholds increased with the number of distractor gratings. The decrease in performance with increased n is common in search tasks and is often attributed to a bottleneck in the information that observers can process simultaneously. However, the results in the integration paradigm show that subjects

indeed have access to and can use additional information with increasing n, at least up to 4 patches. Finally, simple detection models predict the trends in both the search and integration paradigms without invoking an input bottleneck.
Author
Normal Density Functions ; Visual Fields ; Eccentricity

20020010910 NASA Ames Research Center , Moffett Field, CA USA
A Role for MST Neurons in Heading Estimation
Stone, L. S. , NASA Ames Research Center , USA ; Perrone, J. A. , Waikato Univ. , New Zealand ; [1994] ; 1p ; In English ; 24th Annual Meeting Society for Neuroscience , 13-18 Nov. 1994 , Miami Beach, FL , USA ; Sponsored by Society for Neuroscience , USA
Contract(s)/Grant(s): RTOP 199-16-12-37 ; RTOP 199-06-12-24 ; RTOP 199-14-12-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A template model of human visual self-motion perception, which uses neurophysiologically realistic ”heading detectors”, is consistent with numerous human psychophysical results including the failure of humans to estimate their heading (direction of forward translation) accurately under certain visual conditions. We tested the model detectors with stimuli used by others in single-unit studies. The detectors showed emergent properties similar to those of MST neurons: (1) Sensitivity to non-preferred flow; Each detector is tuned to a specific combination of flow components and its response is systematically reduced by the addition of nonpreferred flow, and (2) Position invariance; The detectors maintain their apparent preference for particular flow components over large regions of their receptive fields. It has been argued that this latter property is incompatible with MST playing a role in heading perception. The model however demonstrates how neurons with the above response properties could still support accurate heading estimation within extrastriate cortical maps.
Author
Motion Perception ; Neurons ; Human Beings

20020012282 National Aerospace Lab. , Flight Div. , Amsterdam, Netherlands
NOTECHS: Non-Technical Skill Evaluation in JAR-FCL
van Avermaete, J. A. G. ; November 1998 ; 22p ; In English
Report No.(s): PB2002-100802 ; NLR-TP-98518 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Upon a request from the JAA-Project Advisory Group on Human Factors, NLR, DLR, IMASSA and the University of Aberdeen conducted a study into possible ways to evaluate non-technical skills of multi-pilot aircrew. The request was made in the light of the new requirements in JAR-FCL and JAR-OPS that make such an evaluation mandatory. The project, named NOTECHS, was executed between March 1997 and March 1998, and resulted in a descriptive framework for non-technical skills. The project result includes guidelines on how to use the framework in the check situations referred to in JAR-FCL. The proposed assessment method incorporates safeguards that should prevent misuse or arbitrariness of the evaluation. A formal validation of the proposed method was not possible within the NOTECHS project. The European Union JAR-TEL project will, building on the NOTECHS results, extend its application to JAR-OPS and test the robustness of the method proposed here.
NTIS
Human Factors Engineering ; Flight Crews ; Air Transportation ; Pilot Performance

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20020006062 Bionetics Corp. , Moffett Field, CA USA
Electrochemical Technology for Oxygen Removal and Measurement in the CELSS Test Facility, Engineering Development Unit
Drews, Michael E. , Bionetics Corp. , USA ; [1994] ; 1p ; In English ; 25th International Conference on Environmental Systems , 10-13 Jul. 1995 , San Diego, CA , USA
Contract(s)/Grant(s): RTOP 106-20-07 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The Life Support Flight Program is evaluating regenerative technologies, including those that utilize higher plants, as a means to reduce resupply over long duration space missions. Constructed to assist in the evaluation process is the CELSS Test Facility Engineering Development Unit (CTF-EDU) an environmentally closed (less than 1% mass and thermal leakage) technology test

bed. This ground based fully functional prototype is currently configured to support crop growth, utilizing the power, volume and mass resources allocated for two space station racks. Sub-system technologies were selected considering their impact on available resources, their ability to minimize integration issues, and their degree of modularity. Gas specific mass handling is a key sub-system technology for both biological and physical/chemical life support technologies. The CTF-EDU requires such a system to accommodate non-linear oxygen production from crops, by enabling the control system to change and sustain partial pressure set points in the growth volume. Electrochemical cells are one of the technologies that were examined for oxygen handling in the CTF-EDU. They have been additionally considered to meet other regenerative life support functions, such as oxygen generation, the production of potable water from composite waste streams, and for having the potential to integrate life support functions with those of propulsion and energy storage. An oxygen removal system based on an electrochemical cell was chosen for the EDU due to it's low power, volume and mass requirements (10W, 0.000027 cu m, 4.5 kg) and because of the minimal number of integration considerations. Unlike it's competitors, the system doesn't require post treatments of its byproducts, or heat and power intensive regenerations, that also mandate system redundancy or cycling. The EDUs oxygen removal system only requires two resources, which are already essential to controlled plant growth: electricity and water. Additionally, the amount of oxygen that is removed from the EDU is directly proportional to the cell input current via Faraday's constant, potentially allowing for a mol/electron measurement of photosynthetic rate. The currently operative oxygen removal system has maintained reduced oxygen set points within the EDU, and preparation is underway to verify of the accuracy of electrochemical measurement of oxygen production and hence, photosynthesis. This paper examines the working principles of the electrochemical cell, outlines the overall design of the oxygen removal system and its integration with other EDU subsystems, and summarizes test results obtained over crop growth cycles in the CTF-EDU.
Author
Regeneration (Engineering) ; Electrochemistry ; Technology Assessment ; Oxygen ; Removal ; Closed Ecological Systems ; Life Support Systems ; Oxygen Supply Equipment

20020006872 National Defence Research Establishment , Div. of Human Sciences , Linkoeping, Sweden
Interact. Edinburgh, September 1999
Wikberg, P. ; October 1999 ; 18p ; In English
Report No.(s): PB2001-108139 ; FOA-R-99-01254-505-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This travel report presents some impressions from the INTERACT '99 conference on human-computer interaction. At the conference a number of problems and research areas were presented which were of interest to FOA's (Swedish Defense Research Establishment) support to the armed forces' development of modern command and control systems. The conference was divided into two sections, one with tutorials and workshops and one with presentations of papers and posters. The report contains reviews, references, and comments about the sessions/lectures. The main impressions from the conference were a strive after standardization and time efficiency in the research methods. The focus of the presented research was at the individual level.
NTIS
Lectures ; Conferences ; Command and Control ; Human-Computer Interface

20020006876 Research Inst. of National Defence , Stockholm, Sweden
Annual Report 2000 on FOA's Research on Man-System-Interaction and Physiology ***Arsrapport 2000 foer FOAs Forskning inom FoT-omrade. Maenniska-System-Interaktion med Fysiologi***
Sandstroem, L. ; January 2001 ; 62p ; In Swedish
Report No.(s): PB2001-108072 ; FOI-R-0010-SE ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Man System Interaction aspects are increasingly recognized as crucial for the proper functioning of modern command/control and weapon systems. The operator is the crucial element for system effectiveness. In the area of Information presentation the focus is on the pilots' situation in high-performance aircraft. Recent centrifuge experiments focus on the pilots' ability to correctly identify colors. The possibilities to study experimentally Operator Mental Workload in simulated missions will significantly increase knowledge of single and multiple-operator behavior in handling mission requirements. In the area of Decision support sensor integration and sensor administration and use of modern Temporal Display techniques have been studied. The ability of ground forces to operate during night is of high priority. Test and evaluation of night-vision equipment and how to protect your night-vision capability are important areas of study. In Aviation Medicine the primary focus is on understanding the effects on the pilot of the high G-forces generated by flying high-performance aircraft and the development of methods and therapy to counteract these effects.
NTIS
Military Technology ; Research and Development ; Technology Utilization ; Human-Computer Interface ; System Effectiveness ; Display Devices ; Pilot Support Systems

20020008236 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA

Fort Bliss Field Unit 1986-1988 ***Final Report , 1986-1988***

Allender, L. B. ; Barber, A. V. ; Drewfs, P. R. ; Lockhart, J. M. ; Bittner, A. C. ; Jul. 2001 ; 282p ; In English

Report No.(s): AD-A395881 ; No Copyright ; Avail: CASI ; A13 , Hardcopy ; A03 , Microfiche

Eight working papers dealing with the Patriot system, the Stinger, RADES, and operator workload are presented.

DTIC

Air Defense ; Human Factors Engineering ; Workloads (Psychophysiology) ; Computerized Simulation ; Military Operations

20020008988 Edgewood Chemical Biological Center , Aberdeen Proving Ground, MD USA

Swatch Test Results of Commercial Chemical Protective Gloves to Challenge by Chemical Warfare Agents Executive Summary ***Final Report , Mar.-Sep. 1999***

Lindsay, Robert S. ; Oct. 2001 ; 13p ; In English

Report No.(s): AD-A395992 ; ECBC-TR-164 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Swatches from 11 commercially available chemical protective gloves were challenged with liquid droplets of sarin (GB) and mustard (HD) using modifications of the static diffusion described in TOP 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine an average cumulative mass for each glove. From these data, a breakthrough time was calculated for each glove/ agent combination for the purposes of comparisons.

DTIC

Chemical Warfare ; Gloves ; Performance Tests ; Protective Clothing

20020009173 National Inst. for Occupational Safety and Health , Rockville, MD USA

NIOSH-DOD-OSHA Sponsored Chemical and Biological Respiratory Protection Workshop Report

Dower, John M. ; Metzler, Richard W. ; Palya, Frank M. ; Peterson, Jeff A ; Picketi-Harner, Molly ; Feb. 2000 ; 79p ; In English

Report No.(s): AD-A395882 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

Since publication of Presidential Initiative 62, municipal, state, and national guard responder groups have been developing response plans and establishing the procedural and equipment infrastructures to capably respond to chemical and/or biological terrorism and other crisis situations. The National Institute for Occupational Safety and Health (NIOSH) co-sponsored this technical Workshop together with the Department of Defense (DOD) - US Army Soldier and Biological Chemical Command (SBCCOM) and the Occupational Safety and Health Administration (OSHA). Workshop objectives were to: 1) identily and understand the hazards associated with chemical and/or biological incidents, 2) identify the different responders and their respiratory protection needs, 3) determine which respirators and selection criteria are currently being utilized for response to these types of incidents, and 4) determine public health and medical community concerns which must be considered in developing a standard for chemical and/or biological respiratory protective devices. This Workshop provided a forum for over 140 representatives from 63 different emergency responder, fire fighter, domestic preparedness, equipment manufacturing, federal research, and state and federal regulatory organizations. Participants openly discussed issues, exchanged information, and learned about current respiratory protection issues associated with incidents involving chemical and biological agents. The attendees were subject-matter experts, stakeholders, and partners with a common interest of assuring proper respiratory protection for emergency responders and other worker groups faced with the responsibility of responding to incidents involving chemical and/or biological threats.

DTIC

Defense Program ; Public Health ; Respirators ; Armed Forces (USA)

20020009680 Edgewood Chemical Biological Center , Research and Technology Directorate , Aberdeen Proving Ground, MD USA

Swatch Test Results of Commercial Chemical Protective Boots to Challenge by Chemical Warfare Agents: Executive Summary ***Final Report , Mar.-Sep. 1999***

Lindsay, Robert S. ; Oct. 2001 ; 13p ; In English

Report No.(s): AD-A396012 ; ECBC-TR-165 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Swatches from nine commercially available chemical protective boots were challenged with liquid droplets of sarin (GB) and mustard (HD) using modifications of the static diffusion described in TOP 8-2-501. The cumulative mass of each agent that permeated each swatch was determined over time, and the results for all swatches were used to determine an average cumulative

mass for each boot. From these data, a breakthrough time was calculated for each boot/agent combination for purposes of comparisons.
DTIC
Protective Clothing ; Destructive Tests ; Boots (Footwear)

20020009682 Essex Corp. , Alexandria, VA USA
Manprint Analysis of the DIVAD System , Volume 2 , Lessons Learned
Seven, Sally A. ; Mar. 10, 1988 ; 75p ; In English
Report No.(s): AD-A395994 ; WP-FH-8806-Vol-2 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This report is intended to examine lessons that were learned from the human factors aspects of the Sgt York Follow-On-Evaluation (FOE I) tests. A separate report documents those tests, so details of system description and performance, test planning and execution, and data collection and analysis are not repeated in this report. The present focus is on: (1) applying the experience of Sgt York FOE I to the larger issue of integrating good human factors design into the entire process of weapon system acquisition; (2) using the Sgt York FOE I observations to suggest improvements in human factors operational test and evaluation; (3) putting these observations into the context of the current Army-wide MANPRINT initiative; and (4) relating present findings to the results of earlier reverse engineering and design criteria studies of other major Army weapon system acquisitions (Stinger, Multiple-Launch Rocket System (MLRS), Fire Support Team Vehicle (FIST-V), and the Fault Detection and Isolation Subsystems of the Ml Tank). The observations called 'lessons' may be startling from a MANPRINT standpoint, but they are not really new. There are remarkable parallels for them in the development of earlier systems. Some may see them as old lessons too familiar to warrant recounting; others may find new insights or perspectives. However they are seen, they seem to need to be relearned with each new system, so this volume is called lessons relearned to highlight the sense of (unfortunately) revisiting old territory.
DTIC
Human Factors Engineering ; Air Defense ; Military Technology

20020010110 Army Research Inst. Field Unit , Fort Hood, TX USA
Relationships Between Training Level, Aptitude and System Performance on the AN/TRC-170: Weighted and Unweighted Correctional Analysis
Heuckeroth, Otto ; Dec. 1988 ; 26p ; In English
Report No.(s): AD-A396089 ; WP-FH-88-16 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
With the recent MANPRINT (manpower and personnel integration) initiative on development and evaluation of Army systems, continued interest exists in the relationship between system/soldier performance, training proficiency and Armed Services Vocational Aptitude Battery (ASVAB) scores. During 1986 and early 1987, under the auspices of the Operational Test and Evaluation Agency (OTEA), a Follow-on Test and Evaluation (FOT&E) of the AN/TRC-170 tactical troposcatter systems was conducted. The AN/TRC-170 is a family of three multichannel radio terminal sets (V1-V3) that were developed by Raytheon under contract to the Electronic Systems Division of the USA Air Force. In order to evaluate the suitability of the V2 and V3 systems for Army missions, the FOT&E was conducted. Since four Block test training proficiency measures, system performance (time) measures (obtained during the FOT&E) and ASVAB scores were available, it seemed appropriate to address the relationship among these variables. Differences in the demographic characteristics of the FOT&E and non-FOT&E soldiers in the target audience are summarized. Aptitude (ASVAB) differences between FOT&E and non-FOT&E soldiers are summarized. Finally, comparability of teams formed for conduct of the FOT&E is accessed via training achievement proficiency and ASVAB Composites performance.
DTIC
Abilities ; Aptitude ; Education

20020010246 NASA Ames Research Center , Moffett Field, CA USA
Biomedical Use of Aerospace Personal Cooling Garments
Webbon, Bruce W. , NASA Ames Research Center , USA ; Montgomery, Leslie D. , NASA Ames Research Center , USA ; Callaway, Robert K. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 1995 Annual Scientific Meeting of the Aerospace Medical Association , 7-11 May 1995 , Anaheim, CA , USA ; Sponsored by Aerospace Medical Association , USA
Contract(s)/Grant(s): RTOP 199-61-62 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Personal thermoregulatory systems are required during extravehicular activity (EVA) to remove the metabolic heat generated by the suited astronaut. The Extravehicular and Protective Systems (STE) Branch of NASA Ames Research Center has developed advanced concepts or liquid cooling garments for both industrial and biomedical applications for the past 25 years. Examples of

this work include: (1) liquid cooled helmets for helicopter pilots and race car drivers; (2) vests for fire and mine rescue personnel; (3) bras to increase the definition of tumors during thermography; (4) lower body garments for young women with erythomelaigia; and (5) whole body garments used by patients with multiple sclerosis (MS). The benefits of the biomedical application of artificial thermoregulation received national attention through two recent events: (1) the liquid-cooled garment technology was inducted into the United States Space Foundation's Space Technology Hall of Fame (1993); and (2) NASA has signed a joint Memorandum of Understanding with the Multiple Sclerosis Association (1994) to share this technology for use with MS patient treatment. The STE Branch is currently pursuing a program to refine thermoregulatory design in light of recent technology developments that might be applicable for use by several medical patient populations. Projects have been initiated to apply thermoregulatory technology for the treatment and/or rehabilitation of patients with spinal cord injuries, multiple sclerosis, migraine headaches, and to help prevent the loss of hair during chemotherapy.
Author
Body Temperature ; Thermoregulation ; Cooling Systems ; Garments ; Aerospace Technology Transfer

20020010261 Army Engineer Research and Development Center , Vicksburg, MS USA
Bioengineering as a Tool for Restoring Ecological Integrity to the Carson River
Piper, Kevin L. ; Hoag, J. C. ; Allen, Hollis H. ; Durham, Gail ; Fischenich, J. C. ; September 2001 ; 14p ; In English ; Original contains color images ; Prepared in collaboration with R. O. Anderson Engineering, Inc., Minden, NV
Report No.(s): AD-A396087 ; ERDC-TN-WRAP-01-05 ; ERDC-WQ-TN-CS-03 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This technical note describes a case study involving the following: (1) use of bioengineering (a combination of vegetation and engineered structures and materials) and rock structures to restore an eroded bank of the Carson River, Nevada; and (2) restoration of ecological amenities that existed prior to disturbances by man and a major flood event.
DTIC
Bioengineering ; Rivers ; Rocks ; Ecology

20020011221 Sandia National Labs. , Albuquerque, NM USA
Framework for Geometric Reasoning About Human Figures and Factors in Assembly Processes
Calton, T. L. ; Jul. 20, 1999 ; 9p ; In English
Report No.(s): DE2001-9669 ; SAND99-1920C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Automatic assembly sequencing and visualization tools are valuable in determining the best assembly sequences, but without Human Factors and Figure Models (HFFMs) it is difficult to evaluate or visualize human interaction. In industry, accelerating technological advances and shorter market windows have forced companies to turn to an agile manufacturing paradigm. This trend has promoted computerized automation of product design and manufacturing processes, such as automated assembly planning. However, all automated assembly planning software tools assume that the individual components fly into their assembled configuration and generate what appear to be perfectly valid operations, but in reality some operations cannot physically be carried out by a human. For example, the use of a ratchet may be reasoned feasible for an assembly operation; however, when a hand is placed on the tool the operation is no longer feasible, perhaps because of inaccessibility, insufficient strength or human interference with assembly components. Similarly, human figure modeling algorithms may indicate that assembly operations are not feasible and consequently force design modifications, however, if they had the capability to quickly generate alternative assembly sequences, they might have identified a feasible solution. to solve this problem, HFFMs must be integrated with automated assembly planning which allows engineers to quickly verify that assembly operations are possible and to see ways to make the designs even better. This paper presents a framework for integrating geometry-based assembly planning algorithms with commercially available human figure modeling software packages. Experimental results to selected applications along with lessons learned are presented.
NTIS
Human Factors Engineering ; Manufacturing

20020011871 Texas A&M Univ. , Texas Transportation Inst. , College Station, TX USA
Texas Driver Understanding of Abbreviations for Dynamic Mesaage Signs , *Sep. 1998 - Aug. 1999*
Durkop, B. R. ; Dudek, C. L. ; Feb. 2000 ; 78p ; In English
Report No.(s): PB2002-100356 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
This report presents recommendations to improve the design of messages for dynamic message signs (DMSs). Specifically, it presents recommendations for effective abbreviations that can be used when the required DMS message exceeds the space available on a sign. Abbreviations are especially useful in portable DMSs which have a space limitation of eight characters per

line. The recommendations are made based on the results of human factors studies that were conducted in the following six TXDOT districts: Austin, Dallas, El Paso, Fort Worth, Houston and San Antonio.
NTIS
Transportation ; Traffic ; Highways

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20020006537 Lawrence Livermore National Lab. , Livermore, CA USA
OLIS: On-Line Image Simulation and structure characterization for the Materials Microcharacterization Collaboratory
O'Keefe, M. A. ; Taylor, J. R. ; Feb. 13, 1999 ; 3p ; In English
Report No.(s): DE2001-775178 ; LBNL-47328 ; No Copyright ; Avail: Department of Energy Information Bridge
On-Line Image Simulation (OLIS) will be made available to remote users from an Materials Microcharacterization Collaboratory (MMC) compute server. OLIS has an interactive Graphical User Interface (GUI) to allow users to enter and modify data interactively. OLIS is also integrated with the MMC DeepView control GUI, and OLIS images can thus be displayed on the remote user monitor adjacent to the (live or captured) experimental image, together with a difference image and a goodness-of-fit parameter.
NTIS
On-Line Systems ; Computerized Simulation ; Image Processing ; Microanalysis

20020007084 Los Alamos National Lab. , NM USA
Advanced wave-equation migration
Huang, L. ; Fehler, M. C. ; Dec. 01, 2000 ; 9p ; In English
Report No.(s): DE2001-772611 ; LA-UR-00-6051 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Wave-equation migration methods can more accurately account for complex wave phenomena than ray-tracing-based Kirchhoff methods that are based on the high-frequency asymptotic approximation of waves. With steadily increasing speed of massively parallel computers, wave-equation migration methods are becoming more and more feasible and attractive for imaging complex 3D structures. We present an overview of several efficient and accurate wave-equation-based migration methods that we have recently developed. The methods are implemented in the frequency-space and frequency-wavenumber domains and hence they are called dual-domain methods. In the methods, we make use of different approximate solutions of the scalar-wave equation in heterogeneous media to recursively downward continue wavefields. The approximations used within each extrapolation interval include the Born, quasi-Born, and Rytov approximations. In one of our dual-domain methods, we use an optimized expansion of the square-root operator in the one-way wave equation to minimize the phase error for a given model. This leads to a globally optimized Fourier finite-difference method that is a hybrid split-step Fourier and finite-difference scheme. Migration examples demonstrate that our dual-domain migration methods provide more accurate images than those obtained using the split-step Fourier scheme. The Born-based, quasi-Born-based, and Rytov-based methods are suitable for imaging complex structures whose lateral variations are moderate, such as the Marmousi model. For this model, the computational cost of the Born-based method is almost the same as the split-step Fourier scheme, while other methods takes approximately 15-50% more computational time. The globally optimized Fourier finite-difference method significantly improves the accuracy of the split-step Fourier method for imaging structures having strong lateral velocity variations, such as the SEG/EAGE salt model, at an approximately 30% greater computational cost than the split-step Fourier method.
NTIS
Wave Equations ; Massively Parallel Processors

20020008197 Oak Ridge National Lab. , TN USA
Error Analysis of Variations on Larsen's Benchmark Problem
Azmy, Y. Y. ; Jun. 27, 2001 ; 18p ; In English
Report No.(s): DE2001-786337 ; P01-110943 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Error norms for three variants of Larsen's benchmark problem are evaluated using three numerical methods for solving the discrete ordinates approximation of the neutron transport equation in multidimensional Cartesian geometry. The three variants of Larsen's test problem are concerned with the incoming flux boundary conditions: unit incoming flux on the left and bottom

edges (Larsen's configuration); unit incoming flux only on the left edge; unit incoming flux only on the bottom edge. The three methods considered are the Diamond Difference (DD) method, and the constant-approximation versions of the Arbitrarily High Order Transport method of the Nodal type (AHOT-N), and of the Characteristic (AHOT-C) type. The cell-wise error is computed as the difference between the cell-averaged flux computed by each method and the exact value, then the L1, L2, and L error norms are calculated. The results of this study demonstrate that while integral error norms, i.e. L1, L2, converge to zero with mesh refinement, the pointwise L norm does not due to solution discontinuity across the singular characteristic. Little difference is observed between the error norm behavior of the three methods considered in spite of the fact that AHOT-C is locally exact, suggesting that numerical diffusion across the singular characteristic as the major source of error on the global scale. However, AHOT-C possesses a given accuracy in a larger fraction of computational cells than DD.
NTIS
Variations ; Error Analysis ; Grid Generation (Mathematics) ; Numerical Analysis ; Approximation

20020008653 Institut des Hautes Etudes Scientifiques , Bures-sur-Yvette France
Ruelle-Perron-Frobenius Spectrum for Anosov Maps
Blank, M. ; Keller, G. ; Liverani, C. ; Jun. 2001 ; 64p ; In English ; Portions of this document are not fully legible
Report No.(s): PB2001-108457 ; IHES/M/01/31 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The aim of the present paper is to extend a number of results from one dimensional dynamics based on spectral properties of the Ruelle-Perron-Frobenius operator (transfer operator, for short) to C3 Anosov diffeomorphisms on compact manifolds, which allows to develop a direct, and very powerful, operator approach to study quantitative ergodic properties of these maps.
NTIS
Manifolds (Mathematics) ; Ergodic Process

20020008654 Institut des Hautes Etudes Scientifiques , Bures-sur-Yvette France
Profinite Topology on Coxeter Groups
Gitik, R. ; Jul. 2001 ; 14p ; In English ; Portions of this document are not fully legible
Report No.(s): PB2001-108449 ; IHES/M/01/33 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The profinite topology on a group G is defined by proclaiming all finite index subgroups of G to be the base open neighborhoods of the identity in G. We denote it by PT(G). The profinite topology on groups has been studied for a long time. In this paper we study the subgroups of Coxeter groups which are closed in the profinite topology and discuss some related open problems. The main result of this paper is the following proposition.
NTIS
Topology ; Manifolds (Mathematics)

20020011617 Sandia National Labs. , Albuquerque, NM USA
Markov Modeling with Soft Aggregation for Safety and Decision Analysis
Cooper, ; Sep. 01, 1999 ; 39p ; In English
Report No.(s): DE2001-13062 ; SAND99-2461 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The methodology in this report improves on some of the limitations of many conventional safety assessment and decision analysis methods. A top-down mathematical approach is developed for decomposing systems and for expressing imprecise individual metrics as possibilistic or fuzzy numbers. A 'Markov-like' model is developed that facilitates combining (aggregating) inputs into overall metrics and decision aids, also portraying the inherent uncertainty. A major goal of Markov modeling is to help convey the top-down system perspective. One of the constituent methodologies allows metrics to be weighted according to significance of the attribute and aggregated nonlinearly as to contribution. The aggregation is performed using exponential combination of the metrics, since the accumulating effect of such factors responds less and less to additional factors. This is termed 'soft' mathematical aggregation. Dependence among the contributing factors is accounted for by incorporating subjective metrics on 'overlap' of the factors as well as by correspondingly reducing the overall contribution of these combinations to the overall aggregation. Decisions corresponding to the meaningfulness of the results are facilitated in several ways. First, the results are compared to a soft threshold provided by a sigmoid function. Second, information is provided on input 'importance' and 'Sensitivity,' in order to know where to place emphasis on considering new controls that may be necessary. Third, trends in inputs and outputs are tracked in order to obtain significant information, including cyclic information for the decision process.
NTIS
Decision Making ; Markov Processes ; Decision Support Systems ; Decision Theory ; Safety

20020012227 Lawrence Livermore National Lab. , Livermore, CA USA
Coupling mixed and finite volume discretizations of convection-diffusion-reaction equations on non-matching grids
Lazarov, R. ; Pasciaic, J. ; Vassilevski, P. ; Jul. 01, 1999 ; 20p ; In English
Report No.(s): DE2001-13794 ; UCRL-JC-134960 ; REPT-97-ERD-114 ; No Copyright ; Avail: Department of Energy Information Bridge

In this paper, we consider approximation of a second order convection-diffusion problem by coupled mixed and finite volume methods. Namely, the domain is partitioned into two subdomains, and in one of them we apply the mixed finite element method while on the other subdomain we use the finite volume element approximation. We prove the stability of this discretization and derive an error estimate.
NTIS
Finite Volume Method ; Approximation ; Discretization (Mathematics) ; Computational Grids ; Convection-Diffusion Equation

20020012263 Center for Mathematics and Computer Science , Amsterdam Netherlands
Splitting Methods for Second-Order Initial Value Problems: Modelling, Analysis and Simulation
vanderHouwen, P. J. ; Messina, E. ; Jul. 1998 ; ISSN 1386-3703 ; 26p ; In English
Report No.(s): PB2001-108515 ; MAS-R9809 ; Copyright ; Avail: National Technical Information Service (NTIS)

We consider stiff initial-value problems for second-order differential equations of the special form y(exp 11) = f(y). Stiff initial-value problem solvers are necessarily implicit, hence, we are faced with the problem of solving systems of implicit relations. This paper focuses on the construction and analysis of iterative solution methods which are effective in cases where the Jacobian of the righthand side of the differential equation can be split into a sum of matrices with a simple structure. These iterative methods consist of the modified Newton method and an iterative linear solver to deal with the linear Newton systems. The linear solver is based on the approximate factorization of the system matrix associated with the linear Newton systems. A number of convergence results are derived for the linear solver in the case where the Jacobian matrix can be split into commuting matrices. Such often problems arise in the spatial discretization of time-dependent partial differential equations. Furthermore, the stability matrix and the order of accuracy of the integration process are derived in the case of a finite number of iterations.
NTIS
Partial Differential Equations ; Factorization ; Boundary Value Problems ; Splitting

20020012267 Center for Mathematics and Computer Science , Amsterdam Netherlands
Behavioral Approach to Singular Systems. Modelling, Analysis and Simulation
Lomadze, V. ; Ravi, M. S. ; Rosenthal, J. ; Schumacher, J. M. ; Sep. 1998 ; 22p ; In English
Report No.(s): PB2001-108502 ; MAS-R9818 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche

The notion of behaviors introduced by Willems gives a good description of dynamical systems without reference to any particular representation of the system in terms of equations. In this note, we introduce a notion of behaviors that allows us to describe singular systems in a very natural way. The new definition of behaviors given here is closely related to that of a sheaf over the projective line, and we make this connection precise.
NTIS
Linear Systems ; Dynamical Systems ; Singularity (Mathematics)

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COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20020006221 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Training Challenges for Digitization ***Final Report , May 1999-Mar. 2001***
Moses, Franklin L. ; Jun. 2001 ; 34p ; In English ; Original contains color images
Contract(s)/Grant(s): Proj-A790
Report No.(s): AD-A395401 ; ARI-SR-47 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report outlines challenges about how best to train computer-based digital skills for future battlefield operations. It explains the foundation of Army needs, the state of current knowledge, suggests research to address the most pressing needs, and the potential benefits to the Army. Five training challenges for digitization are identified and discussed: (1) Determine digital task training requirements, (2) Train adaptability, (3) Prepare digitally-linked teams, (4) Assess skill levels of digital soldiers, and (5)

Strategies for training on demand. The report's purpose is to communicate with training managers and leaders who have to make informed decisions about how to support training for the Objective Force and the future Army.
DTIC
Digital Systems ; Computer Techniques ; Digital Techniques ; Education ; Armed Forces

20020008211 North Carolina State Univ. , ECE Dept. , Raleigh, NC USA
Compilation Techniques for Core Plus FPGA Systems
Conte, Tom , North Carolina State Univ. , USA ; [2001] ; 3p ; In English ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
The overall system architecture targeted in this study is a core-plus-fpga design, which is composed of a core VLIW DSP with on-chip memory and a set of special-purpose functional units implemented using FPGAs. A figure is given which shows the overall organization of the core-plus-fpga system. It is important to note that this architecture is relatively simple in concept and can be built from off-the-shelf commercial components, such as one of the Texas Instruments 320C6x family of DSPs for the core processor.
Derived from text
Architecture (Computers) ; Field-Programmable Gate Arrays

20020009054 Pennsylvania Univ. , Medical Image Processing Group , Philadelphia, PA USA
Active Real-Time Target Selection and Tracking Using Peripheral Vision and Dyn ***Final Report , 23 Jan. 1995-22 Jan 1996***
Metaxas, Dimitris N. ; Oct. 2001 ; 2p ; In English ; Sponsored in part by Grant N00014-97-1-0359
Contract(s)/Grant(s): DAAH04-95-1-0067
Report No.(s): AD-A396119 ; ARO-34352.1-RT-RIP ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
List of processing equipment, vendors, prices, and dates purchased for study of active real time optical target selection and tracking.
DTIC
Real Time Operation ; Tracking (Position) ; Peripheral Vision ; Data Processing Equipment

20020009673 Army Engineer Research and Development Center , Environmental Lab. , Vicksburg, MS USA
Integrated Electronic Data Repository to Support the South Fork of the Broad River Research Program ***Final Report***
Dove, Linda P. ; Bong, Steve ; Aug. 2001 ; 28p ; In English ; Prepared in collaboration with Jaya Corp., Huntsville, AL
Report No.(s): AD-A396062 ; ERDC/EL/TR-01-14 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report is the summary of the first part of the Integrated Electronic Data Repository (IEDR) to support all phases of the multiyear Technology Required for Alternative Analyses for a Changing Environment (TRACE) Program. The project was developed by the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, to design and implement a plan for an Integrated Electronic Data Repository (IEDR) to support all phases of the multiyear Technology Required for Alternative analyses for a Changing Environment (TRACE) Program. Specifically, the repository is needed to support the Total Maximum Daily Load (TMDL) field research projects established in the South Fork of the Broad River watershed. The purpose of the repository is to archive and disseminate various types of data associated with the project to support environmental monitoring and modeling. The modeling activities include those such as sediment transport, watershed analyses, and environmental analyses. These models require data gathered ultimately from various data files submitted and cataloged in an orderly fashion with the repository. This report summarizes the design requirements and considerations used to develop a prototype web-based repository site for the TMDL research project. It is presented in two parts: design requirements and considerations and prototype web-based repository.
DTIC
Environmental Monitoring ; Data Bases ; Indexes (Documentation)

20020009761 NASA Ames Research Center , Moffett Field, CA USA
Investigation of Nitride Morphology After Self-Aligned Contact Etch
Hwang, Helen H. , NASA Ames Research Center , USA ; Keil, J. , Lam Research Corp. , USA ; Helmer, B. A. , Lam Research Corp. , USA ; Chien, T. , Lam Research Corp. , USA ; Gopaladasu, P. , Lam Research Corp. , USA ; Kim, J. , Samsung Corp. , Korea, Democratic People's Republic of ; Shon, J. , Lam Research Corp. , USA ; Apr. 29, 2001 ; 1p ; In English ; Poster Presentation , Oct. 2001 , San Francisco, CA , USA ; Sponsored by American Vacuum Society , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Self-Aligned Contact (SAC) etch has emerged as a key enabling technology for the fabrication of very large-scale memory devices. However, this is also a very challenging technology to implement from an etch viewpoint. The issues that arise range from poor oxide etch selectivity to nitride to problems with post etch nitride surface morphology. Unfortunately, the mechanisms that drive nitride loss and surface behavior remain poorly understood. Using a simple langmuir site balance model, SAC nitride etch simulations have been performed and compared to actual etched results. This approach permits the study of various etch mechanisms that may play a role in determining nitride loss and surface morphology. Particle trajectories and fluxes are computed using Monte-Carlo techniques and initial data obtained from double Langmuir probe measurements. Etched surface advancement is implemented using a shock tracking algorithm. Sticking coefficients and etch yields are adjusted to obtain the best agreement between actual etched results and simulated profiles.
Author
Fabrication ; Morphology ; Nitrides ; Algorithms ; Etching ; Mathematical Models

20020010368 NASA Ames Research Center , Moffett Field, CA USA
The Grayscale/Spatial Resolution Trade-Off and Its Impact on Display System Design
Gille, Jennifer , Western Aerospace Labs., Inc. , USA ; Larimer, Jim , NASA Ames Research Center , USA ; Martin, Russel , Xerox Palo Alto Research Center , USA ; [1994] ; 4p ; In English ; The Advisory Group on Electron Devices 1994 International Display Research Conference , 10-13 Oct. 1994 , Monterey, CA , USA ; Sponsored by Society for Information Display , USA
Contract(s)/Grant(s): RTOP 506-59-00 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
We examine technology trade-offs related to the grayscale/spatial resolution trade-off for AMLCD-based display systems. We present new empirical results from our study of the human grayscale/spatial resolution trade-off.
Author
Display Devices ; Spatial Resolution ; Tradeoffs ; Gray Scale

20020012542 National Aerospace Lab. , Informatics Div. , Amsterdam Netherlands
Tool Kit for Turning Heterogeneous Computer Network into Application Environments ***Final Report***
Baalbergen, E. H. ; vanderVen, H. ; October 1998 ; 26p ; In English ; Original contains color illustrations
Report No.(s): PB2002-100800 ; NLR-TP-98462 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
SPINEware is a tool kit that supports the development and operational use of user-oriented application environments on top of heterogeneous computer networks. Such an environment presents itself to its end users as a single and powerful 'metacomputer' with a user-friendly interface that provides uniform and network-transparent access to the resources, such as computing power, data storage, and applications, available from the network. SPINEware also facilitates the tailoring of an environment to a particular application area. It provides experts in that area with tools to translate their computer experience and expertise into a ready-to-use working environment for that area. In this paper, the authors describe a SPINEware-based working environment and how SPINEware supports the realization of such an environment.
NTIS
Computer Networks ; Software Development Tools ; Applications Programs (Computers) ; Programming Environments ; Heterogeneity

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20020005962 Computer Sciences Corp. , Numerical Aerodynamic Simulation , Moffett Field, CA USA
MPIRUN: A Portable Loader for Multidisciplinary and Multi-Zonal Applications
Fineberg, Samuel A. , Computer Sciences Corp. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Multidisciplinary and multi-zonal applications are an important class of applications in the area of Computational Aerosciences. In these codes, two or more distinct parallel programs or copies of a single program are utilized to model a single problem. to support such applications, it is common to use a programming model where a program is divided into several single program multiple data stream (SPMD) applications, each of which solves the equations for a single physical discipline or grid zone. These SPMD applications are then bound together to form a single multidisciplinary or multi-zonal program in which the constituent parts communicate via point-to-point message passing routines. One method for implementing the message passing

portion of these codes is with the new Message Passing Interface (MPI) standard. Unfortunately, this standard only specifies the message passing portion of an application, but does not specify any portable mechanisms for loading an application. MPIRUN was developed to provide a portable means for loading MPI programs, and was specifically targeted at multidisciplinary and multi-zonal applications. Programs using MPIRUN for loading and MPI for message passing are then portable between all machines supported by MPIRUN. MPIRUN is currently implemented for the Intel iPSC/860, TMC CM5, IBM SP-1 and SP-2, Intel Paragon, and workstation clusters. Further, MPIRUN is designed to be simple enough to port easily to any system supporting MPI.
Author
Aerospace Sciences ; Massively Parallel Processors ; Multidisciplinary Research ; Applications Programs (Computers)

20020006044 Air Force Research Lab. , Human Effectiveness Directorate , Mesa, AZ USA
Using Distributed Mission Training to Augment Flight Lead Upgrade Training ***Final Report , Jun. 1999-Feb. 2000***
Crane, Peter ; Robbins, Robert ; Bennett, Winston, Jr ; June 2001 ; 26p ; In English ; Original contains color images
Contract(s)/Grant(s): F41624-97-D-5000 ; Proj-2743
Report No.(s): AD-A394919 ; AFRL-HE-AZ-TR-2000-0111 ; AFRL-HE-AZ-TR-2000-0111 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Previous research on Distributed Mission Training (DMT) shows that pilots and Airborne Warning and Control System (AWACS) weapons directors rate DMT as highly effective for training multiship, multibogey air combat. DMT exercises were also used as opportunities for pilots participating in Flight Lead Upgrade (FLUG) training to gain experience in planning, briefing, leading, and debriefing four-ship missions in an intensive air-to-air threat environment. We describe a four-phase research program at the Air Force Research Laboratory, Warfighter Training Research Division (AFRL/HEA) in April 1999 to assess the effectiveness of using DMT to augment FLUG training. We reviewed training records at one F-16 base to identify four-ship FLUG missions that would benefit most from DMT experience and establish baseline rates for sorties repeated due to noneffective upgrading pilot proficiency. A five-day DMT-FLUG protocol was developed targeting these missions. DMT-FLUG training exercises were conducted over one year. During these exercises, upgrading pilots led several missions of increasing complexity using the AFRL four-ship DMT testbed in Mesa, AZ with AWACS weapons controllers from AFRL's research facility at Brooks AFB, TX. We assessed transfer to aircraft training through review of training records and interviews with both upgrading pilots and their instructors. Eight out of 12 upgrading pilots participating in DMT-FLUG successfully completed the program without any repeated missions, one pilot repeated one mission, two transferred out of fighters, and one pilot was still in training. We discuss pilots and AWACS weapons directors performance within DMT and identify mission tasks most appropriate for DMT.
DTIC
AWACS Aircraft ; Education ; Flight Training ; Distributed Interactive Simulation

20020006049 Lockheed Martin Information Systems , Orlando, FL USA
Leveraging Commercial Data Interchange Standards
Schuldt, Ron ; May 16, 2001 ; 31p ; In English ; Original contains color images ; Proceedings from 3rd Simulation Based Acquisition conference, 15-17 May 2001, sponsored by NDIA. --Original contains color plates: All DTIC reproductions will be in black and white. Contains Viewgraphs Only
Report No.(s): AD-A394756 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This document includes the proceedings from the 3rd Simulation Based Acquisition conference, 15-17 May 2001, sponsored by NDIA.
Author
Conferences ; Computerized Simulation ; Programming Languages

20020006063 NASA Ames Research Center , Moffett Field, CA USA
Accurate Evaluation of Quantum Integrals
Galant, David C. , NASA Ames Research Center , USA ; Goorvitch, D. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 233-02-05 ; No Copyright ; Avail: Issuing Activity
Combining an appropriate finite difference method with Richardson's extrapolation results in a simple, highly accurate numerical method for solving a Schr\"{o}dinger's equation. Important results are that error estimates are provided, and that one can extrapolate expectation values rather than the wavefunctions to obtain highly accurate expectation values. We discuss the

eigenvalues, the error growth in repeated Richardson's extrapolation, and show that the expectation values calculated on a crude mesh can be extrapolated to obtain expectation values of high accuracy.
Author
Error Analysis ; Extrapolation ; Finite Difference Theory ; Integrals

20020006133 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
CERN PS/SL Controls Java Application Programming Interface
Deloose, I. ; Cuperus, J. ; Charrue, P. ; DiMaio, F. ; Kostro, K. ; Oct. 01, 1999 ; 3p ; In English
Report No.(s): DE2001-775627 ; JLAB-ADM-99-03 ; DOE/ER/40150-1815 ; No Copyright ; Avail: Department of Energy Information Bridge

The PS/SL Convergence Project was launched in March 1998. Its objective is to deliver a common control as infrastructure for the CERN accelerators by year 2001. In the framework of this convergence activity, a project was launched to develop a Java Application Programming Interface (API) between programs written in the Java language and the PS and SL accelerator equipment. This Java API was specified and developed in collaboration with TJNAF. It is based on the Java CDEV (1) package that has been extended in order to end up with a CERN/TJNAF common product. It implements a detailed model composed of devices organized in named classes that provide a property-based interface. It supports data subscription and introspection facilities. The device model is presented and the capabilities of the API are described with syntax examples. The software architecture is also described.
NTIS
Java (Programming Language) ; Applications Programs (Computers) ; Accelerators

20020006156 Oak Ridge National Lab. , TN USA
Forest Productivity and Diversity: Using Ecological Theory and Landscape Models to Guide Sustainable Forest Management
Huston, M. A. ; Nov. 01, 1998 ; 14p ; In English
Report No.(s): DE2001-772471 ; P00-108426 ; No Copyright ; Avail: Department of Energy Information Bridge

Sustainable forest management requires maintaining or increasing ecosystem productivity, while preserving or restoring natural levels of biodiversity. Application of general concepts from ecological theory, along with use of mechanistic, landscape-based computer models, can contribute to the successful achievement of both of these objectives. Ecological theories based on the energetics and dynamics of populations can be used to predict the general distribution of individual species, the diversity of different types of species, ecosystem process rates and pool sizes, and patterns of spatial and temporal heterogeneity over a broad range of environmental conditions. This approach requires subdivision of total biodiversity into functional types of organisms, primarily because different types of organisms respond very differently to the spatial and temporal variation of environmental conditions on landscapes. The diversity of species of the same functional type (particularly among plants) tends to be highest at relatively low levels of net primary productivity, while the total number of different functional types (particularly among animals) tends to be highest at high levels of productivity (e.g., site index or potential net primary productivity). In general, the diversity of animals at higher trophic levels (e.g., predators) reaches its maximum at much higher levels of productivity than the diversity of lower trophic levels (e.g., plants). This means that a single environment cannot support high diversity of all types of organisms. Within the framework of the general patterns described above, the distributions, population dynamics, and diversity of organisms in specific regions can be predicted more precisely using a combination of computer simulation models and GIS data based on satellite information and ground surveys. Biophysical models that use information on soil properties, climate, and hydrology have been developed to predict how the abundance and spatial distribution of various plants and animals. These models can be, used to predict the patterns of forest type and structure that develop in response to variation in productivity and disturbance across complex landscapes, as well as species diversity and the distribution and population fluctuations of threatened species in specific regions.
NTIS
Forests ; Management ; Biophysics ; Computerized Simulation ; Forest Management ; Organisms ; Populations

20020006182 NASA Ames Research Center , Moffett Field, CA USA
Computational Aeroscience at NAS and Future Trends in High Performance Computing
Cooper, David M. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; RCI ASIG Member Management Symposium , 7-8 Jun. 1994 , Oakbrook, IL , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

NASA's Numerical Aerodynamic Simulation (NAS) program provides a unique world class supercomputing capability which is readily accessed by the U.S. aeronautics community and offers them the opportunity to perform high speed computations and simulations for a broad range of aerospace research applications. In addition, the NAS program performs on-going research and advanced technology development to ensure the innovative application of newly emerging technologies to computational fluid dynamics and other important aeroscience disciplines. The NAS system and its interaction with industry are described. Furthermore, the results of an analysis of current and future technologies and their potential impact on high performance computing are also presented.
Author
Aerospace Sciences ; Computational Fluid Dynamics ; Supercomputers ; Computerized Simulation

20020006237 Los Alamos National Lab. , NM USA
Evolving retrieval algorithms with a genetic programming scheme
Theiler, J. ; Jun. 01, 1999 ; 11p ; In English
Report No.(s): DE2001-772989 ; LA-UR-99-3483 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The retrieval of scene properties (surface temperature, material type, vegetation health, etc.) from remotely sensed data is the ultimate goal of many earth observing satellites. The algorithms that have been developed for these retrievals are informed by physical models of how the raw data were generated. This includes models of radiation as emitted and/or rejected by the scene, propagated through the atmosphere, collected by the optics, detected by the sensor, and digitized by the electronics. to some extent, the retrieval is the inverse of this "forward" modeling problem. But in contrast to this forward modeling, the practical task of making inferences about the original scene usually requires some ad hoc assumptions, good physical intuition, and a healthy dose of trial and error. The standard MTI data processing pipeline will employ algorithms developed with this traditional approach. But we will discuss some preliminary research on the use of a genetic programming scheme to "evolve" retrieval algorithms. Such a scheme cannot compete with the physical intuition of a remote sensing scientist, but it may be able to automate some of the trial and error. In this scenario, a training set is used, which consists of multispectral image data and the associated 'ground truth' that is, a registered map of the desired retrieval quantity. The genetic programming scheme attempts to combine a core set of image processing primitives to produce an IDL (Interactive Data Language) program which estimates this retrieval quantity from the raw data.
NTIS
Genetic Algorithms ; Earth Observations (From Space) ; Image Processing ; Remote Sensing ; Satellite Imagery

20020006493 Pennsylvania Univ. , Dept. of Computer and Information Science , Philadelphia, PA USA
A Task Networking and Visual Programming Language for Jack ***Final Report , 1 Apr. 1995-31 Aug. 1996***
Badler, Norman I. ; Aug. 1996 ; 32p ; In English
Contract(s)/Grant(s): DAAH04-95-1-0151
Report No.(s): AD-A395660 ; ARO-34551.1-MA ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report includes how VisualJack was designed as a graphical user interface (GUI) to Lisp PaT-Nets (Parallel Transition Networks). The VisualJack conception was that a user could use the GUI to construct PaT-Nets interactively, see the relationships among the various parts of a PaT-Net program, and thus speed the task of PaT-Net definition. Essentially finite automata, Parallel Transition Networks execute in parallel in the Jack environment.x (See the Appendix for a guide to LISP PaT-Nets). Together with the Jack LISP API, they form an intuitive interface to controlling simulation and behavior of processes and agents in Jack.
DTIC
Graphical User Interface ; Programming Languages ; Computer Networks ; Computer Graphics

20020006497 Army Research Lab. , Human Research and Engineering Directorate , Aberdeen Proving Ground, MD USA
Experimental Interrogation of Network Simulation Models of Human Task and Workload Performance in a U.S. Army Tactical Operations Center ***Final Report***
Middlebrooks, Sam E. ; Oct. 2001 ; 226p ; In English ; Original contains color images
Contract(s)/Grant(s): Proj-AH70
Report No.(s): AD-A395672 ; ARL-RP-0036 ; No Copyright ; Avail: CASI ; A11 , Hardcopy ; A03 , Microfiche
This thesis research is involved with the development of new methodologies for enhancing the experimental use of computer simulations to optimize predicted human performance in a work domain. Using a computer simulation called Computer modeling of Human Operator System Tasks (CoHOST) to test the concepts in this research, methods are developed that are used to establish confidence limits and significance thresholds by having the computer model self report its limits. These methods. along with experimental designs that are tailored to the use of computer simulation instead of human subject based research, are used in the

CoHOST simulation to investigate the U.S. Army battalion level command and control work domain during combat conditions and develop recommendations about that domain based on the experimental use of CoHOST with these methodologies. Further, with the realization that analytical results showing strictly numerical data do not always satisfy the need for understanding by those who could most benefit from the analysis. the results are further interpreted in accordance with a team performance model and the CoHOST analysis results are mapped to it according to macroergonomic and team performance concepts. The CoHOST computer simulation models were developed based on Army needs stemming from the Persian Gulf war. They examined human mental and physical performance capabilities resulting from the introduction of a new command and control vehicle with modernized digital communications systems. Literature searches and background investigations were conducted. and the CoHOST model architecture was developed that was based on a taxonomy of human performance. A computer simulation design was implemented with these taxonomic based descriptors of human performance in the military command and control domain using the commercial programming language MicroSaint(TM).
DTIC
Computerized Simulation ; Military Operations ; Workloads (Psychophysiology) ; Architecture (Computers) ; Armed Forces (USA)

20020006501 Air Command and Staff Coll. , Maxwell AFB, AL USA
The Impact of Fastship and High Speed Sealift on Strategic Sealift
Callahan, Shawn M. ; Apr. 1998 ; 52p ; In English
Report No.(s): AD-A395802 ; AU/ACSC/O21/1999-04 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The commercial sealift industry is breaking free of the constraints of traditional hull designs that characterize present vessels. Several alternative designs are being developed to fulfill the need for high speed, heavy payload capable, long distance transportation. One such design, FASTSHIP is thought to be capable of speeds of 45 knots, carrying 8000 long tons, over 5000 nautical miles. This paper uses a combination of spreadsheet based linear programming (LP) and genetic algorithms (GA) to find the best mix of a military application of FASTSHIP's capabilities in strategic sealift. Using data and requirements from past Mobility Requirements Studies (MRS), the Excel based Sealift Optimization Model finds a minimum Net Present Value (NPV) cost mix of sealift ships needed to meet given requirements of cargo and containers within a specified time period subject to several constraints. Various acquisition methods are explored in the determination of cost to include buy, lease, and joint commercial use. Analysis of the model output validates that the current sealift mix is sufficient, however FASTSHIP may provide added capability to meet increased requirements at a cost with a commercial joint venture offering the least cost solution, especially if the Ready Reserve Force (RRF) is allowed to decrease.
DTIC
Ship Hulls ; Ships ; Spreadsheets ; Linear Programming ; Genetic Algorithms

20020006510 Department of Defense , Office of the Inspector General , Arlington, VA USA
Controls Over the Computerized Accounts Payble System at Defense Finance and Accounting Service Kansas City
Granetto, Paul J. ; Bird, Richard B. ; Peek, Marvin L. ; Ventimiglia, Carmelo G. ; DeBlois, George C. ; Oct. 19, 2001 ; 68p ; In English
Report No.(s): AD-A395814 ; IG/DOD-D-2002-008 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Serious internal control weaknesses have been reported over the years in DoD payment processes and systems. The Defense Finance and Accounting Service (DFAS) Kansas City used the Computerized Accounts Payable System for Windows (CAPSW) to make vendor payments to Marine Corps customers. During FY 2000, 75, 861 vendor payments, valued at $1.2 billion, were made for Marine Corps customers using CAPS(W). On April 1, 2001, the Director, DFAS, capitalized all commercial payment resources under the Director, Commercial Pay Services. This is the first in a series of audit reports addressing the controls over the Computerized Accounts Payable System.
DTIC
Accounting ; Defense Program

20020006512 Department of Defense , Office of the Inspector General , Arlington, VA USA
Management of the Joint Simulation System
Ugone, Mary ; Santoni, Charles ; Mitchell, Sean ; Gregg, Averel ; Mitton, John ; Oct. 12, 2001 ; 46p ; In English
Report No.(s): AD-A395842 ; IG/DOD-D-2002-005 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
We performed this audit in response to a request from the Director, Joint Staff, to evaluate the management of the Joint Simulation System. The Joint Simulation System is a joint training, analysis, and evaluation software tool that will realistically represent the full range of military joint task force operations and provide a synthetic battlefield. The Joint Simulation System

was designated an Acquisition Category ID program on December 16, 1999, and is projected to expend nearly $1.55 billion. This is the second audit report on the management of the Joint Simulation System. The first report addressed specific management concerns raised by the Director, Joint Staff. This report addresses the broader topic of overall financial and program management of the development and acquisition of the Joint Simulation System.
DTIC
Financial Management ; Military Operations ; Software Engineering

20020006518 Naval Postgraduate School , Monterey, CA USA
The Role of High Performance Computing in Simulation Based Acquisition: A Case Study Based on Experiences in the RAH-66 Comanche Program
Brown, Denice P. ; Jun. 2001 ; 73p ; In English
Report No.(s): AD-A395875 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
This thesis endeavors to determine how effective a role high performance computing played in the Program Definition and Risk Reduction (PDRR) and early Engineering and Manufacturing Development (EMD) phases of the RAH-66 Comanche program. In so doing, the various modeling and simulation efforts used in the Comanche program are explored and their utility and efficacy determined. This study provides insights into the places to insert high performance computing into the simulation based acquisition process for best effect. In addition, it uncovers the best uses of modeling and simulation in the Comanche program, which can serve as a guide for other simulation based acquisition programs.
DTIC
Helicopters ; Reconnaissance Aircraft ; Computerized Simulation ; Computer Programs

20020006778 Army School of Aviation Medicine , Fort Rucker, AL USA
Distance Learning: Has the Training Culture Kept Up With the Technology Available ***Final Report , 15 Feb. 2000-30 Sep. 2001***
McKeon, Joseph ; October 2001 ; 11p ; In English
Contract(s)/Grant(s): MIPR 0EC5DDM0068
Report No.(s): AD-A395561 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The principal problem encountered in the conduct of this project centered around difficulties developing script-based DL classes from a traditionally didactic style block of instruction. While the instructors at USASAM are facile in platform-based instruction, converting that instruction to the written word, in a fashion that was easily and accurately processed by the student, proved challenging. The process required multiple editing steps, to ensure the lesson was both technically and grammatically sound. This process was time consuming, and competed with the myriad other duties of our busy instructor/writers. The ultimate product was excellent, but the process took considerably more time to execute than originally planned. One of the major technical issues as far as capturing valid time metrics involved the inability to record data to the hard drives of the computers used in the computer classrooms. These computer resources were not USASAM's, and the DL classroom administrators would not allow new software to be downloaded onto their computers. This resulted in hand-written, best guess estimates of actual time being spent on by individuals on the various computer-based lessons. There were also some technical difficulties secondary to security issues. Existing firewalls hindered the abilities of the USASAM staff to review CTA developments. This slowed decision making with respect to design choices and clarification of the authors' intent in several of the lessons. USASAM access to products in development improved significantly during the second half of the project, as security issues were successful resolved.
DTIC
Learning ; Education ; Distance ; Computer Aided Design

20020006779 Naval Research Lab. , Mapping Charting and Geodesy Branch , Stennis Space Center, MS USA
National Implementation Plan: LEA IT Census Phase I of the Database for Assessment of Requirements and Tactics (DART)
Breckenridge, John ; Mesick, Hillary ; Carter, Susan ; Shaw, Kevin ; Lovitt, Todd ; Sep. 14, 2001 ; 19p ; In English ; Prepared in collaboration with Planning Systems, Inc., Slidell, LA
Report No.(s): AD-A395558 ; NRL/MR/7440--01-8267 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Phase I of the Database for Assessment of Requirements and Tactics (DART) offers the National Guard Bureau Counterdrug (NGB-CD) Office a 'Survey Research'-based method of determining the information Technology (IT) capabilities of Law Enforcement Agents (LEAs) involved in counterdrug operations. This document defines a region-based strategy for deploying the DART IT Census. The Counterdrug Coordinator (CDC), located in each of the 50 states and 4 commonwealth areas, serves as the central point of contact for deploying this IT Census. This Implementation Plan (IP) directs all functions of the DART Phase

I IT Census to be executed at the CDC level. The deployment of the Mississippi LEA Census will be used as a 'Pilot Test' to determine the effectiveness of this IP.
DTIC
Data Bases ; Census ; Information Systems ; Drugs

20020006799 Worcester Polytechnic Inst. , MA USA
Data Warehouse Maintenance Under Concurrent Schema and Data Updates
Zhang, Xin ; Rundensteiner, Elke A. ; Aug. 1998 ; 31p ; In English
Report No.(s): AD-A395464 ; WPI-CS-TR-98-8 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Data warehouses (DW) are built by gathering information from several information sources and integrating it into one repository customized to users needs. Recently, proposed view maintenance algorithms tackle the problem of (concurrent) data updates happening at different autonomous ISs, whereas the EVE system addresses the maintenance of a data warehouse after schema changes of ISs. The concurrency of schema changes and data updates performed by different Iss still remains an unexplored problem, however.
DTIC
Algorithms ; Information Systems ; Information Transfer ; Data Bases

20020006863 National Defence Research Establishment , Div. of Defence Analysis , Stockholm, Sweden
JASRAD: A Computer Program Designed to Simulate the Sensor Duel in Air Combat at Large Distances: Model Description ***JASRAD. Ett Program foer att Simulera Upptaecks-Duellen i Luftstrid pa Stora Avstand. Modellbeskrivning***
Berefelt, F. ; December 1999 ; 48p ; In Swedish
Report No.(s): PB2001-108416 ; FOA-R-99-01319-202.616-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
JASRAD is a computer program designed to simulate Beyond Visual Range combat between aircraft equipped with radar, jammers, radar warning receivers and missiles. The purpose of JASRAD is to demonstrate the influence of geometry (i.e. the positioning of the aircraft) and other parameters on the tactical interplay between detection, missile launch and evasive maneuvers. Time dependent scenarios are created in JASRAD, where the effect of jamming in terms of reduced range can be studied. A simple aerodynamical missile model in three dimensional space, including line-of-sight steering, has been implemented. The program may therefore be useful for studying line-of-sight steering and the range of missiles. A description of the model that has been implemented in JASRAD version 3.0 is given (objects, algorithms and equations). The report serves both as a user's guide and as a formal documentation of the model, while the computer program itself will be described in a separate manual.
NTIS
Computer Programs ; Target Acquisition ; Electronic Warfare

20020006866 National Defence Research Establishment , Dept. of Command and Control Warfare Technology , Linkoeping, Sweden
Batch Manager 1.0. A Program for Generating Multiple Simulations with ACSL Trade Name). Methodology Report
Verona, M. ; October 2000 ; 42p ; In English
Report No.(s): PB2001-108411 ; FOA-R-00-01623-616-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This document is a user's manual for the software program Batch Manager. The Batch Manager is a program for making multiple simulations with an ACSL (Advanced Continuous Simulation Language) model or creating an ACSL command file. The program is designed to make this easier for the user. All inputs (constants) and outputs (variables) are controlled through a GUI (Graphical User Interface). One general problem, when producing multiple simulations, is that if one simulation fails, because of a flaw in the model, the batch job will terminate at that point and has to be restored manually. The Batch Manager however, is designed to keep running even if one run fails. All constants in an ACSL model can be viewed and set from the Batch Manager. They can be stepped or randomly chosen within limits set by the user. Apart from this, any of the variables can be selected and will be saved with their final values when the simulations are terminated if the simulations are started from the Batch Manager.
NTIS
User Manuals (Computer Programs) ; Batch Processing ; Operating Systems (Computers) ; Computer Programming

20020006867 National Defence Research Establishment , Div. of Systems and Underwater Technology , Stockholm, Sweden
Data for Construction of the MMI for the PC-Version of Silvia ***Underlag foer Knostruktion av Anvaendargraenssnitt till PC-Versionene av Silvia***
Jahnberg, S. ; December 1999 ; 50p ; In Swedish
Report No.(s): PB2001-108410 ; FOA-R-99-01325-314-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The software system Silvia is a tool for simulation of the duel between Air Defense and Ground Attack Aircraft to be used for studies on a technical-tactical level. The development of Silvia started in 1983. Silvia shall now be run on a PC (personal computer) under Windows NT, which means that a new graphical MMI (Man-Machine Interface) must be developed. The program structure will also be changed to make it possible to introduce new functions which will be necessary for studies of future Air Defense systems.
NTIS
Air Defense ; Computer Programs ; Simulation

20020006880 Sandia National Labs. , Albuquerque, NM USA
Towards a 4/3 Approximation for the Asymmetric Traveling Salesman Problem
Carr, R. ; Vempala, S. ; Jun. 10, 1999 ; 15p ; In English
Report No.(s): DE2001-7891 ; SAND99-1494C ; No Copyright ; Avail: Department of Energy Information Bridge
A long-standing conjecture in combinatorial optimization says that the integrality gap of the famous Held-Karp relaxation of the symmetric TSP is precisely 4/3. In this paper, we show that a slight strengthening of this conjecture implies a tight 4/3 integrality gap for a linear programming relaxation of the asymmetric TSP. This is surprising since no constant-factor approximation is known for the latter problem. Our main tools are a new characterization of the integrality gap for linear objective functions over polyhedra, and the isolation of 'hard-to-round' solutions of the relaxations.
NTIS
Traveling Salesman Problem ; Linear Programming ; Combinatorial Analysis ; Optimization

20020006896 Army Research Lab. , Weapons and Materials Research Directorate , Aberdeen Proving Ground, MD USA
A Comparison of the Mobile Detection Assessment Reconnaissance System (MDARS) and Experimental Unmanned Vehicle (XUV) Robotic Vehicle Models ***Final Report***
Fazio, Peter J. ; Sep. 2001 ; 39p ; In English ; Original contains color images
Report No.(s): AD-A395594 ; ARL-TR-2524 ; ARL/MR-TR-2524 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
During fiscal years 1997 and 1998, the Weapons Analysis Branch, Ballistics and Weapons Concepts Division, Weapons and Materials Research Directorate of the U.S. Army Research Laboratory built an engineering-level model of the unmanned ground vehicle platform used in the Office of the Secretary of Defense Demo III robotics program. The computer model was a representation of the mobile detection assessment reconnaissance system (MDARS) chassis-suspension system. The model was developed within the structure of the combat vehicle engineering simulation (CVES). This effort was undertaken to develop a simulation tool to evaluate the 'ride quality' of small robotic vehicle platforms during off-road travel. 'Ride quality' is defined as the ability of the vehicle's suspension to attenuate shock and vibration between the terrain surface and the vehicle chassis. An ensuing effort was undertaken to develop a computer model of the second generation Demo III robotic vehicle, the experimental unmanned vehicle (XUV). This model was developed with engineering parameters and data provided by the vehicle's manufacturer within the structure of CVES. A simulated ride quality comparison study was performed on the MDARS and XUV chassis-suspension models. The two models were exercised over three different types of simulated terrain and five different speeds. The terrain types were digital representations of the Aberdeen Test Center 2-inch washboard course and 3-inch bump course and the Waterways Experimental Station (Vicksburg, Mississippi) T101 course. The data used for the comparisons were chassis pitch rates and vertical accelerations. The results showed that the XUV model provided substantial reductions in pitch rate and vertical acceleration amplitudes when compared to the MDARS model over most terrain types at all speeds.
DTIC
Computerized Simulation ; Models ; Autonomous Navigation ; Chassis ; Detection ; Surface Vehicles ; Riding Quality ; Robotics

20020006906 Defence Science and Technology Organisation , Electronics and Surveillance Research , Salisbury, Australia
Constructing an Infrastructure to Facilitate Electronic Support Modelling in the Virtual Ship
Canney, Shane A. ; May 2001 ; 43p ; In English
Report No.(s): AD-A395572 ; DSTO-TR-1159 ; DSTO/ESR-AR-011-889 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This document provides a detailed description of the infrastructure that has been constructed to allow Electronic Support (ES) modelling for Virtual Ship applications, together with a discussion of the current Electronic Support Measures (ESM) model. The infrastructure and ESM model, collectively called an ESM federate, has been successfully integrated into the first scenario of the Virtual Ship, namely the Sensor Data Fusion scenario. The implementation issues that arose throughout the integration process are also addressed to aid future developers.
DTIC
Computerized Simulation ; Multisensor Fusion ; Models ; Electronic Equipment ; Standards

20020006910 Geological Survey , Biological Resources Div. , Fort Collins, CO USA
Proceedings of the Workshop: Development of Biological Decision Support Systems for Resource Managers
Getter, James ; D'Erchia, Terry ; Root, Ralph ; December 1999 ; 49p ; In English ; Proceedings of Development of Biological Decision Support Systems for Resource Managers workshop, 27-29 Oct 1998, Denver, CO
Report No.(s): AD-A395567 ; USGS/BRD/ITR-2000-0002 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The format for this 3-day workshop (27-29 October 1998) included plenary presentations by USGS Biological Resources Division (BRD) and U.S. Fish and Wildlife Service personnel who use and develop decision support systems (DSS); breakout sessions addressing DSS technical information aspects, outreach/ customer requirements, and future perspectives; and a DSS Steering Committee meeting to evaluate workshop goals and to provide guidance for future efforts. Steering committee action items developed from workshop inputs were to (1) develop a 'DSS framework' document for use in biological research, (2) develop a 'proof of concept' DSS based upon the framework document, and (3) integrate decision support systems into BRD program elements.
DTIC
Management ; Decision Support Systems ; Expert Systems

20020006933 NASA Ames Research Center , Moffett Field, CA USA
Optical Processing of Speckle Images with Bacteriorhodopsin for Pattern Recognition
Downie, John D. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 506-59-21 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Logarithmic processing of images with multiplicative noise characteristics can be utilized to transform the image into one with an additive noise distribution. This simplifies subsequent image processing steps for applications such as image restoration or correlation for pattern recognition. One particularly common form of multiplicative noise is speckle, for which the logarithmic operation not only produces additive noise, but also makes it of constant variance (signal-independent). We examine the optical transmission properties of some bacteriorhodopsin films here and find them well suited to implement such a pointwise logarithmic transformation optically in a parallel fashion. We present experimental results of the optical conversion of speckle images into transformed images with additive, signal-independent noise statistics using the real-time photochromic properties of bacteriorhodopsin. We provide an example of improved correlation performance in terms of correlation peak signal-to-noise for such a transformed speckle image.
Author
Image Processing ; Pattern Recognition ; Speckle Patterns ; Photoreceptors

20020006936 Research Inst. for Advanced Computer Science , Moffett Field, CA USA
Automata-Based Verification of Temporal Properties on Running Programs
Giannakopoulou, Dimitra , Research Inst. for Advanced Computer Science , USA ; Havelund, Klaus , Research Inst. for Advanced Computer Science , USA ; [2001] ; 11p ; In English ; 16th IEEE International Conference on Automated Software Engineering , 26-29 Nov. 2001 , San Diego, CA , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA
Contract(s)/Grant(s): NCC2-1006 ; 2000-1C-1-0044-3
Report No.(s): RIACS-TR-01.21 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This paper presents an approach to checking a running program against its Linear Temporal Logic (LTL) specifications. LTL is a widely used logic for expressing properties of programs viewed as sets of executions. Our approach consists of translating LTL formulae to finite-state automata, which are used as observers of the program behavior. The translation algorithm we propose modifies standard LTL to Buchi automata conversion techniques to generate automata that check finite program traces. The algorithm has been implemented in a tool, which has been integrated with the generic JPaX framework for runtime analysis of Java programs.
Author
Temporal Logic ; Automata Theory ; Computer Programs

20020006942 NASA Ames Research Center , Moffett Field, CA USA

Goal Directed Model Inversion: Learning Within Domain Constraints

Colombano, Silvano P. , NASA Ames Research Center , USA ; Compton, Michael , RECOM Technologies, Inc. , USA ; Raghavan, Bharathi , DeAnza Coll. , USA ; [1994] ; 1p ; In English ; International Conference on Artificial Neural Networks and Genetic Algorithms , 18-21 Apr. 1995 , Ecole Des Mines d'Ales , France

Contract(s)/Grant(s): RTOP 233-03-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Goal Directed Model Inversion (GDMI) is an algorithm designed to generalize supervised learning to the case where target outputs are not available to the learning system. The output of the learning system becomes the input to some external device or transformation, and only the output of this device or transformation can be compared to a desired target. The fundamental driving mechanism of GDMI is to learn from success. Given that a wrong outcome is achieved, one notes that the action that produced that outcome "would have been right if the outcome had been the desired one." The algorithm makes use of these intermediate "successes" to achieve the final goal. A unique and potentially very important feature of this algorithm is the ability to modify the output of the learning module to force upon it a desired syntactic structure. This differs from ordinary supervised learning in the following way: in supervised learning the exact desired output pattern must be provided. In GDMI instead, it is possible to require simply that the output obey certain rules, i.e., that it "make sense" in some way determined by the knowledge domain. The exact pattern that will achieve the desired outcome is then found by the system. The ability to impose rules while allowing the system to search for its own answers in the context of neural networks is potentially a major breakthrough in two ways: (1) it may allow the construction of networks that can incorporate immediately some important knowledge, i.e., would not need to learn everything from scratch as normally required at present; and (2) learning and searching would be limited to the areas where it is necessary, thus facilitating and speeding up the process. These points are illustrated with examples from robotic path planning and parametric design.

Author

Algorithms ; Machine Learning

20020007087 Argonne National Lab. , IL USA

Automatic differentiation tools in optimization software

More, J. J. ; Jan. 15, 2001 ; 13p ; In English

Report No.(s): DE2001-775260 ; ANL/MCS/CP-103808 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors discuss the role of automatic differentiation tools in optimization software. We emphasize issues that are important to large-scale optimization and that have proved useful in the installation of nonlinear solvers in the NEOS (Network-Enabled Optimization System) Server. Our discussion centers on the computation of the gradient and Hessian matrix for partially separable functions and shows that the gradient and Hessian matrix can be computed with guaranteed bounds in time and memory requirements.

NTIS

Optimization ; Computerized Simulation

20020008159 Department of Energy , Kansas City, MO USA

Demand Activated Manufacturing Architecture

Bender, T. R. ; Zimmerman, J. J. ; Feb. 07, 2001 ; 12p ; In English

Report No.(s): DE2001-774610 ; KCP-613-6378 ; CRADA 98KCP1075 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Honeywell Federal Manufacturing Technologies (FMT) engineers John Zimmerman and Tom Bender directed separate projects within this CRADA (Cooperative Research and Development Agreement). This Project Accomplishments Summary contains their reports independently. Zimmerman: In 1998 Honeywell FMT partnered with the Demand Activated Manufacturing Architecture (DAMA) Cooperative Business Management Program to pilot the Supply Chain Integration Planning Prototype (SCIP). At the time, FMT was developing an enterprise-wide supply chain management prototype called the Integrated Programmatic Scheduling System (IPSS) to improve the DOE's (Department of Energy) Nuclear Weapons Complex (NWC) supply chain. In the CRADA partnership, FMT provided the IPSS technical and business infrastructure as a test bed for SCIP technology, and this would provide FMT the opportunity to evaluate SCIP as the central schedule engine and decision support tool for IPSS. FMT agreed to do the bulk of the work for piloting SCIP. In support of that aim, DAMA needed specific DOE Defense Program opportunities to prove the value of its supply chain architecture and tools. In this partnership, FMT teamed with Sandia National Labs (SNL), Division 6534, the other DAMA partner and developer of SCIP. FMT tested SCIP in 1998 and 1999. Testing ended in 1999 when DAMA CRADA funding for FMT ceased. Before entering the partnership, FMT discovered that the

DAMA SCIP technology had an array of applications in strategic, tactical, and operational planning and scheduling. At the time, FMT planned to improve its supply chain performance by modernizing the NWC-wide planning and scheduling business processes and tools. The modernization took the form of a distributed client-server planning and scheduling system (IPSS) for planners and schedulers to use throughout the NWC on desktops through an off-the-shelf WEB browser. The planning and scheduling process within the NWC then, and today, is a labor-intensive paper-based method that plans and schedules more than 8,000 shipped parts per month based on more than 50 manually-created document types.
NTIS
Decision Support Systems ; Management Information Systems ; Manufacturing ; Procurement Management ; Supplying

20020008230 Computer Sciences Corp. , Moffett Field, CA USA
Dynamic Load Balancing for Finite Element Calculations on Parallel Computers , Chapter 1
Pramono, Eddy , Weidlinger Associates , USA ; Simon, Horst D. , Computer Sciences Corp. , USA ; Sohn, Andrew , New Jersey Inst. of Tech. , USA ; [1994] ; 1p ; In English ; 7th SIAM Conference on Parallel Processing , 15-17 Feb. 1994 , San Francisco, CA , USA ; Sponsored by Society for Information Display , USA
Contract(s)/Grant(s): NAS2-12961 ; RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Computational requirements of full scale computational fluid dynamics change as computation progresses on a parallel machine. The change in computational intensity causes workload imbalance of processors, which in turn requires a large amount of data movement at runtime. If parallel CFD is to be successful on a parallel or massively parallel machine, balancing of the runtime load is indispensable. Here a frame work is presented for dynamic load balancing for CFD applications, called Jove. One processor is designated as a decision maker Jove while others are assigned to computational fluid dynamics. Processors running CFD send flags to Jove in a predetermined number of iterations to initiate load balancing. Jove starts working on load balancing while other processors continue working with the current data and load distribution. Jove goes through several steps to decide if the new data should be taken, including preliminary evaluate, partition, processor reassignment, cost evaluation, and decision. Jove running on a single SP2 node has been completely implemented. Preliminary experimental results show that the Jove approach to dynamic load balancing can be effective for full scale grid partitioning on the target machine SP2.
Author
Computational Fluid Dynamics ; Parallel Computers ; Parallel Processing (Computers)

20020008321 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Directory Service for the CERN PS/SL Java Programming Interface
Cuperus, J. ; Charrue, P. ; DiMaio, F. ; Kostro, K. ; Watson, W. ; Oct. 01, 1999 ; 3p ; In English
Report No.(s): DE2001-774731 ; JLAB-ADM-99-02 ; DOE/ER/40150-1806 ; No Copyright ; Avail: Department of Energy Information Bridge

The CERN PS and SL accelerator control groups developed a common application programming interface (API) in Java. Part of this API is a directory service that provide information about the underlying hardware and software. With this information, it is possible to write generic programs that do general actions on lists of devices without hard coding of device names. And, starting from a device name, full details about related devices, the device itself and its class and properties, can be obtained, including the meaning of bits and bit-patterns in status words. The interface definition is independent of any implementation but a reference implementation is provided using Java Database Connectivity (JDBC) against a set of tables in a relational database. Data from very different systems can be brought together and presented in a uniform way to the user. The full potential of the directory service is reached when it is used in software components (Java Beans).
NTIS
Computer Programming ; Computer Programs ; Directories ; Java (Programming Language)

20020008613 Wien Univ. , Austria
LPNMR 2001: 6th Logic Programming and Nonmonotonic Reasoning. International Conference
Sep. 2001 ; 459p ; In English , Sep. 2001 , Vienna , Austria
Contract(s)/Grant(s): F61775-01-W-F077
Report No.(s): AD-A395766 ; EOARD-CSP 01-5077 ; No Copyright ; Avail: CASI ; A20 , Hardcopy ; A04 , Microfiche

The Final Proceedings for LPNMR 2001 - 6th International Conference on Logic Programming and Nonmonotonic Reasoning, 17 September 2001 - 19 September 2001. The conference goal is to highlight recent original research in design (theory) and implementation of logic based programming languages and database systems, and knowledge representation and nonmonotonic LPNMR seeks theoretical and experimental results leading to construction of practical systems for programming

and knowledge representation. Specific topics include (1) development and mathematical studies of logical systems with non-monotonic entailment relations, (2) implementation of LPNMR systems, and (3) applications of LPNMR systems.
DTIC
Conferences ; Knowledge Representation ; Logic Programming ; Mathematical Logic ; Programming Languages

20020008644 Argonne National Lab. , IL USA
Agent-based infrastructure modeling
North, M. J. ; Dec. 14, 2000 ; 13p ; In English
Report No.(s): DE2001-772133 ; ANL/DIS/CP-103639 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Complex Adaptive Systems (CAS) can be applied to investigate complex infrastructures and infrastructure interdependencies. The CAS model agents within the Spot Market Agent Research Tool (SMART) and Flexible Agent Simulation Toolkit (FAST) allow investigation of the electric power infrastructure, the natural gas infrastructure and their interdependencies.
NTIS
Software Engineering ; Natural Gas ; Market Research ; Electric Current

20020008809 Purdue Univ. , Dept. of Computer Sciences , West Lafayette, IN USA
Multithreaded User Space Multiprotocols: Experiments with Collaborative Multimedia ***Final Report , 2 Mar. 1998-2 Mar 2001***
Rego, Vernon ; Jul. 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0125
Report No.(s): AD-A396038 ; ARO-38425.1-CI-RIP ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

This research is motivated by emerging virtual collaboratories, distributed multimedia, and scalable distributed computing applications on modern heterogeneous networks of machines. It has had a humble origin, namely, a simple threads system (Ariadne) that was developed in our software laboratory (PacsLab) at Purdue. The Ariadne project has since expanded in scope, matured, and won recognition as a powerful supporting infrastructure for timer enhanced multithreaded distributed computing. This is mainly due to its portability, efficiency and support for thread migration. Ariadne has been used to support optimistic distributed simulations on large Sun and SGI (Silicon Graphics, Inc.) workstation clusters, the IBM (International Business Machines) SP/2, and the Intel Paragon. It has led to the development of a novel sister threads system, (Arachne) which supports thread-migration on heterogeneous networked platforms. The funds provided by this award have enabled us to set up a multiprocessor cluster on which we can conduct experiments on thread migration, protocols and collaborative computing. These experiments are currently in progress.
DTIC
Multiprocessing (Computers) ; Protocol (Computers) ; Parallel Processing (Computers) ; Information Systems

20020008875 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
CDEV: An Object-Oriented Class Library for Developing Device Control Applications
Chen, J. ; Heyes, G. ; Akers, W. ; Wu, D. ; Watson, W. A. ; Oct. 01, 1995 ; 8p ; In English
Report No.(s): DE2001-777761 ; JLAB-ACC-95-002 ; DOE/ER/40150-1834 ; No Copyright ; Avail: Department of Energy Information Bridge

The Control Device API (CDEV) is a highly modulated and extensible object oriented C++ class library that provides a standard interface to one or more underlying control or data acquisition packages through a common framework into which system developers can customize code. It defines a set of abstract classes from which a new CDEV service layer can be developed by inheritance and accessed with the same API through run time dynamic binding. All I/O (input/output) in the system is handled as synchronous or asynchronous messages to devices that may span multiple services. CDEV routes messages to appropriate services by a name service and dispatches multiple services to handle service specific I/O events. In addition, CDEV handles data transfer through a data object that may contain multiple tagged values of different types, allowing flexible I/O between clients and servers. This paper presents the design, implementation and current status of CDEV, and shows that CDEV can be a starting point to achieve the goal of sharing software in control system applications.
NTIS
Control Systems Design ; Software Engineering ; Object-Oriented Programming ; Message Processing

20020009001 Alabama Univ. , Research Administration , Huntsville, AL USA

Feasibility Study on the Use of CORBA in the Environment of the U.S. Army Test, Maintenance, and Diagnostic Equipment Activity ***Final Report , 24 May-6 Nov. 2000***

Etzkorn, Letha ; Ironside, Eric ; Nov. 06, 2000 ; 143p ; In English

Contract(s)/Grant(s): DAAH01-98-D-R001

Report No.(s): AD-A395944 ; 5-21026 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche

Discussed results of a CORBA (Common Object Request Broker Architecture) Interoperability Study, plus the development of a CORBA demonstration software package developed that described the use of CORBA in the Army test environment

DTIC

Computer Programs ; Interoperability ; Armed Forces (USA) ; Test Facilities

20020009049 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Model-Based Verification: Claim Creation Guidelines

Comella-Dorda, Santiago ; Gluch, David P. ; Hudak, John ; Lewis, Grace ; Weinstock, Chuck ; Oct. 2001 ; 34p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396125 ; CMU/SEI-2001-TN-018 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Model Based Verification (MBV) is a systematic approach to finding defects (errors) in software requirements, designs, or code. MBV involves creating essential models of system behavior and analyzing these models against formal representations of expected properties, known as claims. Claim generation has been identified as a particularly complex activity within model-based verification. This technical note describes a pattern-based approach to facilitate claim generation. The report includes a list of directly usable patterns for the most frequent expected properties found in system specifications.

DTIC

Mathematical Models ; Program Verification (Computers) ; Software Engineering ; Artificial Intelligence

20020009050 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Framework Document: Model-Based Verification Pilot Study

Gluch, David P. ; Hudak, John J. ; Janousek, Robert ; Walker, John ; Weinstock, Charles B. ; Oct. 2001 ; 39p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396124 ; CMU/SEI-2001-SR-024 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This Pilot Study Framework document describes the processes, activities, artifacts, and deliverables associated with an Engineering Practice Investigation that applies Model-Based Verification (MBV).

DTIC

Mathematical Models ; Program Verification (Computers) ; Software Engineering ; Computer Program Integrity

20020009051 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Analyzing Enterprise JavaBeans Systems Using Quality Attribute Design Primitives

Liu, Anna ; Bass, Len ; Klein, Mark ; Oct. 2001 ; 39p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396123 ; CMU/SEI-2001-TN-025 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Quality attribute requirements such as those for performance, security, modifiability, reliability, and usability have a significant influence on the software architecture of a system. At the Software Engineering Institute, we are studying and codifying the relationship between quality attribute requirements and the architectural design strategies that impact their achievement. In CMU/ SEI-2000-TN-017 Bass 00, we introduced the notion of quality attribute design primitives. Quality attribute design primitives (or attribute primitives) are architectural building blocks that target the achievement of one-or sometimes several-quality attribute requirements. Our intent is to codify a fairly comprehensive set of attribute primitives in a manner that articulates how each attribute primitive makes its specific contribution toward the achievement of one or several attribute goals. We believe this will provide a very powerful ”language” for constructing or analyzing software architectures in relation to quality attribute requirements. to determine the expressive and explanatory power of these attribute primitives, we will examine various classes of systems. This paper uses attribute primitives to examine the qualities of Enterprise JavaBeans (EJB)-based systems. In particular, we find that attribute primitives hold promise for providing insight into the quality attribute consequences of using various EJB infrastructure features.

DTIC

Software Engineering ; Java (Programming Language) ; Architecture (Computers) ; Design Analysis

20020009053 Analytic Sciences Corp. , Fairborn, OH USA

3D Graphics Investigation ***Final Report , Dec. 1997-Aug. 1998***

Azar, Maurice ; Clark, Mike ; Stute, Nicholas J. ; Bautsch, Holly S. ; Gdowski, Matthew R. ; Aug. 1998 ; 151p ; In English ; Prepared in collaboration with Logicon Technical Services, Inc., Dayton, OH and Air Force Research Laboratory, Wright-Patterson AFB, OH

Contract(s)/Grant(s): F41624-97-D-5002 ; Proj-1710

Report No.(s): AD-A396121 ; AFRL-HE-WP-TR-2001-0083 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche

The purpose of this study was to test three dimensional (3D) technology as a means of facilitating the presentation and interpretation of graphical information used to support complex maintenance tasks. The focus of the study was on graphic performance (user or software) and human factors issues. To accomplish this study, the team conducted a cognitive task analysis (CTA) to determine how aircraft maintainers could use 3D graphics. The results of the CTA were used to formulate requirements for candidate 3D file formats and viewers. The team then identified and evaluated 3D file formats and viewers to determine two ”best-value” 3D file and viewer candidates. Finally, a comparative study was conducted with aircraft maintainers to gather data on the features and usability of the two ”best-value” 3D file and viewer candidates.

DTIC

Computer Graphics ; Three Dimensional Models ; Human Factors Engineering ; Cognitive Psychology

20020009061 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Applicability of General Scenarios to the Architecture Tradeoff Analysis Method ***Final Report***

Bass, Len ; klein, Mark ; Moreno, Gabriel ; Oct. 2001 ; 65p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396098 ; CMU/SEI-2001-TR-014 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The SE has been developing a list of scenarios to characterize quality attributes. The SEl has also been conducting Architecture Trade Off Analysis Method (ATAM) evaluations. One output of an ATAM evaluation is a collection ot scenarios that relate to quality attribute requirements for the specific system being evaluated. In this report, we compare the scenarios elicited from five ATAM evaluations with the scenarios used to characterize the quality attributes. This effort was designed to validate the coverage of the existing set of general scenarios and to analyze trends in the risks uncovered in ATAM reports. Architecture Tradeoff Analysis Method and ATAM are service marks of Carnegie Mellon University.

DTIC

Tradeoffs ; Architecture (Computers)

20020009063 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Use of the ATAM in the Acquisition of Software-Intensive Systems ***Final Report***

Bergey, John K. ; Fisher, Matthew J. ; Sep. 2001 ; 39p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396096 ; CMU/SIE-2001-TN-009C ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Software architecture is critical to the quality of a software-intensive system. For an acquisition organization, such as the Department of Defense (DoD) , the ability to evaluate software architectures early in an acquisition can have a favorable impact on the delivered system. This technical note discusses the role of software architecture evaluations in a system acquisition and describes the contractual elements that are needed to accommodate architecture evaluations in an acquisition. The note then provides an example of contractual language that incorporates the Architecture Tradeoff Analysis Method (ATAM) as a software architecture evaluation method in a system acquisition.

DTIC

Tradeoffs ; Computer Systems Programs ; Architecture (Computers)

20020009073 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA

Documenting Software Architectures: Organization of Documentation Package ***Final Report***

Bachmann, Felix ; Bass, Len ; Clements, Paul ; Garlan, David ; Ivers, James ; Aug. 2001 ; 31p ; In English

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A396052 ; CMU/SEI-2001-TN-010 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report represents a milestone of a work in progress. That work is a comprehensive handbook on how to produce high-quality documentation for software architectures. The handbook, tentatively entitled Documenting Software Architectures, will be published in early 2002 by Addison Wesley Longman as part of the SEI Series on Software Engineering. Since this report is a snapshot of current work, the material described here may change before the handbook is published. The theme of the report

is that documenting an architecture entails documenting the set of relevant views of that architecture, and then completing the picture by documenting information that transcends any single view. The audience for Documenting Software Architectures is the community of practicing architects, apprentice architects, and developers who receive architectural documentation.
DTIC
Architecture (Computers) ; Handbooks

20020009074 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA
Legacy System Modernization Strategies
Seacord, Robert C. ; Comella-Dorda, Santiago ; Lewis, Grace ; Place, Pat ; Plakosh, Dan ; Jul. 2001 ; 75p ; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A396051 ; CMU/SEI-2001-TR-025 ; ESC-TR-2001-025 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Modernization of legacy enterprise systems introduces many challenges due to the size, complexity, and frailty of the legacy systems. Size and complexity issues often dictate that these systems are incrementally modernized, and new functionality is incrementally deployed before the modernization effort is concluded. This in turn requires that legacy components operate side by side with modernized components in an operation system, introducing additional problems. In this report we discuss some alternative development approaches for incrementally modernizing legacy systems, including consideration of the advantages and disadvantages of each approach. These development alternatives can be mapped against the peculiarities of a particular modernization effort to recommend an appropriate approach.
DTIC
Data Bases ; Information Transfer

20020009075 Purdue Univ. , Dept. of Computer Sciences , West Lafayette, IN USA
Enabling Technologies for Collaborative Simulators on Heterogeneous Networks ***Final Report , 1 Mar. 1999-28 Feb. 2001***
Rego, Vernon ; Aug. 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAD19-99-1-0017
Report No.(s): AD-A396044 ; ARO-39415.5-CI-RIP ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

This project deals with an experimental approach to developing enabling technology for the efficient support of collaborative simulation engines on heterogeneous networked platforms. The goal is to achieve collaborative operations of two kinds: cooperative operations between distinct but neighboring numerical solvers (simulation engines), and also collaboration between users who interact with neighboring solvers during model development, experimentation and production mode operation. to deliver efficient runtime support, we propose an architecture that reuses legacy components from existing tool suites, and also offers a methodology for developing new multithreaded simulation solvers. Our focus on efficient and portable runtime support departs from the traditional view of layering application software on top of existing communication libraries and/or protocols such as TCP/IP. We believe that most of the functionality and performance problems faced by such systems (e.g., scalability, multiprotocols, communicating threads, asynchronous low-latency, high throughput communication) are directly tied to architectural issues of runtime support and protocol layering. Our idea is to eliminate the layering that separates applications from protocols, and view an application as consisting of protocol threads and communication threads. We minimize, and eventually, given direct access to secure network devices, propose to eliminate, OS kernel involvement in communication. We emphasize software portability by exploiting portable user-space threads and communication systems, and adhering to strictly portable options in threads management and protocol design.
DTIC
Architecture (Computers) ; Computerized Simulation ; Applications Programs (Computers)

20020009114 Los Alamos National Lab. , NM USA
Automated Parametric Execution and Documentation for Large-Scale Simulations
Kelsey, R. L. ; Mar. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-776171 ; LA-UR-01-1428 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A language has been created to facilitate the automatic execution of simulations for purposes of enabling parametric study and test and evaluation. Its function is similar in nature to a job-control language, but more capability is provided in that the language extends the notion of literate programming to job control. Interwoven markup tags self document and define the job control process. The language works in tandem with another language used to describe physical systems. Both languages are implemented in the Extensible Markup Language (XML). A user describes a physical system for simulation and then creates a set of instructions for automatic execution of the simulation. Support routines merge the instructions with the physical-system

description, execute the simulation the specified number of times, gather the output data, and document the process and output for the user. The language enables the guided exploration of a parameter space and can be used for simulations that must determine optimal solutions to particular problems. It is generalized enough that it can be used with any simulation input files that are described using XML. XML is shown to be useful as a description language, an interchange language, and a self-documented language.
NTIS
Document Markup Languages ; Programming Languages ; Tasks

20020009141 Army Engineer Research and Development Center , Vicksburg, MS USA
Water Quality Additions to CASC2D: TAPS
Dellman, Patrick N. ; Gerald, Terry K. ; Ruiz, Carlos E. ; Sep. 2001 ; 8p ; In English
Report No.(s): AD-A395728 ; ERDC-WQTN-PD-11 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The purpose of this effort was the implementation of nutrient water quality components included in the Transport and Pollutant System (TAPS) into the CASC2D hydrology watershed model. The CASC2D model is still in development and is being improved, refined, and updated with new technology. Users of CASC2D need to have a thorough background in hydrology and numerical modeling. CASC2D is currently being restructured and an updated version (under a new name, Generalized Surface/Subsurface Hydraulic Analysis (GSSHA)) is anticipated in the near future. This newly updated version of the CASC2D code will replace the version of CASC2D in the Watershed Modeling System (WMS).
DTIC
Hydrology Models ; Water Quality ; Contaminants ; Applications Programs (Computers)

20020009150 Army Engineer Research and Development Center , Information Technology Lab. , Vicksburg, MS USA
SOILSTRUCT-ALPHA for Personal Computers , Report 1 , Visual Modeler
White, Barry C. ; Ebeling, Robert M. ; December 2001 ; 47p ; In English ; Original contains color images ; Prepared in collaboration with Computer Systems Technology, Inc., Vicksburg, MS
Report No.(s): AD-A395693 ; ERDC/ITL-TR-01-2C ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The SOILSTRUCT-ALPHA for Personal Computers analysis package comprises three separate stages: the Visual Modeler, the SOILSTRUCT-ALPHA Finite Element Analysis Program, and the Visual Postprocessor. This report describes how the SOILSTRUCT-ALPHA Visual Modeler (i.e., a preprocessor) is used, applying it to the suggested work flow of a typical project as an example. This report is intended to serve as a user's guide and not as a reference manual defining each specific command. SOILSTRUCT-ALPHA is a special purpose finite element program for two-dimensional, plane strain analysis of soil structure interaction problems. SOILSTRUCT calculates displacements and stresses resulting from incremental construction, backfilling, excavation, dewatering, rising water table, and/or load application. Nonlinear, stress-path-dependent, stress-strain behavior of the backfill was approximated in the finite element analysis using the tangent modulus method. In the tangent modulus method, new values of tangent moduli are assigned to each soil element at each increment of loading (i.e., dewatering, lock construction, and backfilling) or unloading (i.e., excavation, rising water table). The modulus values assigned to each element are adjusted in accordance with their stresses to simulate nonlinear behavior. The Visual Modeler is designed to facilitate the development of a finite element mesh for SOILSTRUCT-ALPHA in a timely manner. The modeler comprises two parts, a computer-aided design (CAD) tool for the actual creation and refinement of a mesh, including four-noded two-dimensional continua and interface elements, and a computer-aided design tool for the application of loads to the mesh and the creation of one-dimensional, two-noded bar elements. These tools expedite the creation and refinement of the often extensive input data to SOILSTRUCT-ALPHA.
DTIC
Computer Programs ; Soil Mechanics ; Personal Computers ; Structural Analysis

20020009175 TiNi Alloy Co. , San Leandro, CA USA
High Temperature Shape Memory Alloys for Useful Devices ***Final Report***
Johnson, A. D. ; Oct. 23, 2001 ; 27p ; In English
Contract(s)/Grant(s): DAAH01-01-C-R125 ; ARPA Order K475
Report No.(s): AD-A395862 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The goal of this project was to develop shape memory alloys with transition temperatures above 100 C. The main focus was on TiNiHf. Special vacuum sputtering setups were used to produce thin films having variations in composition, ranging from those rich in Ti+Hf to those rich in Ni. Three targets were used: TiNi, Hf, and Ni. Deposition rates were calibrated separately for each target. These calibrations were used to calculate composition of film deposited by simultaneous sputtering from all three targets.

Although this procedure does not permit measurement of absolute composition, it makes possible a methodical search for alloys with increased transition temperature and improved ductility by systematic and controlled variation of composition. Depositions were done with predicted alloy compositions close to 50 at% Ni, the balance being Ti+Hf. The Hf concentration was varied within the range 10 - 15 at%. TiNiHf films were produced having transition temperatures above 100 C, with austenite finish temperatures as high as 170 C. Measurements of phase transformation temperature, ductility, and composition were made. High ductility and shape recovery up to 4 percent was achieved. Micromachined valve actuators were fabricated and tested. Actuators demonstrated thermomechanical performance similar to that of binary TiNi film.
DTIC
Shape Memory Alloys ; Heat Resistant Alloys ; Thin Films ; Thermodynamics ; Mechanical Properties ; Micromachining ; Transition Temperature

20020009212 Carnegie-Mellon Univ. , Software Engineering Inst. , Pittsburgh, PA USA
Product Line Analysis: A Practical Introduction ***Final Report***
Chastek, Gary ; Donohoe, Patrick ; Kang, Kyo Chul ; Thiel, Steffen ; Jun. 2001 ; 67p ; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A396137 ; CMU-SEI-2001-TR-001 ; ESC-TR-2001-001 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Product line analysis applies established modeling techniques to engineer the requirements for a product line of software-intensive systems. This report provides a practical introduction to product line requirements modeling. It describes product line analysis in the context of product line development and shows how a requirements model is built based on object modeling, use-case modeling, and feature-modeling techniques. A running example, based on home automation systems, illustrates concepts and terminology. Two different strategies for creating the requirements model are also presented. The product line analysis work is evolving. This report describes its current status and planned development.
DTIC
Automatic Control ; Software Engineering ; Product Development ; Mathematical Models

20020009511 Army Communications-Electronics Command , Fort Monmouth, NJ USA
A First-Order Computational Model of Human Operational Planning
Powell, Gerald M. ; Schmidt, Charles F. ; Aug. 1988 ; 61p ; In English
Report No.(s): AD-A395978 ; CECOM-TR-01-8 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Most computational models of planning developed within AI (Artificial Intelligence) require complete and accurate knowledge of the starting situation as well as a well defined goal for their operation. In marked contrast, human planners often must create plans despite the fact that the goal is often ill-defined and knowledge about the world in which the plan is to be executed is incomplete and possibly inaccurate. Battlefield planning is certainly a paradigmatic example of such a planning context. Consequently, the development of a model of how planning takes place within this type of domain represents a considerable challenge to our current computational understanding of planning. The research reported here is directed at this challenge. Based on observations made of the planning activities of human experts at the U.S. Army War College and a review of the pedagogy associated with the training of human experts, the present paper provides a basic first order model of the possible control strategy employed by experts in battlefield planning. Next, the purpose model is evaluated by comparing its 'predictions' concerning the types of planning activities that should be observed and the order in which these activities should appear against a protocol of the planning activities of human experts. Implications of this first order model for further knowledge acquisition and development of planning aids are discussed.
DTIC
Command and Control ; Planning ; Military Operations ; Decision Theory ; Operations Research

20020009542 RECOM Technologies, Inc. , USA
Techniques and Tools for Performance Tuning of Parallel and Distributed Scientific Applications
Sarukkai, Sekhar R. , RECOM Technologies, Inc. , USA ; VanderWijngaart, Rob F. , MCAT Inst. , USA ; [1994] ; 1p ; In English ; 9th International Parallel Processing Symposium , 25-28 Apr. 1995 , Santa Barbara, CA , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA
Contract(s)/Grant(s): NCC2-752 ; RTOP 509-10-31 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Performance degradation in scientific computing on parallel and distributed computer systems can be caused by numerous factors. In this half-day tutorial we explain what are the important methodological issues involved in obtaining codes that have good performance potential. Then we discuss what are the possible obstacles in realizing that potential on contemporary hardware

platforms, and give an overview of the software tools currently available for identifying the performance bottlenecks. Finally, some realistic examples are used to illustrate the actual use and utility of such tools.
Author
Parallel Computers ; Performance Prediction ; Computer Techniques

20020009555 NASA Ames Research Center , Moffett Field, CA USA
Numerical Simulations of Light Bullets, Using the Full Vector, Time Dependent, Nonlinear Maxwell Equations
Goorjian, Peter M. , NASA Ames Research Center , USA ; Silberberg, Yaron , Weizmann Inst. of Science , Israel ; [1994] ; 1p ; In English ; Integrated Photonics Research Topical Meeting , 23-25 Feb. 1995 , Dana Point, CA , USA ; Sponsored by Optical Society of America , USA
Contract(s)/Grant(s): RTOP 505-59-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This paper will present results in computational nonlinear optics. An algorithm will be described that solves the full vector nonlinear Maxwell's equations exactly without the approximations that are currently made. Present methods solve a reduced scalar wave equation, namely the nonlinear Schrodinger equation, and neglect the optical carrier. Also, results will be shown of calculations of 2-D electromagnetic nonlinear waves computed by directly integrating in time the nonlinear vector Maxwell's equations. The results will include simulations of 'light bullet' like pulses. Here diffraction and dispersion will be counteracted by nonlinear effects. The time integration efficiently implements linear and nonlinear convolutions for the electric polarization, and can take into account such quantum effects as Kerr and Raman interactions. The present approach is robust and should permit modeling 2-D and 3-D optical soliton propagation, scattering, and switching directly from the full-vector Maxwell's equations.
Author
Numerical Analysis ; Nonlinear Optics ; Algorithms ; Optical Properties

20020009556 NASA Ames Research Center , Moffett Field, CA USA
Progress in Computational Aeroelasticity Using High Fidelity Flow and Structural Equations on Parallel Computers
Guruswamy, Guru P. , NASA Ames Research Center , USA ; Byun, Chansup , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; NASA Computational Workshop , Mar. 1995 , Moffett Field, CA , USA ; Sponsored by NASA , USA
Contract(s)/Grant(s): RTOP 505-10-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Aeroelasticity which involves strong coupling of fluids, structures and controls is an important element in designing an aircraft. Computational aeroelasticity using low fidelity methods such as the linear aerodynamic flow equations coupled with the modal structural equations are well advanced. Though these low fidelity approaches are computationally less intensive, they are not adequate for the analysis of modern aircraft such as High Speed Civil Transport (HSCT) and Advanced Subsonic Transport (AST) which can experience complex flow/structure interactions. HSCT can experience vortex induced aeroelastic oscillations whereas AST can experience transonic buffet associated structural oscillations. Both aircraft may experience a dip in the flutter speed at the transonic regime. For accurate aeroelastic computations at these complex fluid/structure interaction situations, high fidelity equations such as the Navier-Stokes for fluids and the finite-elements for structures are needed. Computations using these high fidelity equations require large computational resources both in memory and speed. Current conventional supercomputers have reached their limitations both in memory and speed. As a result, parallel computers have evolved to overcome the limitations of conventional computers. This paper will address the transition that is taking place in computational aeroelasticity from conventional computers to parallel computers. The paper will address special techniques needed to take advantage of the architecture of new parallel computers. Results will be illustrated from computations made on iPSC/860 and IBM SP2 computer by using ENASERO code that directly couples the Euler/Navier-Stokes flow equations with high resolution finite-element structural equations.
Author
Aeroelasticity ; Computer Programs ; High Resolution ; Stokes Flow ; Subsonic Speed ; Supersonic Transports ; Transonic Flutter

20020009558 Thermoscience Inst. , Moffett Field, CA USA
Energy- and Structure-Related Properties for the (100) Surface of Beta-SiC
Halicioglu, Timur , Thermoscience Inst. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): NAS2-14031 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Calculations were carried out to investigate energy- and structure-related properties for the (100) surfaces of beta-SiC. Investigations for both C- and Si-terminated planes include (1 x 1), (2 x 1) and c(2 x 2) surface phases. All calculations were performed employing the empirical Tersoff function developed for SiC systems. This function has been used on several occasions, with varying sets of parameters to calculate properties for systems containing Si and C atoms. Here a comparative study was

conducted. Results obtained from different sets of parameters were compared with respect to each other and also with values from the literature. Suitabilities and limitations of each parameter set were delineated.
Author
Computation ; Silicon Carbides ; Mechanical Properties

20020009561 NASA Ames Research Center , Moffett Field, CA USA
Technologies for Visualization in Computational Aerosciences
Miceli, Kristina D. , NASA Ames Research Center , USA ; [1993] ; 1p ; In English ; German Science Foundation Workshop on Visualization , 18-20 Jan. 1994 , Paderborn , Germany ; Sponsored by German Science Foundation , Germany
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

State-of-the-art research in computational aerosciences produces' complex, time-dependent datasets. Simulations can also be multidisciplinary in nature, coupling two or more physical disciplines such as fluid dynamics, structural dynamics, thermodynamics, and acoustics. Many diverse technologies are necessary for visualizing computational aerosciences simulations. This paper describes these technologies and how they contribute to building effective tools for use by domain scientists. These technologies include data management, distributed environments, advanced user interfaces, rapid prototyping environments, parallel computation, and methods to visualize the scalar and vector fields associated with computational aerosciences datasets.
Author
Aerospace Sciences ; Data Management ; Dynamic Structural Analysis ; Computation

20020009565 National Taiwan Univ. , Graduate Inst. of Building and Planning , Taipei, Taiwan, Province of China
An Abductive Propositional Logic for Design Reasoning
Lin, Feng-Tyan , National Taiwan Univ. , Taiwan, Province of China ; Wang, Hung-Hsiang , National Taipei Univ. of Technology , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 569-579 ; In English ; Copyright ; Avail: Issuing Activity

Design can be seen as a reasoning process based on non-classic logic, in which non-monotonicity and abduction are two essential features. This paper introduces Abductive Propositional Logic (APL), which is a simple but powerful formal system to deal with these two features. to show its capabilities, APL is used to analyze the reasoning of a conceptual design of a scooter. The results reveal that APL is not only a profound basis for developing computer supported design systems, but also a useful too] for analyzing design processes.
Author
Mathematical Logic ; Logic Design

20020009569 National Chung-Cheng Univ. , Dept. of Chemical Engineering , Taiwan, Province of China
Optimal L(sup Infinity) Model Reduction using Genetic Algorithms
Leu, Jeng-Fan , National Chung-Cheng Univ. , Taiwan, Province of China ; Hwang, Chyi , National Chung-Cheng Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 607-618 ; In English
Contract(s)/Grant(s): NSC-86-2214-E-194-002 ; Copyright ; Avail: Issuing Activity

In this paper, we are concerned with the solution of optimal L(sup infinity) model- reduction problems using genetic algorithms (GAs). More precisely, we present an approach to facilitate using GAs to effectively search optimal reduced-order models for high-order linear time-invariant systems such that the L(sup infinity)-norm of approximation error is minimized. The proposed approach has the following distinct features: (1) the parameter space for GA search is bounded; (2) the finite and infinite zero structures, as well as the stability of the original system is retained in the reduced-order models; and (3) the GA solution accuracy can be greatly enhanced. The first two features are achieved through representing a reduced-order model in a transfer function parameterized in terms of Schur and anti-Schur polynomials, whereas the third feature is gained by using schemes of region contraction and local improvement.
Author
Genetic Algorithms ; Optimization ; Mathematical Models

20020009637 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Software Engineering Management for Productivity and Quality
White, K. ; Oct. 01, 1999 ; 3p ; In English
Report No.(s): DE2001-777747 ; JLAB-ACE-99-11 ; DOE/ER/40150-1829 ; No Copyright ; Avail: Department of Energy Information Bridge

Since the advent of electronic computers, people have struggled to develop effective software engineering processes. While these processes are similar to those used by hardware engineers, the software industry has earned a reputation for late delivery of inadequate products. Most software managers are looking for ways to deliver quality products faster, or with fewer resources. The development time and product outcome of any software project can be influenced by four variables: the product characteristics, the people involved, the processes they use, and the underlying technology. In order to have an impact on the productivity of a software development effort, the manager must focus on and balance these areas. This paper will discuss effective ways to improve productivity by using this approach.
NTIS
Productivity ; Software Engineering ; Quality Control ; Technology Assessment ; Engineering Management

20020009659 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA
Computer-Based Methods for Constructing Two-Level Fractional Factorial Experimental Designs with a Requirement Set
Forsythe, Steven L. ; Jan. 2001 ; 189p ; In English
Report No.(s): AD-A396172 ; AFIT/DSS/ENS/97J-4 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A02 , Microfiche
This dissertation developed four methodologies for computer-aided experimental design of two-level fractional factorial designs with requirement sets (DOE/RS). The requirement sets identify all the experimental factors and the appropriate interaction terms to be evaluated in the experiment. Taguchi graphs and similar manual methods provide techniques for solving the DOE/RS problem. Unfortunately, these methods are limited because they become difficult to use as the number of factors or interaction terms exceeds ten. This research showed that the DOE/RS problem belongs to a class of difficult-to-solve problems known as NP-Complete. It is the combinatorial nature of NP-Complete problems that causes them to become computationally challenging as the size of the problem increases. Heuristics are often used to find good solutions to large NP-Complete problems.
DTIC
Computer Aided Design ; Computer Techniques

20020009670 ITT Systems and Sciences Corp. , Rome, NY USA
Knowledge Base Applications to Adaptive Space-Time Processing , Volume 6 , Knowledge-Based Space-Time Adaptive Processing (KBSTAP) User's Manual and Programmer's Manual ***Final Report , Aug. 1995-Jul. 1999***
Salama, Yassir ; Senn, Roy ; July 2001 ; 29p ; In English
Contract(s)/Grant(s): F30602-95-C-0041 ; Proj-4506
Report No.(s): AD-A396079 ; AFRL-SN-RS-TR-2001-146-VOL-6 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This User's Manual is intended to be used as a guide for the execution of the Knowledge-Based Space-Time Adaptive Processing (KBSTAP) software. The software has been implemented as a proof-of-concept demonstration to illustrate the advantages of using expert systems techniques in an end-to-end radar system simulation. The software has been built to test the performance of radar systems when knowledge-based rules are applied to filtering, detection, and tracking. Multi-Channel Airborne Radar Measurement (MCARM) data is used as the basis for the evaluation process.
DTIC
User Manuals (Computer Programs) ; Knowledge Based Systems ; Computer Programs

20020009672 Harris Technical Services Corp. , Fairview Heights, IL USA
The National Air Intelligence Center Software Process Improvement Effort (NAIC SPI) ***Final Report , Apr. 1996-Dec. 1999***
Blankenship, Donald D. ; Jul. 2001 ; 40p ; In English
Contract(s)/Grant(s): F30602-94-D-0055 ; AF Proj. R135
Report No.(s): AD-A396063 ; Rept-1070-033 ; AFRL-IF-RS-TR-2001-144 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report summarizes the requirements, methods, procedures, and accomplishments of the National Air Intelligence Center (NAIC) Software Process Improvements (SPI) effort. The objective of this effort was for the contractor to provide engineering and software process improvement for NAIC/SCD (System Development Corporation) to reach SEI's (Software Engineering Institute) CMM (Capability Maturity Model) Level 2 in process maturity. While working to reach CMM Level 2, the goal was to develop policies and practices that would lead directly to and support CMM Level 3. Work included estimation, software

subcontract management, software configuration management, software quality assurance, metrics and measurements, and training.
DTIC
Software Engineering ; Software Reliability ; Systems Engineering ; Computer Systems Programs

20020009676 Purdue Univ. , Dept. of Computer Sciences , West Lafayette, IN USA
A Software Architecture for Scalable Simulations on Heterogeneous Networks ***Final Report , 1 May 1996-30 Apr. 2001***
Rego, Vernon ; Sunderam, V. ; September 2001 ; 5p ; In English
Contract(s)/Grant(s): DAAH04-96-1-0083
Report No.(s): AD-A396043 ; ARO-34798.20-MA-SDI ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

Our initial research since the inception of this project has established the viability and effectiveness of each of the novel aspects of our approach to massively concurrent computing viz. specialized communications substrate, threads based programming, semi-automatic domain specific parallelization, and failure resilient computing. Experiences with a few, but nonetheless representative, classes of applications has demonstrated the efficacy of our prototype systems, and have established the justifications for building robust production quality versions thereof. In the process, our work has also highlighted several interesting research issues from the computer systems and computer science points of view. We have focused on four layers of a software architecture: domain layers (ParaSol and EcliPSe) and support layers (Ariadne for threads, and Conch/Clam for communication). The architecture uses a two-level control hierarchy, exploiting locality and new (UDP-based) network protocols to reduce communication times, enhance functionality and improve performance. The modification involves designating specific processes within the host pool as sub-domain servers(SDS). The first process to be initiated on each subnet automatically instantiates a thread that serves as the primary SDS for that subset of the host pool, with subsequent processes assuming secondary responsibility in the case of failures. Each SDS is responsible for process and thread creation/destruction on its machines, as well as for collecting load and resource availability statistics. by exchanging control messages among themselves, the SDS threads provide hints to the higher layers (EcliPSe, Anadne and ParaSol) to enable workload allocation based on balanced distribution of computation and on minimized communication across subnet boundaries.
DTIC
Computers ; Architecture (Computers) ; Protocol (Computers) ; Computer Programming

20020009701 Oak Ridge Y-12 Plant , TN USA
Laptop Computer: Based Facial Recognition System Assessment
Cain, R. A. ; Singleton, G. B. ; Mar. 01, 2001 ; 24p ; In English
Report No.(s): DE2001-780800 ; Y/NSP-553 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The objective of this project was to assess the performance of the leading commercial-off-the-shelf (COTS) facial recognition software package when used as a laptop application. We performed the assessment to determine the system's usefulness for enrolling facial images in a database from remote locations and conducting real-time searches against a database of previously enrolled images. The assessment involved creating a database of 40 images and conducting 2 series of tests to determine the product's ability to recognize and match subject faces under varying conditions. This report describes the test results and includes a description of the factors affecting the results. After an extensive market survey, we selected Visionics' FaceIt(reg sign) software package for evaluation and a review of the Facial Recognition Vendor Test 2000 (FRVT 2000). This test was co-sponsored by the US Department of Defense (DOD) Counterdrug Technology Development Program Office, the National Institute of Justice, and the Defense Advanced Research Projects Agency (DARPA). Administered in May-June 2000, the FRVT 2000 assessed the capabilities of facial recognition systems that were currently available for purchase on the US market. Our selection of this Visionics product does not indicate that it is the 'best' facial recognition software package for all uses. It was the most appropriate package based on the specific applications and requirements for this specific application. In this assessment, the system configuration was evaluated for effectiveness in identifying individuals by searching for facial images captured from video displays against those stored in a facial image database. An additional criterion was that the system be capable of operating discretely. For this application, an operational facial recognition system would consist of one central computer hosting the master image database with multiple standalone systems configured with duplicates of the master operating in remote locations. Remote users could perform real-time searches where network connectivity is not available. As images are enrolled at the remote locations, periodic database synchronization is necessary.
NTIS
Personal Computers ; Pattern Recognition ; Applications Programs (Computers) ; Central Processing Units ; Display Devices ; Systems Engineering

20020009755 RECOM Technologies, Inc. , Moffett Field, CA USA

Automated Performance Prediction of Message Passing Parallel Programs

Block, Robert J. , Illinois Univ. , USA ; Mehra, Pankaj , RECOM Technologies, Inc. , USA ; Sarukkai, Sekhar , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; No Copyright ; Avail: Issuing Activity ; Abstract Only

As the trend toward massively parallel processing continues, the need for tools that can predict scalability trends becomes greater. While high level languages Eke HPF have come into greater use, explicit message-passing programs proliferate, and will probably do so for some time, thanks to the onslaught of standards such as MPI. Much work has been done to create simple models that represent important characteristics of parallel programs, such as latency, network contention, and communication volume. But many of these methods still require a substantial manual effort to represent an application in the model's format. The YAPP ("Yet Another Performance Predictor") tool is an attempt to automate the formation of first-order expressions for completion time, with a minimum of programmer assistance. The content of this paper is as follows: First, we explore the implementation details of YAPP, and illustrate with examples some of the reasons that automatic prediction is difficult. In the following sections, we present the results of four applications, using execution traces on the Intel i860, analyze the error in YAPP's predictions, explain the limitations of our implementation, and mention possible future additions. In particular, we illustrate techniques used to identify pipeline communication patterns, and demonstrate how compiler analysis and regression are combined to automate the prediction process.

Author

Automatic Control ; Performance Prediction ; Parallel Programming

20020010131 National Inst. of Standards and Technology , Gaithersburg, MD USA

Requirements for Real-Time Extensions to the Java(Trademark) Platform: Report from the Requirements Group for Real-Time Extensions for the Java Platform

Carnahan, L. ; Ruark, M. ; Sep. 1999 ; 32p ; In English

Report No.(s): PB2000-100844 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The National Institute of Standards and Technology (NIST) sponsored the Requirements Group for Real-time Extensions to the Java Platform. The Requirements Group includes representatives from companies and organizations whose expertise spans the computing industry and academia. Industry participants include desktop, server, and enterprise systems providers, embedded systems providers, device manufacturers, and real-time operating system vendors. The Requirements Group met during a six-month period in a series of open workshops. The goal of the Group was to develop cross disciplinary requirements for real-time functionality that is expected to be needed by real-time applications written in the Java programming language and executing on various platforms. This document is the result of the Requirements Group's efforts. The requirements contained in this document were developed by group consensus. Therefore the requirements in total do not necessarily represent the opinions of all Requirements Group members or their organizations. In the Requirements Group workshops, consensus was declared only in cases where the agreement was overwhelming. Unless explicitly stated otherwise, consensus was reached on all requirements. In a few instances, a strong consensus could not be reached. Where strong consensus could not be reached, the requirement is marked as Open - no consensus.

NTIS

Java (Programming Language) ; Architecture (Computers) ; Computer Systems Design ; Applications Programs (Computers)

20020010133 National Inst. of Standards and Technology , Gaithersburg, MD USA

Assessing Algorithms as Computational Models for Human Face Recognition

Phillips, P. J. , National Inst. of Standards and Technology , USA ; O'Toole, A. J. , Texas Univ. at Dallas , USA ; Cheng, Y. , Texas Univ. at Dallas , USA ; Ross, B. , Texas Univ. at Dallas , USA ; Wild, H. A. , Texas Univ. at Dallas , USA ; June 1999 ; 12p ; In English

Report No.(s): PB99-146953 ; NISTIR-6348 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

We assessed the qualitative accord between several automatic face recognition algorithms and human perceivers. by comparing model- and human-generated measures of the similarity between pairs of faces, we were able to evaluate the suitability of the algorithms as models of human face recognition. Multidimensional scaling (MDS) was used to create a spatial representation of the subject response patterns. Next, the model response patterns were projected into the MDS space. The results revealed a bimodal structure for both the subjects and for most of the models, indicating that the qualitative performance of the subjects and models was related. The bimodal subject structure reflected strategy differences in making similarity decisions. For

the models, the bimodal structure was related to combined aspects of the representations and the distance metrics used in the implementations.
NTIS
Algorithms ; Pattern Recognition ; Image Processing

20020010182 Lawrence Livermore National Lab. , Livermore, CA USA
Surface Reconstruction from Sparse Fringe Contours
Cong, G. ; Parvin, B. ; Aug. 10, 1998 ; 6p ; In English
Report No.(s): DE2001-779708 ; LBNL-42163 ; No Copyright ; Avail: Department of Energy Information Bridge
A new approach for reconstruction of 3D surfaces from 2D cross-sectional contours is presented. by using the so-called 'Equal Importance Criterion,' we reconstruct the surface based on the assumption that every point in the region contributes equally to the surface reconstruction process. In this context, the problem is formulated in terms of a partial differential equation (PDE), and we show that the solution for dense contours can be efficiently derived from distance transform. In the case of sparse contours, we add a regularization term to insure smoothness in surface recovery. The proposed technique allows for surface recovery at any desired resolution. The main advantage of the proposed method is that inherent problems due to correspondence, tiling, and branching are avoided. Furthermore, the computed high resolution surface is better represented for subsequent geometric analysis. We present results on both synthetic and real data.
NTIS
Contours ; Three Dimensional Models ; Partial Differential Equations

20020010225 Lawrence Livermore National Lab. , Livermore, CA USA
Graphical interface for the physics-based generation of inputs to 3D MEEC SGEMP and SREMP simulations
Bland, M. ; Walters, D. ; Wondra, J. ; Jun. 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9360 ; UCRL-JC-132762-REV-2 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A graphical user interface (GUI) is under development for the MEEC family of SGEMP and SREMP simulation codes (1,2). These codes are 'workhorse' legacy codes that have been in use for nearly two decades, with modifications and enhanced physics models added throughout the years. The MEEC codes are currently being evaluated for use by the DOE in the Dual Revalidation Program and experiments at NIF. The new GUI makes the codes more accessible and less prone to input errors by automatically generating the parameters and grids that previously had to be designed 'by hand.' Physics-based algorithms define the simulation volume with expanding meshes. Users are able to specify objects, materials, and emission surfaces through dialogs and input boxes. 3D and orthographic views are available to view objects in the volume. Zone slice views are available for stepping through the overlay of objects on the mesh in planes aligned with the primary axes.
NTIS
Computer Graphics ; System Generated Electromagnetic Pulses ; Computerized Simulation ; Graphical User Interface

20020010253 National Inst. of Standards and Technology , (MSEL) , Gaithersburg, MD USA
MatML: Materials Markup Language Workshop Report
Sturrock, C. P. ; Begley, E. F. ; Kaufman, J. G. ; August 2001 ; 48p ; In English
Report No.(s): PB2002-100394 ; NISTIR-6785 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The MatML - Materials Markup Language Workshop was held at NIST to consider the technical and strategic future of MatML, an extensible markup language for materials data. Following detailed description and illustrations of MatML, the views of various constituencies of MatML were presented and considered. Several key strategic issues were identified, debated, and targeted for additional follow-up work. With the imminent migration of MatML from NIST to the broader user community, the longer-term stewardship of MatML and its potential formal standardization were recognized as the primary strategic issues to be resolved in the coming years.
NTIS
Document Markup Languages ; Applications Programs (Computers) ; Materials Science ; Data Processing

20020010586 RECOM Technologies, Inc. , Moffett Field, CA USA

A Formal Approach to Domain-Oriented Software Design Environments

Lowry, Michael , RECOM Technologies, Inc. , USA ; Philpot, Andrew , RECOM Technologies, Inc. , USA ; Pressburger, Thomas , RECOM Technologies, Inc. , USA ; Underwood, Ian , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; 9th Knowledge-Based Software Engineering Conference (KBSE'94) , 20-23 Sep. 1994 , Monterey, CA , USA

Contract(s)/Grant(s): RTOP 233-01-02 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This paper describes a formal approach to domain-oriented software design environments, based on declarative domain theories, formal specifications, and deductive program synthesis. A declarative domain theory defines the semantics of a domain-oriented specification language and its relationship to implementation-level subroutines. Formal specification development and reuse is made accessible to end-users through an intuitive graphical interface that guides them in creating diagrams denoting formal specifications. The diagrams also serve to document the specifications. Deductive program synthesis ensures that end-user specifications are correctly implemented. AMPHION has been applied to the domain of solar system kinematics through the development of a declarative domain theory, which includes an axiomatization of JPL's SPICELIB subroutine library. Testing over six months with planetary scientists indicates that AMPHION's interactive specification acquisition paradigm enables users to develop, modify, and reuse specifications at least an order of magnitude more rapidly than manual program development. Furthermore, AMPHION synthesizes one to two page programs consisting of calls to SPICELIB subroutines from these specifications in just a few minutes. Test results obtained by metering AMPHION's deductive program synthesis component are examined. AMPHION has been installed at JPL and is currently undergoing further refinement in preparation for distribution to hundreds of SPICELIB users worldwide. Current work to support end-user customization of AMPHION's specification acquisition subsystem is briefly discussed, as well as future work to enable domain-expert creation of new AMPHION applications through development of suitable domain theories.

Author

Software Engineering ; Subroutines ; Subroutine Libraries (Computers) ; User Requirements

20020010595 Sandia National Labs. , Albuquerque, NM USA

FORTRAN 77 program and user's guide for the statistical analyses of scatterplots to identify important factors in large-scale simulations

Helton, J. C. ; Shortencarier, M. J. ; Aug. 01, 1999 ; 80p ; In English

Report No.(s): DE2001-9722 ; SAND99-1058 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A description and user's guide are given for a computer program, PATTRN, developed at Sandia National Laboratories for use in sensitivity analyses of complex models. This program is intended for use in the analysis of input-output relationships in Monte Carlo analyses when the input has been selected using random or Latin hypercube sampling. Procedures incorporated into the program are based upon attempts to detect increasingly complex patterns in scatterplots and involve the detection of linear relationships, monotonic relationships, trends in measures of central tendency, trends in measures of variability, and deviations from randomness. The program was designed to be easy to use and portable.

NTIS

Statistical Analysis ; FORTRAN ; Applications Programs (Computers)

20020010598 Sandia National Labs. , Albuquerque, NM USA

Strengthening Integrality Gaps for Capacitated Network Design and Covering Problems

Carr, R. D. ; Fleischer, L. K. ; Leung, V. J. ; Phillips, C. A. ; Jul. 28, 1999 ; 14p ; In English

Report No.(s): DE2001-9674 ; SAND99-1972C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A capacitated covering IP is an integer program of the form min(l brace)ex(vert bar)Ux (ge) d, 0 (le) x (le) b, x (element of) Z(sup +)(r brace), where all entries of c, U, and d are nonnegative. Given such a formulation, the ratio between the optimal integer solution and the optimal solution to the linear program relaxation can be as bad as (parallel)d(parallel)(sub (proportional to)), even when U consists of a single row. They show that by adding additional inequalities, this ratio can be improved significantly. In the general case, they show that the improved ratio is bounded by the maximum number of non-zero coefficients in a row of U, and provide a polynomial-time approximation algorithm to achieve this bound. This improves upon the results of Bertsimas and Vohra, strengthening their extension of Hall and Hochbaum.

NTIS

Algorithms ; Computer Networks ; Design

20020010893 National Inst. of Standards and Technology , Gaithersburg, MD USA

NIST Sparse BLAS User's Guide

Remington, K. A. ; Pozo, R. ; May 09, 2001 ; 58p ; In English

Report No.(s): PB2001-104875 ; NISTIR-6744 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The NIST Sparse BLAS (Basic Linear Algebra Subprogram) library provides computational kernels for fundamental sparse matrix operations. This version of the NIST Sparse BLAS supports the following sparse formats: compressed sparse row (CSR), compressed sparse column (CSC), coordinate (COO), block sparse row (BSR), block sparse column (BSC), block coordinate (BCO) and variable block row (VBR). Symmetric and skew-symmetric versions are also supported. The routines are written in ANSI C and are callable from FORTRAN and C through the interface proposed in the Sparse BLAS Toolkit.

NTIS

Matrices (Mathematics) ; FORTRAN ; Algebra

20020010965 National Inst. of Standards and Technology , Gaithersburg, MD USA

Evolution of Prototype Architectures Developed for the Scheduling Software Integration Project

Riddick, F. , National Inst. of Standards and Technology , USA ; LeCapitaine, C. , National Inst. of Standards and Technology , USA ; 2001 ; 14p ; In English

Report No.(s): PB2000-106984 ; No Copyright ; Avail: National Technical Information Service (NTIS)

The National Institute of Standards and Technology (NIST) is collaborating with vendors, users, and university researchers to develop a virtual manufacturing testbed. This testbed contains a number of software research prototypes, which address both optimization and integration issues for a wide range of software applications, including scheduling. This report describes the evolution and current state of a prototype that integrates scheduling applications with data collection systems.

NTIS

Prototypes ; Programming (Scheduling) ; Data Acquisition ; Computer Aided Manufacturing ; Systems Integration ; Software Engineering

20020011142 RECOM Technologies, Inc. , Moffett Field, CA USA

User Interface Technology for Formal Specification Development

Lowry, Michael , RECOM Technologies, Inc. , USA ; Philpot, Andrew , RECOM Technologies, Inc. , USA ; Pressburger, Thomas , RECOM Technologies, Inc. , USA ; Underwood, Ian , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; Seventh Annual Symposium on User Interface Software and Technology , 2-4 Nov. 1994 , Marina Del Rey, CA , USA

Contract(s)/Grant(s): RTOP 233-01-02 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Formal specification development and modification are an essential component of the knowledge-based software life cycle. User interface technology is needed to empower end-users to create their own formal specifications. This paper describes the advanced user interface for AMPHION1 a knowledge-based software engineering system that targets scientific subroutine libraries. AMPHION is a generic, domain-independent architecture that is specialized to an application domain through a declarative domain theory. Formal specification development and reuse is made accessible to end-users through an intuitive graphical interface that provides semantic guidance in creating diagrams denoting formal specifications in an application domain. The diagrams also serve to document the specifications. Automatic deductive program synthesis ensures that end-user specifications are correctly implemented. The tables that drive AMPHION's user interface are automatically compiled from a domain theory; portions of the interface can be customized by the end-user. The user interface facilitates formal specification development by hiding syntactic details, such as logical notation. It also turns some of the barriers for end-user specification development associated with strongly typed formal languages into active sources of guidance, without restricting advanced users. The interface is especially suited for specification modification. AMPHION has been applied to the domain of solar system kinematics through the development of a declarative domain theory. Testing over six months with planetary scientists indicates that AMPHION's interactive specification acquisition paradigm enables users to develop, modify, and reuse specifications at least an order of magnitude more rapidly than manual program development.

Author

User Requirements ; Software Engineering ; Subroutine Libraries (Computers) ; Specifications ; Computer Programming

20020011151 Lawrence Livermore National Lab. , Livermore, CA USA

Shadow penumbras by depth-dependent filtering

Keating, B. ; Max, N. ; Jan. 12, 1999 ; 19p ; In English

Report No.(s): DE2001-9856 ; UCRL-JC-132898 ; No Copyright ; Avail: Department of Energy Information Bridge

The paper presents an efficient algorithm for filtering multi-layer depth images (MDIs) in order to produce approximate penumbras. The filtering is performed on a MDI that represents the view from the light source. The algorithm is based upon both ray tracing and the z-buffer shadow algorithm, and is closely related to convolution methods. The method's effectiveness is demonstrated on especially complex objects such as trees, whose soft shadows are expensive to compute by other methods. The method specifically addresses the problem of light-leaking that occurs when tracing rays through discrete representations, and the inability of convolution methods to produce accurate self-shadowing effects.
NTIS
Penumbras ; Algorithms

20020011362 Collier Research and Development Corp. , Hampton, VA USA
User's Manual and Final Report for Hot-SMAC GUI Development
Yarrington, Phil , Collier Research and Development Corp. , USA ; Novemer 2001 ; 61p ; In English ; Original contains color illustrations
Contract(s)/Grant(s): NAS3-00159 ; RTOP 251-30-07
Report No.(s): NASA/CR-2001-211294 ; E-13088 ; NAS 1.26:211294 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

A new software package called Higher Order Theory-Structural/Micro Analysis Code (HOT-SMAC) has been developed as an effective alternative to the finite element approach for Functionally Graded Material (FGM) modeling. HOT-SMAC is a self-contained package including pre- and post-processing through an intuitive graphical user interface, along with the well-established Higher Order Theory for Functionally Graded Materials (HOTFGM) thermomechanical analysis engine. This document represents a Getting Started/User's Manual for HOT-SMAC and a final report for its development. First, the features of the software are presented in a simple step-by-step example where a HOT-SMAC model representing a functionally graded material is created, mechanical and thermal boundary conditions are applied, the model is analyzed and results are reviewed. In a second step-by-step example, a HOT-SMAC model of an actively cooled metallic channel with ceramic thermal barrier coating is built and analyzed. HOT-SMAC results from this model are compared to recently published results (NASA/TM-2001-210702) for two grid densities. Finally, a prototype integration of HOTSMAC with the commercially available HyperSizer(R) structural analysis and sizing software is presented. In this integration, local strain results from HyperSizer's structural analysis are fed to a detailed HOT-SMAC model of the flange-to-facesheet bond region of a stiffened panel. HOT-SMAC is then used to determine the peak shear and peel (normal) stresses between the facesheet and bonded flange of the panel and determine the "free edge" effects.
Author
Applications Programs (Computers) ; Structural Analysis ; User Manuals (Computer Programs)

20020011363 Lawrence Livermore National Lab. , Livermore, CA USA
Graphical Interface for the Physics-Based Generation of Inputs to 3D MEEC SGEMP and SREMP Simulations
Bland, M. ; Wondra, J. ; Nunan, S. ; Walters, D. ; Dec. 01, 1998 ; 6p ; In English
Report No.(s): DE2001-9654 ; UCRL-JC-132762 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A graphical user interface (GUI) is under development for the MEEC family of SGEMP and SREMP simulation codes. These codes are workhorse legacy codes that have been in use for nearly two decades, with modifications and enhanced physics models added throughout the years. The MEEC codes are currently being evaluated for use by the Department of Energy in the Dual Revalidation program and experiments at NIF. The new GUI makes the codes more accessible and less prone to input errors by automatically generating the parameters and grids that previously had to be designed by hand. Physics-based algorithms define the simulation volume with expanding meshes. Users are able to specify objects, materials, and emission surfaces through dialogs and input boxes. Three-dimensional and orthographic views are available to view objects in the volume. Zone slice views are available for stepping through the overlay of objects on the mesh in planes aligned with the primary axes.
NTIS
Computerized Simulation ; Graphical User Interface ; Computer Programs

20020011670 NASA Ames Research Center , Moffett Field, CA USA
The 3D Recognition, Generation, Fusion, Update and Refinement (RG4) Concept
Maluf, David A. , NASA Ames Research Center , USA ; Cheeseman, Peter , NASA Ames Research Center , USA ; Smelyanskyi, Vadim N. , NASA Ames Research Center , USA ; Kuehnel, Frank , NASA Ames Research Center , USA ; Morris, Robin D. , NASA Ames Research Center , USA ; [2001] ; 9p ; In English ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

This paper describes an active (real time) recognition strategy whereby information is inferred iteratively across several viewpoints in descent imagery. We will show how we use inverse theory within the context of parametric model generation, namely height and spectral reflection functions, to generate model assertions. Using this strategy in an active context implies that, from every viewpoint, the proposed system must refine its hypotheses taking into account the image and the effect of uncertainties as well. The proposed system employs probabilistic solutions to the problem of iteratively merging information (images) from several viewpoints. This involves feeding the posterior distribution from all previous images as a prior for the next view. Novel approaches will be developed to accelerate the inversion search using novel statistic implementations and reducing the model complexity using foveated vision. Foveated vision refers to imagery where the resolution varies across the image. In this paper, we allow the model to be foveated where the highest resolution region is called the foveation region. Typically, the images will have dynamic control of the location of the foveation region. For descent imagery in the Entry, Descent, and Landing (EDL) process, it is possible to have more than one foveation region. This research initiative is directed towards descent imagery in connection with NASA's EDL applications. Three-Dimensional Model Recognition, Generation, Fusion, Update, and Refinement (RGFUR or RG4) for height and the spectral reflection characteristics are in focus for various reasons, one of which is the prospect that their interpretation will provide for real time active vision for automated EDL.
Author
Aerial Photography ; Descent ; Image Resolution ; Imaging Techniques

20020011675 NASA Ames Research Center , Moffett Field, CA USA
A High-Order Finite Spectral Volume Method for Conservation Laws on Unstructured Grids
Wang, Z. J. , Michigan State Univ. , USA ; Liu, Yen , NASA Ames Research Center , USA ; [2001] ; 10p ; In English ; 40th AIAA Aerospace Sciences Meeting and Exhibit , 14-17 Jan. 2002 , Reno, NV , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

A time accurate, high-order, conservative, yet efficient method named Finite Spectral Volume (FSV) is developed for conservation laws on unstructured grids. The concept of a 'spectral volume' is introduced to achieve high-order accuracy in an efficient manner similar to spectral element and multi-domain spectral methods. In addition, each spectral volume is further sub-divided into control volumes (CVs), and cell-averaged data from these control volumes is used to reconstruct a high-order approximation in the spectral volume. Riemann solvers are used to compute the fluxes at spectral volume boundaries. Then cell-averaged state variables in the control volumes are updated independently. Furthermore, TVD (Total Variation Diminishing) and TVB (Total Variation Bounded) limiters are introduced in the FSV method to remove/reduce spurious oscillations near discontinuities. A very desirable feature of the FSV method is that the reconstruction is carried out only once, and analytically, and is the same for all cells of the same type, and that the reconstruction stencil is always non-singular, in contrast to the memory and CPU-intensive reconstruction in a high-order finite volume (FV) method. Discussions are made concerning why the FSV method is significantly more efficient than high-order finite volume and the Discontinuous Galerkin (DG) methods. Fundamental properties of the FSV method are studied and high-order accuracy is demonstrated for several model problems with and without discontinuities.
Author
Finite Volume Method ; Spectral Methods ; Conservation Laws

20020011679 NASA Ames Research Center , Moffett Field, CA USA
An XML-Based Protocol for Distributed Event Services
Smith, Warren , NASA Ames Research Center , USA ; Gunter, Dan , California Univ., Lawrence Berkeley Lab. , USA ; Quesnel, Darcy , Argonne National Lab. , USA ; [2001] ; 14p ; In English ; 2001 Conference on Parallel and Distributed Processing Techniques and Applications , Unknown
Contract(s)/Grant(s): DTTS59-99-00437 ; NASA Order A-61812-D ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

A recent trend in distributed computing is the construction of high-performance distributed systems called computational grids. One difficulty we have encountered is that there is no standard format for the representation of performance information and no standard protocol for transmitting this information. This limits the types of performance analysis that can be undertaken in complex distributed systems. to address this problem, we present an XML-based protocol for transmitting performance events in distributed systems and evaluate the performance of this protocol.
Author
Computational Grids ; Protocol (Computers) ; Distributed Processing

20020011722 Sandia National Labs. , Albuquerque, NM USA

Practical Approach for Integrating Automatically Designed Fixtures with Automated Assembly Planning

Calton, T. L. ; Peters, R. R. ; Jul. 20, 1999 ; 8p ; In English

Report No.(s): DE2001-9647 ; SAND99-1903C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This paper presents a practical approach for integrating automatically designed fixtures with automated assembly planning. Product assembly problems vary widely; here the focus is on assemblies that are characterized by a single base part to which a number of smaller parts and subassemblies are attached. This method starts with three-dimensional computer aided designed descriptions of an assembly whose assembly tasks require a fixture to hold the base part. It then combines algorithms that automatically design assembly pallets to hold the base part with algorithms that automatically generate assembly sequences. The designed fixtures rigidly constrain and locate the part, obey task constraints, are robust to part shape variations, are easy to load, and are economical to produce. The algorithm is guaranteed to find the global optimum solution that satisfies these and other pragmatic conditions. The assembly planner consists of four main elements: a user interface, a constraint system, a search engine, and an animation module. The planner expresses all constraints at a sequencing level, specifying orders and conditions on part mating operations in a number of ways. Fast replanning enables an interactive plan-view-constrain-replan cycle that aids in constrain discovery and documentation. The combined algorithms guarantee that the fixture will hold the base part without interfering with any of the assembly operations. This paper presents an overview of the planners, the integration approach, and the results of the integrated algorithms applied to several practical manufacturing problems. For these problems initial high-quality fixture designs and assembly sequences are generated in a matter of minutes with global optimum solutions identified in just over an hour.

NTIS

Algorithms ; Fixtures ; Planning ; Automatic Control

20020011851 National Defence Research Establishment , Dept. of Command and Control Warfare Technology , Linkoeping, Sweden

Integration ACSL-OPTSIM

Andersson, T. ; Dec. 06, 2000 ; 40p ; In Swedish ; Original contains color illustrations

Report No.(s): PB2001-108155 ; FOA-R-00-01689-616-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

At the Department of Electronic Warfare Assessments at FOA, there are several simulation environments. Two of those are ACSL and OPTSIM, which are used to simulate system duels. ACSL is used in the project Technical Threat System Analysis to analyze threat systems, while OPTSIM is used in the project Technical System Duels in order to analyze electro-optical sensor and countermeasure systems. This report describes two methods which coordinate the simulation environments ACSL and OPTSIM in order to permit improved validation possibilities of duel simulations.

NTIS

Electronic Warfare ; Systems Analysis ; Electro-Optics

20020011858 National Inst. of Standards and Technology , Mathematical and Computational Sciences Div. , Gaithersburg, MD USA

REGTET: A Program for Computing Regular Tetrahedralizations

Bernal, J. ; Sep. 2001 ; 24p ; In English

Report No.(s): PB2001-108263 ; NISTIR-6786 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

REGTET, a FORTRAN 77 program for computing a regular tetrahedralization for a finite set of weighted points in 3-dimensional space, is discussed. REGTET is based on an algorithm by Edelsbrunner and Shah for constructing regular tetrahedralizations with incremental topological flipping. At the start of the execution of REGTET a regular tetrahedralization for the vertices of an artificial cube that contains the weighted points is constructed. Throughout the execution the vertices of this cube are treated in the proper lexicographical manner so that the final tetrahedralization is correct.

NTIS

Applications Programs (Computers) ; Algorithms

20020012228 Lawrence Livermore National Lab. , Livermore, CA USA

Autonomous, agile micro-satellites and supporting technologies

Breitfeller, E. ; Dittman, M. D. ; Gaughan, R. J. ; Jones, M. S. ; Kordas, J. F. ; Jul. 19, 1999 ; 12p ; In English

Report No.(s): DE2001-13760 ; UCRL-JC-135060 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This paper updates the on-going effort at Lawrence Livermore National Laboratory to develop autonomous, agile micro-satellites (MicroSats). The objective of this development effort is to develop MicroSats weighing only a few tens of kilograms, that are able to autonomously perform precision maneuvers and can be used telerobotically in a variety of mission modes. The required capabilities include satellite rendezvous, inspection, proximity-operations, docking, and servicing. The MicroSat carries an integrated proximity-operations sensor-suite incorporating advanced avionics. A new self-pressurizing propulsion system utilizing a miniaturized pump and non-toxic mono-propellant hydrogen peroxide was successfully tested. This system can provide a nominal 25 kg MicroSat with 200-300 m/s delta-v including a warm-gas attitude control system. The avionics is based on the latest PowerPC processor using a Compact PCI bus architecture, which is modular, high-performance and processor-independent. This leverages commercial-off-the-shelf (COTS) technologies and minimizes the effects of future changes in processors. The MicroSat software development environment uses the Vx-Works real-time operating system (RTOS) that provides a rapid development environment for integration of new software modules, allowing early integration and test. We will summarize results of recent integrated ground flight testing of our latest non-toxic pumped propulsion MicroSat testbed vehicle operated on our unique dynamic air-rail.

NTIS

Computer Programs ; Software Engineering ; Computer Programming ; Artificial Satellites

20020012250 National Aerospace Lab. , Amsterdam, Netherlands

Integrated Management of Design Processes and Data: the CACE Environment Prototype

Spee, J. B. R. ; Bijwaard, D. J. A. ; Jan. 1999 ; 14p ; In English ; Original contains color illustrations

Report No.(s): PB2001-108838 ; NLR-TP-98599 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The drive for efficiency improvement in industry has implications for control engineering also. A process-oriented viewpoint is adopted, highlighting the need for integrated management of design processes and data. The concepts of a design process management system are explained: it has services to support design teams in concurrent design tasks, following a defined flow of activities, using predefined tools on a data repository. The CACE Environment Prototype is presented as an example application in the domain of aircraft control engineering. Most important to efficiency improvement is the automated consistency control of all information in the framework.

NTIS

Computer Aided Design ; Automatic Control

20020012252 National Aerospace Lab. , Amsterdam, Netherlands

User-Oriented ICT Infrastructure for the Multidisciplinary Virtual Enterprise

Vankan, W. J. ; Baalbergen, E. H. ; vanRijn, L. C. J. ; Nov. 2000 ; 18p ; In English

Report No.(s): PB2001-108833 ; NLR-TP-2000-581 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The concurrent engineering objective in the multidisciplinary virtual enterprise to co-ordinate parallel business processes is often hampered by deficiencies in exchange and interpretation of information. Important factors for this deficiency are related to the intrinsic complexity of state of the art computer networks, such as network heterogeneity and security measures such as firewalls. In this paper the software system SPINEware is described, which provides a framework to effectively deal with the particular problem areas related to the complex computer networks in multidisciplinary virtual enterprises. to illustrate the merits of SPINEware, the multidisciplinary and concurrent engineering aspects of several international projects in which SPINEware has been used successfully will be described.

NTIS

Computer Networks ; Concurrent Engineering

20020012254 National Aerospace Lab. , Fluid Dynamics Div. , Amsterdam, Netherlands

Tetrahedral Grid Optimization: Towards a Structured Tetrahedral Grid ***Final Report***

vanderBurg, J. W. ; Jul. 2000 ; 22p ; In English

Report No.(s): PB2001-108714 ; NLR-TP-2000-343 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

In the paper algorithms for optimizing a tetrahedral grid are proposed. In order to obtain an optimized tetrahedral grid a new concept is introduced, namely: a structured tetrahedral grid. This grid type fits naturally into the classification of grid types. The tetrahedral optimization algorithm consists of two components: An algorithm to optimize the grid connectivity and an equi-distribution algorithm to optimize the cell size of the tetrahedral elements.

NTIS

Structured Grids (Mathematics) ; Tetrahedrons ; Grid Generation (Mathematics)

20020012266 Center for Mathematics and Computer Science , Amsterdam Netherlands

Probabilistic Complexity of Numerically Checking the Binary Goldbach Conjecture in Certain Intervals. Modelling, Analysis and Simulation

Deshouillers, J. M. ; te Riele, H. J. J. ; Oct. 1998 ; 24p ; In English

Report No.(s): PB2001-108508 ; MAS-R9820 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche

A heuristic analysis is presented of the complexity of an algorithm which was applied recently to verify the binary Goldbach conjecture for every integer in the interval (4, 10 to the 14th power), as well as for every integer in (10k, 10k + 10-9), for different values of k up to 300. The analysis agrees reasonably well with the experimental observations.

NTIS

Algorithms ; Heuristic Methods

20020012284 National Aerospace Lab. , Informatics Div. , Amsterdam Netherlands

Efficient Harmonisation of Simulation Competence in a CACE Working Environment: Its Use in the Development of a Generic Vehicle Behaviour Federate ***Final Report***

Kos, J. ; ten Dam, A. A. ; Pruis, G. W. ; Vankan, W. J. ; November 1998 ; 22p ; In English ; Original contains color illustrations

Report No.(s): PB2002-100799 ; NLR-TP-98417 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

NLR is developing a generic behavior model for the simulation of a large class of (space) vehicles, based on multi-body dynamics theory and following objected-oriented principles. Special attention is given to the vehicle-terrain interface, which concerns the simulation of the contract and release events and the simulation of the constrained motion during the contact phase. NLR's working environment ISMuS supports the development of the generic vehicle behavior model by supplying simulation competence such as: application knowledge, model repositories, simulation tools, and model development tools, in a user-friendly way. The use of ISMuS allows more efficient development of the generic vehicle behavior model, since previously gathered know-how and know-why on modelling, simulation, and control of constrained robotic systems is contained in the working environment for use by the developers of the generic vehicle behavior federate.

NTIS

Computerized Simulation ; Programming Environments ; Computer Aided Design ; Three Dimensional Models ; Spacecraft

20020012343 Stanford Linear Accelerator Center , Menlo Park, CA USA

LCD Root Simulation and Analysis Tools

Iwasaki, M. ; Feb. 08, 2001 ; 5p ; In English

Report No.(s): DE2001-784876 ; SLAC-PUB-8774 ; No Copyright ; Avail: Department of Energy Information Bridge

The North American Linear Collider Detector group has developed a simulation program package based on the ROOT system. The package consists of Fast simulation, the reconstruction of the Full simulated data, and physics analysis utilities.

NTIS

Computerized Simulation ; Linear Alternators ; Data Processing

20020012424 NASA Glenn Research Center , Cleveland, OH USA

On the Performance of TCP Spoofing in Satellite Networks

Ishac, Joseph , NASA Glenn Research Center , USA ; Allman, Mark , Bolt, Beranek, and Newman, Inc. , USA ; September 2001 ; 12p ; In English ; MILCOM 2001 , 28-31 Oct. 2001 , Vienna, VA , USA ; Sponsored by Institute of Electrical and Electronics Engineers , USA

Contract(s)/Grant(s): RTOP 258-90-00

Report No.(s): NASA/TM-2001-211151 ; NAS 1.15:211151 ; E-13005 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

In this paper, we analyze the performance of Transmission Control Protocol (TCP) in a network that consists of both satellite and terrestrial components. One method, proposed by outside research, to improve the performance of data transfers over satellites is to use a performance enhancing proxy often dubbed 'spoofing.' Spoofing involves the transparent splitting of a TCP connection between the source and destination by some entity within the network path. In order to analyze the impact of spoofing, we constructed a simulation suite based around the network simulator ns-2. The simulation reflects a host with a satellite connection to the Internet and allows the option to spoof connections just prior to the satellite. The methodology used in our simulation allows us to analyze spoofing over a large range of file sizes and under various congested conditions, while prior work on this topic has

primarily focused on bulk transfers with no congestion. As a result of these simulations, we find that the performance of spoofing is dependent upon a number of conditions.
Author
Protocol (Computers) ; Computerized Simulation ; Computer Networks

20020012537 National Aerospace Lab. , Amsterdam, Netherlands
MOSAIC: Model-Oriented Software Automatic Interface Converter
Lammen, W. F. ; tenDam, A. A. ; Heesbeen, W. M. M. ; Franco, R. ; Nov. 2000 ; 20p ; In English ; Simulation for European Space Programmes (SESP) 2000 Workshop , 11 Oct. 2000 , Noordwijk , Netherlands ; Original contains color illustrations
Report No.(s): PB2001-108832 ; NLR-TP-2000-571 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
A typical requirement on simulation models, being software application components that need to interact with other simulation components, is compliance with interface standards. One of the challenges of the international simulation community is to enable simulation models to run in any simulation tool, independent of which tool was used for model creation. The National Aerospace Laboratory NLR has developed for ESA/ESTEC the Model-Oriented Software Automatic Interface Converter (MOSAIC) tool. MOSAIC automatically transfers simulation models from MATLAB/Simulink to the real-time simulation tool EuroSim. It has been experienced that automatic model transfer with MOSAIC significantly reduces time, cost, effort and error-prone source code editing.
NTIS
Computer Programs ; Computerized Simulation

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20020006064 RECOM Technologies, Inc. , Moffett Field, CA USA
Performance Evaluation Methodologies and Tools for Massively Parallel Programs
Yan, Jerry C. , RECOM Technologies, Inc. , USA ; Sarukkai, Sekhar , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; Frontiers 1995 , 6-9 Feb. 1995 , McLean, VA , USA
Contract(s)/Grant(s): RTOP 509-10-22 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
The need for computing power has forced a migration from serial computation on a single processor to parallel processing on multiprocessors. However, without effective means to monitor (and analyze) program execution, tuning the performance of parallel programs becomes exponentially difficult as program complexity and machine size increase. The recent introduction of performance tuning tools from various supercomputer vendors (Intel's ParAide, TMC's PRISM, CSI'S Apprentice, and Convex's CXtrace) seems to indicate the maturity of performance tool technologies and vendors'/customers' recognition of their importance. However, a few important questions remain: What kind of performance bottlenecks can these tools detect (or correct)? How time consuming is the performance tuning process? What are some important technical issues that remain to be tackled in this area? This workshop reviews the fundamental concepts involved in analyzing and improving the performance of parallel and heterogeneous message-passing programs. Several alternative strategies will be contrasted, and for each we will describe how currently available tuning tools (e.g., AIMS, ParAide, PRISM, Apprentice, CXtrace, ATExpert, Pablo, IPS-2)) can be used to facilitate the process. We will characterize the effectiveness of the tools and methodologies based on actual user experiences at NASA Ames Research Center. Finally, we will discuss their limitations and outline recent approaches taken by vendors and the research community to address them.
Author
Evaluation ; Massively Parallel Processors ; Parallel Processing (Computers) ; Performance Tests

20020006117 Sandia National Labs. , Albuquerque, NM USA
ASCI Network for SC' 98: Dense Wave Division Multiplexing for Distributed and Distance Computing
Adams, R. L. ; Butman, W. ; Martinez, L. G. ; Pratt, T. J. ; Vahle, M. O. ; Jun. 01, 1999 ; 23p ; In English
Report No.(s): DE2001-7860 ; SAND99-1480 ; No Copyright ; Avail: Department of Energy Information Bridge
This document highlights the DISCOM's Distance computing and communication team activities at the 1998 Supercomputing conference in Orlando, Florida. This conference is sponsored by the IEEE and ACM. Sandia National Laboratories, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory have participated in this

conference for ten years. For the last three years, the three laboratories have a joint booth at the conference under the DOE's ASCI, Accelerated Strategic Computing Initiatives. The DISCOM communication team uses the forum to demonstrate and focus communications and networking developments. At SC & DISCOM demonstrated the capabilities of Dense Wave Division Multiplexing. We exhibited an OC48 ATM encryptor. We also coordinated the other networking activities within the booth. This paper documents those accomplishments, discusses the details of their implementation, and describes how these demonstrations support overall strategies in ATM networking.
NTIS
Computer Networks ; Supercomputers

20020006177 Computer Sciences Corp. , Moffett Field, CA USA
Statistical Analysis of NAS Parallel Benchmarks and LINPACK Results
Meuer, Hans-Werner , Mannheim Univ., Mannheim , Germany ; Simon, Horst D. , Computer Sciences Corp. , USA ; Strohmeier, Erich , Mannheim Univ., Mannheim , Germany ; [1994] ; 1p ; In English ; Supercomputing 1994 , 14-18 Nov. 1994 , Washington, DC , USA
Contract(s)/Grant(s): NAS2-12961 ; RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

In the last three years extensive performance data have been reported for parallel machines both based on the NAS Parallel Benchmarks, and on LINPACK. In this study we have used the reported benchmark results and performed a number of statistical experiments using factor, cluster, and regression analyses. In addition to the performance results of LINPACK and the eight NAS parallel benchmarks, we have also included peak performance of the machine, and the LINPACK n and n(sub 1/2) values. Some of the results and observations can be summarized as follows: 1) All benchmarks are strongly correlated with peak performance. 2) LINPACK and EP have each a unique signature. 3) The remaining NPB can grouped into three groups as follows: (CG and IS), (LU and SP), and (MG, FT, and BT). Hence three (or four with EP) benchmarks are sufficient to characterize the overall NPB performance. Our poster presentation will follow a standard poster format, and will present the data of our statistical analysis in detail.
Author
Statistical Analysis ; Parallel Processing (Computers) ; Computer Systems Performance ; Computer Systems Programs

20020006185 Computer Sciences Corp. , Moffett Field, CA USA
Performance Evaluation of Three Distributed Computing Environments for Scientific Applications
Fatoohi, Rod , Computer Sciences Corp. , USA ; Weeratunga, Sisira , Computer Sciences Corp. , USA ; [1994] ; 1p ; In English ; Supercomputing 1994 , 14-18 Nov. 1994 , Washington, DC , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We present performance results for three distributed computing environments using the three simulated CFD applications in the NAS Parallel Benchmark suite. These environments are the DCF cluster, the LACE cluster, and an Intel iPSC/860 machine. The DCF is a prototypic cluster of loosely coupled SGI R3000 machines connected by Ethernet. The LACE cluster is a tightly coupled cluster of 32 IBM RS6000/560 machines connected by Ethernet as well as by either FDDI or an IBM Allnode switch. Results of several parallel algorithms for the three simulated applications are presented and analyzed based on the interplay between the communication requirements of an algorithm and the characteristics of the communication network of a distributed system.
Author
Algorithms ; Computational Fluid Dynamics ; Performance Tests ; Communication Networks

20020006204 Wisconsin Univ. , Dept. of Computer Sciences , Madison, WI USA
Cost-Effective Parallel Computing
Wood, David A. ; Hill, Mark D. ; Sep. 01, 1994 ; 6p ; In English
Contract(s)/Grant(s): F33615-94-1-1525 ; ARPA ORDER-B550
Report No.(s): AD-A395472 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Many academic papers imply that parallel computing is only worthwhile when applications achieve nearly linear speedup (i.e. execute nearly p times faster on p processors). This note shows that parallel computing is cost-effective whenever speedup exceeds costup-the parallel system cost divided by uniprocessor cost. Furthermore, when applications have large memory requirements (e.g. 512 megabytes) the costup and hence speedup necessary to be cost-effective can be much less than linear.
DTIC
Parallel Processing (Computers) ; Cost Effectiveness ; Computer Networks ; Applications Programs (Computers)

20020006210 Minnesota Univ. , Dept. of Computer Science , Minneapolis, MN USA

Distributed Network Computing Over Local ATM Networks

Lin, Mengjou ; Hsieh, Jenwei ; Du, David H. ; Thomas, Joseph P. ; MacDonald, James A. ; Jan. 01, 1995 ; 35p ; In English

Contract(s)/Grant(s): F19628-92-C-0072 ; DAAL02-89-C-0038

Report No.(s): AD-A395466 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Communication between processors has long been the bottleneck of distributed network computing. However, recent progress in switch-based high-speed Local Area Networks (LANs) may be changing this situation. Asynchronous Transfer Mode (ATM) is one of the most widely-accepted and emerging high-speed network standards which can potentially satisfy the communication needs of distributed network computing. In this paper, we investigate distributed network computing over local ATM networks.

DTIC

Asynchronous Transfer Mode ; Communication Networks ; Distributed Processing ; Local Area Networks

20020006498 Department of Defense , Office of the Inspector General , Arlington, VA USA

FY 2001 DoD Information Security Status for Government Information Security Reform

Sep. 19, 2001 ; 59p ; In English

Report No.(s): AD-A395673 ; IG/DOD-D-2001-184 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

The Government Information Security Reform Act (the Act) directs each Federal agency to evaluate its information security program and practices annually and, as part of the budget process, submit the results to the Office of Management and Budget.

Derived from text

Defense Program ; Governments ; Security ; Information Management

20020006505 Naval Postgraduate School , Monterey, CA USA

Network Defense-in-Depth: Evaluating Host-Based Intrusion Detection Systems

Yun, Ronald E. ; Vozzola, Steven A. ; Jun. 2001 ; 81p ; In English

Report No.(s): AD-A395808 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

As networks grow, their vulnerability to attack increases. DoD networks represent a rich target for a variety of attackers. The number and sophistication of attacks continue to increase as more vulnerabilities and the tools to exploit them become available over the Internet. The challenge for system administrators is to secure systems against penetration and exploitation while maintaining connectivity and monitoring and reporting intrusion attempts. Traditional intrusion detection (ID) systems can take either a network or a host- based approach to preventing attacks. Many networks employ network-based ID systems. A more secure network will employ both techniques. This thesis will analyze the benefits of installing host-based ID systems, especially on the critical servers (mail, web, DNS) that lie outside the protection of the network ID system/Firewall. These servers require a layer of protection to ensure the security of the entire network and reduce the risk or attack. Three host-based ID systems will be tested and evaluated to demonstrate their benefits on Windows 2000 Server. The proposed added security of host-based ID systems will establish defense-in-depth and work in conjunction with the network-based ID system to provide a complete security umbrella for the entire network.

DTIC

Defense Program ; Computer Networks ; Computer Information Security

20020006793 General Accounting Office , Washington, DC USA

Information Systems: Opportunities Exist to Strengthen SECs Oversight of Capacity and Security

July 2001 ; 39p ; In English ; Report to the Ranking Minority Member, Committee on Energy and Commerce, House of Representatives

Report No.(s): AD-A395533 ; GAO-01-863 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The various components of SECs ARP program provide it with a reasonable level of assurance that the SROs address capacity, security, and other information system issues. However, SECs ARP oversight could be improved. To plan and conduct inspections of SRO systems issues, ARP staff use various criteria, including checklists that are based on ARP policy statements and standards from guidance developed by other external audit organizations and information technology bodies, such as banking regulators. However, we found that the ARP program has not consolidated these criteria into a single guide that covers all the issues key to SEC oversight or that provides the specific review steps.

DTIC

Information Systems ; Systems Analysis ; Security

20020006837 Argonne National Lab. , IL USA

Components and interfaces of a process management system for parallel programs

Butler, R. ; Gropp, W. ; Lusk, E. ; Feb. 23, 2001 ; 12p ; In English

Report No.(s): DE2001-775263 ; ANL/MCS/CP-104191 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Parallel jobs are different from sequential jobs and require a different type of process management. We present here a process management system for parallel programs such as those written using MPI (Message Passing Interface). A primary goal of the system, which we call MPD (for multipurpose daemon), is to be scalable. by this we mean that startup of interactive parallel jobs comprising thousands of processes is quick, that signals can be quickly delivered to processes, and that stdin, stdout, and stderr are managed intuitively. Our primary target is parallel machines made up of clusters of SMPs, but the system is also useful in more tightly integrated environments. We describe how MPD enables much faster startup and better runtime management of parallel jobs. We show how close control of stdio can support the easy implementation of a number of convenient system utilities, even a parallel debugger. We describe a simple but general interface that can be used to separate any process manager from a parallel library, which we use to keep MPD separate from MPICH.

NTIS

Management Information Systems ; Parallel Processing (Computers)

20020008167 Department of Defense , Office of the Inspector General , Arlington, VA USA

Implementation of DoD Information Security Policy for Processing Accomplished at Defense Enterprise Computing Centers

Sep. 19, 2001 ; 51p ; In English

Report No.(s): AD-A395684 ; IG/DOD-D-2001-183 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

Public Law 106-398, 'Government Information Security Reform,' title X, subtitle G, FY 2001 Floyd D. Spence National Defense Authorization Act, requires that each agency obtain an independent assessment of its security posture. The Inspector General of each agency is to evaluate the agency's security posture based on a review of an independently selected subset of systems. The DoD (Department of Defense) uses information technology for thousands of processes that are integral to support and operational functions. Mission critical, mission essential, and support function processes, or applications, reside on computer systems in Defense Enterprise Computing Centers and Detachments, which are part of the Defense Information Systems Agency. Customer applications from all DoD Components include financial accounting; personnel; pay and disbursement; material shipping, receiving, and storing; munitions maintenance; and weapon systems-associated applications.

DTIC

Policies ; Defense Program ; USA ; Computer Information Security

20020008206 NASA Ames Research Center , Moffett Field, CA USA

Improved Multi-Partition Method for Line-Based Iteration Schemes

Smith, Merritt H. , NASA Ames Research Center , USA ; VanderWijngaart, Rob , MCAT Inst. , USA ; Yarrow, Maurice , Sterling Software, Inc. , USA ; [1994] ; 1p ; In English ; NASA Computational Aerosciences Workshop , 7-9 Mar. 1995 , Moffett Field, CA , USA ; Sponsored by NASA , USA

Contract(s)/Grant(s): NCC2-752 ; NCC2-13210 ; RTOP 509-10-00 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Regular 3-dimensional multi-partitioning has been shown to be an efficient domain decomposition method for the parallelization of ADI-type algorithms on MIMD architectures. This paper discusses further improvements that can be made to the scheme that increase the granularity and reduce the communication density. These improvements, which are illustrated by simulation and parallel benchmark results, make multi-partitioning the method of choice on systems with relatively poor communication capabilities, such as networks of workstations, or on massively parallel machines with very fast processors, such as the IBM SP2.

Author

Iteration ; Parallel Processing (Computers) ; Algorithms

20020008207 RECOM Technologies, Inc. , Moffett Field, CA USA

Toward Automatic Scalability Analysis of Message Passing Programs: A Case Study

Sarukkai, Sekhar R. , RECOM Technologies, Inc. , USA ; Mehra, Pankaj , RECOM Technologies, Inc. , USA ; Block, Robert , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English ; Frontiers 1995 , 6-9 Feb. 1995 , McLean, VA , USA

Contract(s)/Grant(s): RTOP 509-10-31 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Scalability analysis forms an important component of any performance debugging cycle, for massively parallel machines. However, tools that help in performing such analysis for parallel programs are non-existent. The primary reason for lack of such tools is the complexity involved in capturing program dynamics such as communication-computation overlap, communication latencies and memory hierarchy reference patterns. In this paper, we highlight some simple techniques that can be used to study scalability of explicit message-passing parallel programs that consider the above issues. We start from the high level source code and use a methodology for deducing communication characteristics and its impact on the total execution time of the program. The approach is validated with the help of a pipelined method for solving scalar tri-diagonal systems, using both simulations and symbolic cost models on the Intel hypercube.
Author
Program Verification (Computers) ; Massively Parallel Processors ; Parallel Processing (Computers)

20020008212 Lawrence Livermore National Lab. , Livermore, CA USA
Analysis, tuning and comparison of two general sparse solvers for distributed memory computers
Amestoy, P. R. ; Duff, I. S. ; L'Excellent, J. Y. ; Li, X. S. ; Jun. 30, 2000 ; 63p ; In English
Report No.(s): DE2001-776597 ; LBNL-45992 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We describe the work performed in the context of a Franco-Berkeley funded project between NERSC-LBNL located in Berkeley (USA) and CERFACS-ENSEEIHT located in Toulouse (France). We discuss both the tuning and performance analysis of two distributed memory sparse solvers (superlu from Berkeley and mumps from Toulouse) on the 512 processor Cray T3E from NERSC (Lawrence Berkeley National Laboratory). This project gave us the opportunity to improve the algorithms and add new features to the codes. We then quite extensively analyze and compare the two approaches on a set of large problems from real applications. We further explain the main differences in the behavior of the approaches on artificial regular grid problems. As a conclusion to this activity report, we mention a set of parallel sparse solvers on which this type of study should be extended.
NTIS
Computers ; Distributed Memory

20020008227 NASA Ames Research Center , Moffett Field, CA USA
Dynamic Load Balancing For Grid Partitioning on a SP-2 Multiprocessor: A Framework
Sohn, Andrew , New Jersey Inst. of Tech. , USA ; Simon, Horst , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 9th International Parallel Processing Symposium , 25-28 Apr. 1995 , Santa Barbara, CA , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Computational requirements of full scale computational fluid dynamics change as computation progresses on a parallel machine. The change in computational intensity causes workload imbalance of processors, which in turn requires a large amount of data movement at runtime. If parallel CFD is to be successful on a parallel or massively parallel machine, balancing of the runtime load is indispensable. Here a framework is presented for dynamic load balancing for CFD applications, called Jove. One processor is designated as a decision maker Jove while others are assigned to computational fluid dynamics. Processors running CFD send flags to Jove in a predetermined number of iterations to initiate load balancing. Jove starts working on load balancing while other processors continue working with the current data and load distribution. Jove goes through several steps to decide if the new data should be taken, including preliminary evaluate, partition, processor reassignment, cost evaluation, and decision. Jove running on a single IBM SP2 node has been completely implemented. Preliminary experimental results show that the Jove approach to dynamic load balancing can be effective for full scale grid partitioning on the target machine IBM SP2.
Author
Computational Fluid Dynamics ; Parallel Processing (Computers) ; Parallel Computers

20020008228 RECOM Technologies, Inc. , Moffett Field, CA USA
Automated Scalability Analysis Tools for Message Passing Parallel Programs
Sarukkai, Sekhar R. , RECOM Technologies, Inc. , USA ; Mehra, Pankaj , RECOM Technologies, Inc. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 509-10-31 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
In order to develop scalable parallel applications, a number of programming decisions have to be made during the development of the program. Performance tools that help in making these decisions are few, if existent. Traditionally, performance tools have focused on exposing performance bottlenecks of small-scale executions of the program. However, it is common knowledge that programs that perform exceptionally well on small processor configurations, more often than not, perform poorly when executed on larger processor configurations. Hence, new tools that predict the execution characteristics of scaled-up programs are an essential part of an application developers toolkit. In this paper we discuss important issues that need to be

considered in order to build useful scalability analysis tools for parallel programs. We introduce a simple tool that automatically extracts scalability characteristics of a class of deterministic parallel programs. We show with the help of a number of results on the Intel iPSC/860, that predictions are within reasonable bounds.
Author
Parallel Processing (Computers) ; Software Development Tools

20020008403 Sandia National Labs. , Albuquerque, NM USA
Implementing Virtual Private Networking for Enabling Lower Cost, More Secure Wide Area Communications at Sandia National Laboratories
Miller, ; Yonek, ; Aug. 01, 2001 ; 84p ; In English
Report No.(s): DE2001-786633 ; SAND2001-2264 ; No Copyright ; Avail: Department of Energy Information Bridge
Virtual Private Networking is a new communication technology that promises lower cost, more secure wide area communications by leveraging public networks such as the Internet. Sandia National laboratories has embrace the technology for interconnecting remote sites to Sandia's corporate network, and for enabling remote access users for both dial-up and broadband access.
NTIS
Communication Networks ; Broadband ; Wide Area Networks

20020009033 Argonne National Lab. , IL USA
Secure, efficient data transport and replica management for high-performance data-intensive computing
Allcock, B. ; Bester, J. ; Bresnahan, J. ; Chervenak, A. L. ; Foster, I. ; Feb. 23, 2001 ; 15p ; In English
Report No.(s): DE2001-776736 ; ANL/MCS/CP-104204 ; No Copyright ; Avail: Department of Energy Information Bridge
An emerging class of data-intensive applications involve the geographically dispersed extraction of complex scientific information from very large collections of measured or computed data. Such applications arise, for example, in experimental physics, where the data in question is generated by accelerators, and in simulation science, where the data is generated by supercomputers. So-called Data Grids provide essential infrastructure for such applications, much as the Internet provides essential services for applications such as e-mail and the Web. We describe here two services that we believe are fundamental to any Data Grid: reliable, high-speed transport and replica management. Our high-speed transport service, GridFTP, extends the popular FTP (File Transfer Protocol) protocol with new features required for Data Grid applications, such as striping and partial file access. Our replica management service integrates a replica catalog with GridFTP transfers to provide for the creation, registration, location, and management of dataset replicas. We present the design of both services and also preliminary performance results. Our implementations exploit security and other services provided by the Globus Toolkit.
NTIS
Data Management ; Computational Grids ; Data Transmission ; Computer Information Security ; Supercomputers

20020009142 Lawrence Livermore National Lab. , Livermore, CA USA
Electronic Resources for Security Related Information, CIAC-2307 R.1
Feingold, Richard ; Dec. 01, 1994 ; 77p ; In English ; Prepared in cooperation with Booz Allen and Hamilton, McLean, VA
Report No.(s): AD-A395715 ; UCRL-ID-118613 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
Information Technology (IT) security professionals are battling network attackers. Each of the professionals from the operations level down to the assistant computer security officer, whether classified or unclassified, manager or user must maintain their ability to recognize the threat and acquire the appropriate countermeasures. They must gain and maintain knowledge and ability to use the ever increasing resources on parity with the attackers. This paper opens the door for the novice and enlarges the opening for the expert. It increases the reader s threat awareness and enables effective and efficient use of the resources that attackers will certainly use against us. In short, cognizance of electronic resources is critical they are the common ground of both information technology threats and countermeasures. The attackers use the resources with abundant facility; we must become at least as proficient.
DTIC
Information Systems ; Data Processing ; Computer Information Security

20020009177 Booz-Allen and Hamilton, Inc. , McLean, VA USA
Understanding Information Age Warfare
Alberts, David S. ; Garstka, John J. ; Hayes, Richard E. ; Signori, David A. ; Aug. 2001 ; 320p ; In English
Report No.(s): AD-A395859 ; XD-ASD/C3I/CCRP ; No Copyright ; Avail: CASI ; A14 , Hardcopy ; A03 , Microfiche

Armed with a general understanding of the concepts of Information Superiority and Network Centric Warfare, enterprising individuals and organizations are developing new ways of accomplishing their missions by leveraging the power of information and applying network centric concepts. Visions are being created and significant progress is being made. But to date we have been only scratching the surface of what is possible.
DTIC
Computer Networks ; Military Operations ; Information Retrieval ; Warfare

20020009213 Naval Postgraduate School , Monterey, CA USA
Navy/Marine Corps Intranet Information Assurance Operational Services Performance Measures
Gumke, Randall ; Jun. 2001 ; 130p ; In English
Report No.(s): AD-A396135 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
Communicating in the Department of the Navy (DON) over the Internet is an everyday event. The DON is developing the Navy Marine Corps Intranet (N/MCI) to enhance this communication capability. The security of communicating over the N/MCI has become a concern to the DON. The DON is relying on the N/MCI contractor to provide security for their communications. Key aspects of this secure communication will be provided through the use of a DON Public Key Infrastructure (PKI), which the N/MCI contractor is managing. to ensure the security of the PKI based communications the contract requires the monitoring of four PKI performance measures. This thesis analyzes performance measures, criterion, and standards then uses this analysis to review the contractual PKI performance measures and data collected from commercial PKI vendors. It recommends changes to these performance measures and provides additional performance criteria that should be included in the N/MCI contract. Finally, this thesis analyses how the N/MCI contract, specifically the PKI, impact DON members.
DTIC
Navy ; Internets ; Performance Tests ; Computer Networks ; Computer Information Security

20020011018 NASA Ames Research Center , Moffett Field, CA USA
Dynamic Load Balancing for Grid Partitioning on a SP-2 Multiprocessor: A Framework
Sohn, Andrew , NASA Ames Research Center , USA ; Simon, Horst , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 9th International Parallel Processing Symposium , 25-28 Apr. 1995 , Santa Barbara, CA , USA
Contract(s)/Grant(s): NAS2-12961 ; RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Computational requirements of full scale computational fluid dynamics change as computation progresses on a parallel machine. The change in computational intensity causes workload imbalance of processors, which in turn requires a large amount of data movement at runtime. If parallel CFD is to be successful on a parallel or massively parallel machine, balancing of the runtime load is indispensable. Here a framework is presented for dynamic load balancing for CFD applications, called Jove. One processor is designated as a decision maker Jove while others are assigned to computational fluid dynamics. Processors running CFD send flags to Jove in a predetermined number of iterations to initiate load balancing. Jove starts working on load balancing while other processors continue working with the current data and load distribution. Jove goes through several steps to decide if the new data should be taken, including preliminary evaluate, partition, processor reassignment, cost evaluation, and decision. Jove running on a single EBM SP2 node has been completely implemented. Preliminary experimental results show that the Jove approach to dynamic load balancing can be effective for full scale grid partitioning on the target machine IBM SP2.
Author
Dynamic Loads ; Computational Fluid Dynamics ; Balancing ; Parallel Processing (Computers)

20020012003 NASA Glenn Research Center , Cleveland, OH USA
Space Internet-Embedded Web Technologies Demonstration
Foltz, David A. , NASA Glenn Research Center , USA ; September 2001 ; 10p ; In English ; Original contains color illustrations
Contract(s)/Grant(s): RTOP 322-20-2A
Report No.(s): NASA/TM-2001-211145 ; E-12997 ; NAS 1.15:211145 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
The NASA Glenn Research Center recently demonstrated the ability to securely command and control space-based assets by using the Internet and standard Internet Protocols (IP). This is a significant accomplishment because future NASA missions will benefit by using Internet standards-based protocols. The benefits include reduced mission costs and increased mission efficiency. The Internet-Based Space Command and Control System Architecture demonstrated at the NASA Inspection 2000 event proved that this communications architecture is viable for future NASA missions.
Author
Internets ; NASA Programs ; Protocol (Computers) ; Architecture (Computers) ; Spacecraft Control

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20020006042 State Univ. of New York , Center of Multisource Information Fusion , Buffalo, NY USA
Foundations for an Empirically Determined Scale of Trust in Automated Systems ***Interim Report , Apr. 1996-Feb. 1997***
Jian, Jiun-Yin ; Bisantz, Ann M. ; Drury, Colin G. ; Llinas, James ; February 1998 ; 48p ; In English
Contract(s)/Grant(s): F41624-94-D-6000 ; Proj-7184
Report No.(s): AD-A395339 ; AFRL-HE-WP-TR-2000-0102 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

One component in the successful use of automated systems is the extent to which people trust the automation to perform effectively. In order to understand the relationship between trust in computerized systems and the use of those systems, we need to be able to effectively measure trust. Although questionnaires regarding trust have been used in prior studies, these questionnaires were theoretically rather than empirically generated and did not distinguish between three potentially different types of trust: human-human trust, human-machine trust, and trust in general. A three-phased experiment, comprising a word elicitation study, a questionnaire study, and a paired comparison study was performed, in order to better understand similarities and differences in the concepts of trust and distrust, and between the different types of trust. Results indicated that trust and distrust can be considered opposites, rather than comprising different concepts. Components of trust, in terms of words related to trust, were similar across the three types of trust. Results obtained from a cluster analysis were used to identify 12 potential factors of trust between people and automated systems. These 12 factors were then used to develop a proposed scale to measure trust in automation.
DTIC
Automatic Control ; Man Machine Systems

20020006174 NASA Ames Research Center , Moffett Field, CA USA
Goal Directed Model Inversion: Learning Within Domain Constraints
Colombano, Silvano P. , NASA Ames Research Center , USA ; Compton, Michael , RECOM Technologies, Inc. , USA ; Raghavan, Bharathi , DeAnza Coll. , USA ; [1994] ; 1p ; In English ; Neural Information Processing Systems , 28 Nov. - 3 Dec. 1994 , Denver, CO , USA
Contract(s)/Grant(s): RTOP 233-03-04 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Goal Directed Model Inversion (GDMI) is an algorithm designed to generalize supervised learning to the case where target outputs are not available to the learning system. The output of the learning system becomes the input to some external device or transformation, and only the output of this device or transformation can be compared to a desired target. The fundamental driving mechanism of GDMI is to learn from success. Given that a wrong outcome is achieved, one notes that the action that produced that outcome ”would have been right if the outcome had been the desired one.” The algorithm makes use of these intermediate ”successes” to achieve the final goal. A unique and potentially very important feature of this algorithm is the ability to modify the output of the learning module to force upon it a desired syntactic structure. This differs from ordinary supervised learning in the following way: in supervised learning the exact desired output pattern must be provided. In GDMI instead, it is possible to require simply that the output obey certain rules, i.e., that it ”make sense” in some way determined by the knowledge domain. The exact pattern that will achieve the desired outcome is then found by the system. The ability to impose rules while allowing the system to search for its own answers in the context of neural networks is potentially a major breakthrough in two ways: 1) it may allow the construction of networks that can incorporate immediately some important knowledge, i.e. would not need to learn everything from scratch as normally required at present, and 2) learning and searching would be limited to the areas where it is necessary, thus facilitating and speeding up the process. These points are illustrated with examples from robotic path planning and parametric design.
Author
Inversions ; Algorithms ; Machine Learning

20020006247 Federal Energy Technology Center , Morgantown, WV USA
Design and construction of a force-reflecting teleoperation system
Ebadian, M. A. ; Jan. 01, 1999 ; 102p ; In English
Report No.(s): DE2001-772517 ; DE-FG01-95EW55094-65 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

For certain applications, such as space servicing, undersea operations, and hazardous material handling tasks in nuclear reactors, the environments can be uncertain, complex, and hazardous. Lives may be in danger if humans were to work under these conditions. As a result, a man-machine system--a teleoperator system--has been developed to work in these types of environments. In a typical teleoperator system, the actual system operates at a remote site; the operator located away from this system usually receives visual information from a video image and/or graphical animation on the computer screen. Additional feedback, such as aural and force information, can significantly enhance performance of the system. Force reflection is a type of feedback in which forces experienced by the remote manipulator are fed back to the manual controller. Various control methods have been proposed for implementation on a teleoperator system. In order to examine different control schemes, a one Degree-Of-Freedom (DOF) Force-Reflecting Manual Controller (FRMC) is constructed and integrated into a PC. The system parameters are identified and constructed as a mathematical model. The Proportional-Integral-Derivative (PID) and fuzzy logic controllers are developed and tested experimentally. Numerical simulation results obtained from the mathematical model are compared with those of experimental data for both types of controllers. In addition, the concept of a telesensation system is introduced. A telesensation system is an advanced teleoperator system that attempts to provide the operator with sensory feedback. In this context, a telesensation system integrates the use of a Virtual Reality (VR) unit, FRMC, and Graphical User Interface (GUI). The VR unit is used to provide the operator with a 3-D visual effect. Various commercial VR units are reviewed and features compared for use in a telesensation system. As for the FRMC, the conceptual design of a 3-DOF FRMC is developed in an effort to make the system portable, compact, and lightweight. A variety of design alternatives are presented and evaluated. Finally, a GUI software package is developed to interface with several teleoperation unit components. These components include an industrial robot, electric motor, encoder, force/torque sensor, and CCD camera. The software includes features such as position scaling, force scaling, and rereferencing and is intended to provide a sound basis for the development of a multi-DOF FRMC system in the future.
NTIS
Teleoperators ; Applications Programs (Computers) ; Sensory Feedback ; Remote Manipulator System ; CCD Cameras ; Graphical User Interface

20020006313 Research Inst. for Advanced Computer Science , Moffett Field, CA USA
Representing Learning With Graphical Models
Buntine, Wray L. , Research Inst. for Advanced Computer Science , USA ; [1994] ; 2p ; In English
Contract(s)/Grant(s): RTOP 233-01-02 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Probabilistic graphical models are being used widely in artificial intelligence, for instance, in diagnosis and expert systems, as a unified qualitative and quantitative framework for representing and reasoning with probabilities and independencies. Their development and use spans several fields including artificial intelligence, decision theory and statistics, and provides an important bridge between these communities. This paper shows by way of example that these models can be extended to machine learning, neural networks and knowledge discovery by representing the notion of a sample on the graphical model. Not only does this allow a flexible variety of learning problems to be represented, it also provides the means for representing the goal of learning and opens the way for the automatic development of learning algorithms from specifications.
Author
Machine Learning ; Mathematical Models ; Probability Theory

20020006796 Texas Univ. , Computer and Vision Research Center , Austin, TX USA
Segmentation and Recognition of Continuous Human Activity
Ali, Anjum ; Aggarwal, J. K. ; January 2001 ; 9p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0230 ; DAAH04-95-1-0494
Report No.(s): AD-A395511 ; ARO-37634.19-PH ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
This paper presents a methodology for automatic segmentation and recognition of continuous human activity. We segment a continuous human activity into separate actions and correctly identify each action. The camera views the subject from the lateral view. There are no distinct breaks or pauses between the execution of different actions. We have no prior knowledge about the commencement or termination of each action. We compute the angles subtended by three major components of the body with the vertical axis, namely the torso, the upper component of the leg and the lower component of the leg. Using these three angles as a feature vector we classify frames into breakpoint and non-breakpoint frames. Breakpoints indicate an action's commencement or termination. We use single action sequences for the training data set. The test sequences, on the other hand, are continuous sequences of human activity that consist of three or more actions in succession. The system has been tested on continuous activity

sequences containing actions such as walking, sitting down, standing up, bending, getting up, squatting and rising. It detects the breakpoints and classifies the actions between them.
DTIC
Pattern Recognition ; Image Processing ; Walking ; Human Reactions

20020007083 Sandia National Labs. , Albuquerque, NM USA
Embudito Mission: A Case Study of the Systematics of Autonomous Ground Mobile Robots
Eicker, P. J. ; Feb. 01, 2001 ; 31p ; In English
Report No.(s): DE2001-786622 ; SAND2001-0193 ; No Copyright ; Avail: Department of Energy Information Bridge
Ground mobile robots are much in the mind of defense planners at this time, being considered for a significant variety of missions with a diversity ranging from logistics supply to reconnaissance and surveillance. While there has been a very large amount of basic research funded in the last quarter century devoted to mobile robots and their supporting component technologies, little of this science base has been fully developed and deployed-notable exceptions being NASA's Mars rover and several terrestrial derivatives. The material in this paper was developed as a first exemplary step in the development of a more systematic approach to the R&D of ground mobile robots.
NTIS
Robots ; Research and Development ; Autonomy ; Deployment

20020008098 Technische Univ. , Delft, Netherlands
Compile-Time Scheduling for Distributed-Memory Systems
Radulescu, A. ; Jun. 05, 2001 ; 152p ; In English
Report No.(s): PB2001-106697 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche
In this thesis we addressed the problem of scheduling parallel programs at compile time on a distributed memory system, also known as the task scheduling problem. Our main goal was to reduce the scheduling time complexity while at the same time obtaining performance comparable with existing approaches performance. Low time complexity, namely the problem size and the parallel system size have grown to be extremely large. We considered the scheduling problem from two different perspectives: scheduling tasks that can run only on a single processor (S-task scheduling), and scheduling tasks that can run on multiple processors (M-task scheduling).
NTIS
Parallel Processing (Computers) ; Distributed Memory ; Programming (Scheduling) ; Task Complexity

20020008125 Oak Ridge National Lab. , TN USA
Advanced Three-Dimensional Deterministic and Monte Carlo Codes for Simulation of Real-Life Complex Nuclear Systems
Haghighat, A. ; Jan. 10, 2001 ; 5p ; In English
Report No.(s): DE2001-774681 ; P00-109310 ; No Copyright ; Avail: Department of Energy Information Bridge
In the past 10 years, the Penn State Transport Theory Group (PSTTG) has concentrated its efforts on developing accurate and efficient particle transport codes to address increasing needs for efficient and accurate simulation of nuclear systems. The PSTTG's efforts have primarily focused on shielding applications that are generally treated using multigroup, multi-dimensional, discrete ordinates (S(sub n)) deterministic and/or statistical Monte Carlo methods. The difficulty with the existing public codes is that they require significant (impractical) computation time for simulation of complex three-dimensional (3-D) problems. For the S(sub n) codes, the large memory requirements are handled through the use of scratch files (i.e., read-from and write-to-disk) that significantly increases the necessary execution time. Further, the lack of flexible features and/or utilities for preparing input and processing output makes these codes difficult to use. The Monte Carlo method becomes impractical because variance reduction (VR) methods have to be used, and normally determination of the necessary parameters for the VR methods is very difficult and time consuming for a complex 3-D problem.
NTIS
Complex Systems ; Monte Carlo Method ; Computerized Simulation ; Commercial Off-The-Shelf Products

20020008133 Oak Ridge National Lab. , TN USA
Fault Detection for Wheeled Mobile Robots with Parametric Uncertainty
Dixon, W. E. ; Jan. 18, 2001 ; 6p ; In English ; Advanced Intelligent Mechatronics (AIM)
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774668 ; P00-109334 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In this paper, we develop a new method for Wheeled Mobile Robot (WMR) fault detection. Specifically, we develop kinematic and dynamic models of the WMR in the presence of faults such as a change in the wheel radius (e.g., deformation, broken spoke, flat tire) or general kinematic disturbances that model slipping or skidding faults. Utilizing the WMR models, we employ a torque filtering technique to develop a prediction error based fault detection residual. The structure of the prediction error allows for fault detection despite parametric uncertainty in the WMR model.
NTIS
Dynamic Models ; Fault Detection ; Kinematics ; Robots

20020008998 Massachusetts Inst. of Tech. , Artificial Intelligence Lab. , Cambridge, MA USA
The Intelligent Room ***Final Report , Jun. 1994-Aug. 1999***
Shrobe, H. ; Coen, M. ; Wilson, K. ; Weisman, L. ; Thomas, K. ; Aug. 2001 ; 53p ; In English
Contract(s)/Grant(s): F30602-94-C-0204 ; Proj-B322
Report No.(s): AD-A395958 ; AFRL-IF-RS-TR-2001-168 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Intelligent, interactive environments promise to drastically change our everyday lives by connecting computation to ordinary, human-level events happening in the real world. The motivation for building these intelligent, interactive environments is to bring computation into the real, physical world to support what are traditionally considered non-computational activities. The ultimate goal is to allow people to interact with computational systems in a way that they would with other people: via gesture, voice, movement, and context. An existing prototype space, known as The Intelligent Room, was created to experiment with different forms of natural, multi-modal human-computer interaction. This research platform is equipped with numerous computer vision, speech, and gesture recognition systems that connect it to what the inhabitants of the room are doing and saying. The purpose of this report is to detail the design of The Intelligent Room and the experiences gained during its creation.
DTIC
Human-Computer Interface ; Systems Engineering ; Artificial Intelligence

20020009091 Los Alamos National Lab. , NM USA
Novelty detection under changing environmental conditions
Sohn, H. ; Worder, K. ; Farrar, C. R. ; Apr. 01, 2001 ; 11p ; In English
Report No.(s): DE2001-777147 ; LA-UR-01-1894 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The primary objective of novelty detection is to examine a system's dynamic response to determine if the system significantly deviates from an initial baseline condition. In reality, the system is often subject to changing environmental and operation conditions that affect its dynamic characteristics. Such variations include changes in loading, boundary conditions, temperature, and moisture. Most damage diagnosis techniques, however, generally neglect the effects of these changing ambient conditions. Here, a novelty detection technique is developed explicitly taking into account these natural variations of the system in order to minimize false positive indications of true system changes. Auto-associative neural networks are employed to discriminate system changes of interest such as structural deterioration and damage from the natural variations of the system.
NTIS
Boundary Conditions ; Environmental Monitoring ; Neural Nets ; Dynamic Characteristics

20020009092 Kansas City Plant , Kansas City, MO USA
Intelligent Software Tools for Advanced Computing
Baumgart, C. W. , Kansas City Plant , USA ; Apr. 03, 2001 ; 9p ; In English
Report No.(s): DE2001-776968 ; KCP-613-6424 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Feature extraction and evaluation are two procedures common to the development of any pattern recognition application. These features are the primary pieces of information which are used to train the pattern recognition tool, whether that tool is a neural network, a fuzzy logic rulebase, or a genetic algorithm. Careful selection of the features to be used by the pattern recognition tool can significantly streamline the overall development and training of the solution for the pattern recognition application. This report summarizes the development of an integrated, computer-based software package called the Feature Extraction Toolbox (FET), which can be used for the development and deployment of solutions to generic pattern recognition problems. This toolbox integrates a number of software techniques for signal processing, feature extraction and evaluation, and pattern recognition, all under a single, user-friendly development environment. The toolbox has been developed to run on a laptop computer, so that it may be taken to a site and used to develop pattern recognition applications in the field. A prototype version of this toolbox has

been completed and is currently being used for applications development on several projects in support of the Department of Energy.
NTIS
Pattern Recognition ; Applications Programs (Computers) ; Computer Techniques

20020009210 Naval Postgraduate School , Monterey, CA USA
The NPS Small Robotic Technology Initiative, Man-Portable Robots for Low Intensity Conflict
Ferry, Todd W. ; Jun. 2001 ; 179p ; In English
Report No.(s): AD-A396139 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A02 , Microfiche

The Naval Postgraduate School's Small Robotic Technology (SMART) Initiative is an ongoing research effort within the Combat Systems Science and Technology Curriculum that engages in forward-looking applications of small robotic technology for military employment. The immediate goal of which is to develop a multipurpose robotic platform that is capable of hosting varied sensor packages for military research. This thesis successfully accomplished initial background research and integration of a low cost, lightweight, all-terrain, robotic vehicle to fulfill this requirement. The areas of robotic investigation included: research and procurement of a Foster Miller Lemming tracked vehicle; the selection of a robust, network enabled, real-time microcontroller called the ipEngine; selection of Differential GPS as a highly accurate autonomous vehicle positioning technique; and the development of the ipEngine software environment for integration and testing of the microcontroller's wireless interfacing. Wireless communication tests using TCP/IP sockets, serial communication, telnet and a common Internet Web Browser validated the ability to remotely operate the vehicle under both direct and autonomous control. Ultimately, this thesis laid the foundation for follow-on NPS students to research and integrate varied robotic sensing techniques, including synthetic array seismic sonar's and chemical detection devices, and to participate in cooperative research with other military laboratories.
DTIC
Robotics ; Robots ; Autonomy

20020009635 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Fast Feedback System for CEBAF
Chowdhary, M. P. ; Krafft, G. A. ; Shoaee, H. ; Watson, W. A. ; Oct. 01, 1995 ; 6p ; In English
Report No.(s): DE2001-777762 ; JLAB-ACC-95-001 ; DOE/ER/40150-1835 ; No Copyright ; Avail: Department of Energy Information Bridge

A fast feedback system based on concepts of modern control theory has been implemented in the CEBAF (Continuous Electron Beam Accelerator Facility) Control System to stabilize various machine parameters. The continuous wave operation of CEBAF requires that parameters such as beam energy and position are stabilized against fast fluctuations. The beam energy must be stabilized against fast gradient and phase fluctuations in the RF (radio frequency) accelerating system. This fast feedback system currently operates at 60 Hz rate and is integrated with EPICS (Experimental Physics and Industrial Control System). The mathematical model of the system for various feedback loops is expressed in state space formalism. The design of control law and simulation of closed-loop system response is performed using Matlab (TM) and Simulink (TM). This paper describes the process of designing control algorithms, implementation of the fast feedback system and operational experience with this system at CEBAF. The performance of this feedback system, while operating at much higher rates with high closed loop gain, can be enhanced by continually performing on-line identification of the system from the input and output data. System identification is the process of developing or improving an analytically derived mathematical representation of a physical system using experimental data. The current status of this feature is presented.
NTIS
Control Systems Design ; Feedback Control ; Linear Accelerators ; Numerical Control

20020009679 ITT Systems and Sciences Corp. , Rome, NY USA
Knowledge Base Applications to Adaptive Space-Time Processing , Volume 4 , Knowledge-Based Tracking ***Final Report , Aug. 1995-Jul. 1999***
Morgan, Charles ; Moyer, Lee ; Jul. 2001 ; 76p ; In English ; Prepared in cooperation with Technology Service Corporation, Trumbull, CT
Contract(s)/Grant(s): F30602-95-C-0041 ; AF Proj. 4506
Report No.(s): AD-A396021 ; TSC-CT109-22-Vol-4 ; AFRL-SN-RS-TR-2001-146-Vol-4 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

This report describes a knowledge-based tracking capability that will support a space-time adaptive processing (STAP) environment. The effort described in this report resulted in development of a multiple target tracker and the design and testing

of several knowledge-based rules. Three types of tracking filters are described: 1) An uncoupled two state alpha-beta filter with position and velocity component states, 2) An uncoupled three state Kalman filter with position, velocity, and acceleration component states, and 3) An extended four state Kalman filter with both x and y position and velocity component states. The first two filters use a one-dimensional measurement vector containing the report position component. The extended Kalman filters uses a three-dimensional measurement vector containing x and y report position and 'pseudo' Doppler, the latter defined as range times range rate.
DTIC
Radar Tracking ; Kalman Filters ; Tracking Filters

20020010611 Atomic Energy Commission , Idaho Falls, ID USA
Virtualwindow: A Reconfigurable, Modular, Stereo Vision System
McKay, M. D. ; Anderson, M. O. ; Kinoshita, R. A. ; Willis, W. D. ; Feb. 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9608 ; INEEL/CON-99-00199 ; No Copyright ; Avail: Department of Energy Information Bridge
An important need while using unmanned vehicles is the ability for the remote operator or observer to easily and accurately perceive the operating environment. A classic problem in providing a complete representation of the remote work area is sensory overload or excessive complexity in the human-machine interface. In addition, remote operations often benefit from depth perception capability while viewing or manipulating objects. Thus, there is an ongoing effort within the remote and teleoperated robotic field to develop better human-machine interfaces. The Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL) has been researching methods to simplify the human-machine interface using atypical operator techniques. Initial telepresence research conducted at the INEEL developed and implemented a concept called the VirtualwindoW. This system minimized the complexity of remote stereo viewing controls and provided the operator the "feel" of viewing the environment, including depth perception, in a natural setting. The Virtual window has shown that the human-machine interface can be simplified while increasing operator performance. This paper deals with the continuing research and development of the VirtualwindoW to provide a reconfigurable, modular system that easily utilizes commercially available off the shelf components. This adaptability is well suited to several aspects of unmanned vehicle applications, most notably environmental perception and vehicle control.
NTIS
Computer Vision ; Robotics ; Stereoscopic Vision

20020011373 Research Inst. of National Defence , Div. of Command and Control Warfare , Linkoeping, Sweden
Decentralized Tracking with Feedback, Adaptive Sample Rate and IMM
Karlsson, E. , Research Inst. of National Defence , Sweden ; Mar. 2000 ; 104p ; In English
Report No.(s): PB2001-108436 ; FOA-R-00-01539-706-SE ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
This report compares filter architectures for target tracking with multiple sensors. Two decentralized architectures are implemented and evaluated in simulations against a central tracking filter. Data from an array radar and an infrared sensor are used. The central filter is an interactive multiple models filter (IMM) with three models. These models are extended Kalman filters. The decentralized architectures have two sensor filters and one central filter that fuses the tracks from the sensor filters. The filter architectures are evaluated with respect to their accuracy and ability to perform adaptive sampling.
NTIS
Infrared Detectors ; Kalman Filters ; Tracking Filters ; Tracking Networks

20020011683 NASA Ames Research Center , Moffett Field, CA USA
VIPER: Virtual Intelligent Planetary Exploration Rover
Edwards, Laurence , NASA Ames Research Center , USA ; Flueckiger, Lorenzo , QSS Group, Inc. , USA ; Nguyen, Laurent , NASA Ames Research Center , USA ; Washington, Richard , Research Inst. for Advanced Computer Science , USA ; [2001] ; 6p ; In English ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Simulation and visualization of rover behavior are critical capabilities for scientists and rover operators to construct, test, and validate plans for commanding a remote rover. The VIPER system links these capabilities. using a high-fidelity virtual-reality (VR) environment. a kinematically accurate simulator, and a flexible plan executive to allow users to simulate and visualize possible execution outcomes of a plan under development. This work is part of a larger vision of a science-centered rover control environment, where a scientist may inspect and explore the environment via VR tools, specify science goals, and visualize the expected and actual behavior of the remote rover. The VIPER system is constructed from three generic systems, linked together via a minimal amount of customization into the integrated system. The complete system points out the power of combining plan

execution, simulation, and visualization for envisioning rover behavior; it also demonstrates the utility of developing generic technologies. which can be combined in novel and useful ways.
Author
Virtual Reality ; Computerized Simulation ; Roving Vehicles

20020011719 Sandia National Labs. , Albuquerque, NM USA
Modular Telerobot Control System for Accident Response
Anderson, R. J. ; Shirey, D. L. ; Jul. 20, 1999 ; 12p ; In English
Report No.(s): DE2001-9644 ; SAND99-1904C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Accident Response Mobile Manipulator System (ARMMS) is a teleoperated emergency response vehicle that deploys two hydraulic manipulators, five cameras, and an array of sensors to the scene of an incident. It is operated from a remote base station that can be situated up to four kilometers away from the site. Recently, a modular telerobot control architecture called SMART (Sandia's Modular Architecture for Robotic and Teleoperation) was applied to ARMMS to improve the precision, safety, and operability of the manipulators on board. Using SMART, a prototype manipulator control system was developed in a couple of days, and an integrated working system was demonstrated within a couple of months. New capabilities such as camera teleoperation, autonomous tool changeout and dual manipulator control have been incorporated. The final system incorporates twenty-two separate modules and implements eight different behavior modes. This paper describes the integration of SMART into the ARMMS system.
NTIS
Manipulators ; Robotics ; Teleoperators

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20020006209 Maryland Univ. Baltimore County , Catonsville, MD USA
Standard, Mixed and Non-Conforming HP Finite Elements for Problems in Mechanics ***Final Report , 1 Mar. 1998-31 Aug. 2001***
Suri, Manil ; Oct. 02, 2001 ; 12p ; In English
Contract(s)/Grant(s): F49620-98-1-0161
Report No.(s): AD-A395467 ; AFRL-SR-BL-TR-01-0538 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Numerical analysis of a linearized formulation for three-dimensional buckling and stress-stiffening phenomena showed that an algorithm implemented in the commercial finite element code STRESS CHECK is robust. An hp method was formulated and implemented for computing the response of woven composite (3) Domain decomposition/concatenation hp methods were analyzed. Locking-free robust hp mixed methods for elasticity were developed.
DTIC
Algorithms ; Finite Element Method ; Numerical Analysis ; Linearization ; Three Dimensional Models ; Elastic Properties

20020006310 NASA Ames Research Center , Moffett Field, CA USA
Optimizations on Designing High-Resolution Finite-Difference Schemes
Liu, Yen , NASA Ames Research Center , USA ; Koomullil, George , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; AIAA 12th CFD Conference , 19-22 Jun. 1995 , San Diego, CA , USA ; Sponsored by American Inst. of Aeronautics and Astronautics , USA
Contract(s)/Grant(s): RTOP 505-59-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
We describe a general optimization procedure for both maximizing the resolution characteristics of existing finite differencing schemes as well as designing finite difference schemes that will meet the error tolerance requirements of numerical solutions. The procedure is based on an optimization process. This is a generalization of the compact scheme introduced by Lele in which the resolution is improved for single, one-dimensional spatial derivative, whereas in the present approach the complete scheme, after spatial and temporal discretizations, is optimized on a range of parameters of the scheme and the governing equations. The approach is to linearize and Fourier analyze the discretized equations to check the resolving power of the scheme for various wave number ranges in the solution and optimize the resolution to satisfy the requirements of the problem. This represents a constrained nonlinear optimization problem which can be solved to obtain the nodal weights of discretization. An objective function is defined in the parametric space of wave numbers, Courant number, Mach number and other quantities of

interest. Typical criterion for defining the objective function include the maximization of the resolution of high wave numbers for acoustic and electromagnetic wave propagations and turbulence calculations. The procedure is being tested on off-design conditions of non-uniform mesh, non-periodic boundary conditions, and non-constant wave speeds for scalar and system of equations. This includes the solution of wave equations and Euler equations using a conventional scheme with and without optimization and the design of an optimum scheme for the specified error tolerance.
Author
Finite Difference Theory ; High Resolution ; Numerical Analysis ; Optimization ; Nonlinearity

20020006777 Brown Univ. , Div. of Applied Mathematics , Providence, RI USA
Facility for Local Postprocessing, Visualization, and Animation of Remotely Simulated Very Large Temporal Datasets ***Final Report , 1 Apr. 2000-30 Jun. 2001***
Hesthaven, Jan S. ; Jun. 30, 2001 ; 8p ; In English
Contract(s)/Grant(s): F49620-00-1-0211
Report No.(s): AD-A395562 ; AFRL-SR-BL-TR-01-0537 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
This DURIP equipment Grant in support of ongoing AFOSR sponsored research in the Division of Applied Mathematics at Brown University primary purpose of the equipment is to enhanced computationally intensive research in high-order numerical methods and high-performance computing currently supported under AFOSR Grant F49620-99-1-0077, High Order Methods for the Numerical Simulation of High Speed Flows. These efforts focused on the analysis and application of novel high-order schemes, designed specifically with contemporary parallel high performance computer architectures in mind, for the solution of wave dominated transient problems in three dimensional complex geometries.
DTIC
Architecture (Computers) ; Numerical Analysis ; Parallel Computers

20020008611 Cambridge Univ. , Cambridge UK
Twentieth Century Harmonic Analysis: A Celebration
Byrnes, James S. ; Jan. 2001 ; 412p ; In English , 2-15 Jul. 2000 , Ciocco , Italy
Contract(s)/Grant(s): F61775-00-W-F063
Report No.(s): AD-A395783 ; EOARD-CSP 00-5063 ; No Copyright ; Avail: CASI ; A18 , Hardcopy ; A04 , Microfiche
The Final Proceedings for 20th Century Harmonic Analysis 2 July 2000 - 15 July 2000 published as Vol. 33 of NATO Science Series II. Mathematics, Physics and Chemistry Topics include pure and applied harmonic analysis.
DTIC
Conferences ; Harmonic Analysis ; Numerical Analysis

20020008681 Lawrence Livermore National Lab. , Livermore, CA USA
Unsymmetrized multifrontal LU factorization
Amestoy, P. R. ; Puglisi, C. ; Jul. 17, 2000 ; 17p ; In English
Report No.(s): DE2001-776628 ; LBNL-46474 ; No Copyright ; Avail: Department of Energy Information Bridge
A well-known approach to compute the LU factorization of a general unsymmetric matrix bf A is to build the elimination tree associated with the pattern of the symmetric matrix A + A(sup T) and use it as a computational graph to drive the numerical factorization. This approach, although very efficient on a large range of unsymmetric matrices, does not capture the unsymmetric structure of the matrices. We introduce a new algorithm which detects and exploits the structural unsymmetry of the submatrices involved during the process of the elimination tree. We show that with the new algorithm significant gains both in memory and in time to perform the factorization can be obtained.
NTIS
Factorization ; Computation

20020008810 California Univ. , Dept. of Mathematics , Los Angeles, CA USA
Modeling and Numerical Methods for Material Growth and Convection ***Final Report , 1 Jun. 1998-31 May 2001***
Caflisch, Russel E. ; Oct. 21, 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0323
Report No.(s): AD-A396030 ; ARO-38085.8-MA ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

Under support from this grant, substantial progress was made on a number of research projects, including the level set methods, modeling and simulation for material growth, Monte Carlo methods for rarefied gas dynamics, boundary value problem for Prandtl equations and image processing.
DTIC
Mathematical Models ; Numerical Analysis ; Epitaxy ; Convection

20020009058 Research Associates for Defense Conversion, Inc. , Marcy, NY USA
Multi-Dimensional Interference Rejection & Target Detection in Early Warning Airborne Radar ***Final Report , Jan. 1997-Oct. 1999***
Adve, Raviraj S. ; Aug. 2001 ; 70p ; In English
Contract(s)/Grant(s): F30602-97-C-0006 ; Proj-4506
Report No.(s): AD-A396106 ; AFRL-SN-RS-TR-2001-153 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
A study of the effects of mutual coupling and non-homogeneous data on the performance of adaptive algorithms (both covariance matrix based and least squared error) for Space Time Adaptive Processing (STAP). This effort addresses some of the issues in applying adaptive processing to real world, measured, data, by looking at the performance of two approaches: the JDL and D3 algorithms. Section 1.0 is an Introduction to the material in this report. Section 2.0 is a detailed analysis of the issue of mutual coupling and near field scattering. The section presents examples to illustrate the impact of mutual coupling on both D3 and statistical algorithms. Section 3.0 discusses the issues of non-homogeneous data, the use of a non-homogeneity detection and direct domain processing in non-homogeneous conditions.
DTIC
Algorithms ; Early Warning Systems ; Target Acquisition ; Matrices (Mathematics)

20020009111 Los Alamos National Lab. , NM USA
Method of Hyperbolic Systems with Stiff Relaxation
Lowrie, R. B. ; Morel, J. E. ; Mar. 01, 2001 ; 8p ; In English
Report No.(s): DE2001-776177 ; LA-UR-01-1301 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Three methods are analyzed for solving a linear hyperbolic system that contains stiff relaxation. We show that the semi-discrete discontinuous Galerkin method, with a linear basis, is accurate when the relaxation time is unresolved (asymptotically preserving (AP)). A recently developed central method is shown to be non-AP. to discriminate between AP and non-AP methods, we argue that one must study problems that are diffusion dominated.
NTIS
Galerkin Method ; Hyperbolic Functions

20020009113 Los Alamos National Lab. , NM USA
Algorithm for Parallel sn Sweeps on Unstructured Meshes
Pautz, S. D. ; Mar. 01, 2001 ; 19p ; In English
Report No.(s): DE2001-776172 ; LA-UR-01-1420 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We develop a new algorithm for performing parallel S(sub n) sweeps on unstructured meshes. The algorithm uses a low-complexity list ordering heuristic to determine a sweep ordering on any partitioned mesh. For typical problems and with 'normal' mesh partitionings we have observed nearly linear speedups on up to 126 processors. This is an important and desirable result, since although analyses of structured meshes indicate that parallel sweeps will not scale with normal partitioning approaches, we do not observe any severe asymptotic degradation in the parallel efficiency with modest ((le) 100) levels of parallelism. This work is a fundamental step in the development of parallel S(sub n) methods.
NTIS
Algorithms ; Unstructured Grids (Mathematics) ; Grid Generation (Mathematics)

20020009152 City Univ. of New York , Dept. of Physics , NY USA
Laser and Optical Physics ***Final Report , 1 Apr. 1996-30 Jun. 2001***
Lax, Melvin ; Oct. 18, 2001 ; 8p ; In English
Contract(s)/Grant(s): DAAH04-096-1-0030
Report No.(s): AD-A395671 ; ARO-34795.3-PH-H ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The following problems were studied under grant DAAH04-96-1-0030: (1) Analytical solution of the photon (or elastic-particle) transport problem; and (2) Inverse image reconstruction of objects in highly scattering media.
DTIC
Numerical Analysis ; Boltzmann Transport Equation ; Photons

20020009174 Ufa State Technical Aviation Univ. , Inst. of Physics of Advanced Materials , Russia
Nanostructures and Enhanced Properties in Tungsten and its Alloys Processed by Equal Channel Angular Pressing ***Interim Report , 11 Jul.-10 Oct. 2001***
Valiev, R. Z. ; Alexandrov, I. V. ; Oct. 10, 2001 ; 5p ; In English
Contract(s)/Grant(s): N68171-01-M-5641
Report No.(s): AD-A395865 ; R/D-9135-MS-01 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
The present report presents the results of an experimental investigation and numerical simulation of the process of equal-channel angular pressing with a backpressure equal to 2.4 sigma(sub s) which have allowed to increase the accumulated strain rate up to e=7, what allows to obtain ultrafine-grained structure with a grain size less than 0.5 micrometers. Note should be made that in that case the punch loading was close to its calculated value, which is in conformity with the strength characteristics of the material and the die-set design. With the purpose of studying the influence of initial state on the ultrafine-grained structure formation there were carried out comparative investigations of the behavior of single- and polycrystalline tungsten during severe plastic deformation process. A possibility of reducing the severe plastic deformation temperature when using special sheathing for tungsten billets is being investigated. There were started investigations of the microstructure refinement of the W-2%Re alloy with enhanced strength and ductility at severe plastic deformation.
DTIC
Mechanical Properties ; Nanostructures (Devices) ; Tungsten ; Microstructure ; Tungsten Alloys ; Metallurgy ; Pressing (Forming)

20020009753 National Central Univ. , Dept. of Mechanical Engineering , Chung-Li, Taiwan, Province of China
On the Reachability of a Class of Continuous Bilinear Systems
Hwang, Yean-Ren , National Central Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 635-639 ; In English ; Copyright ; Avail: Issuing Activity
It is well known that using differential geometric methods, the reachability of nonlinear systems can be checked via Lie algebra. Normally, the resultant checking condition is state dependent and requires complicated recursive Lie bracket operations. In this paper, it is shown that for dyadic bilinear systems, the reachability property is actually state independent, and hence a global property of the system. Specifically, it is proved that the Lie algebra condition is equivalent to the rank conditions of two constant matrices. As examples, the reachability of two real-world systems is examined through the new checking condition.
Author
Nonlinear Systems ; Numerical Analysis

20020012268 Center for Mathematics and Computer Science , Amsterdam Netherlands
Parallel Methods for Nonstiff VIDES. Modelling, Analysis and Simulation
van der Houwen, P. J. ; 2001 ; 18p ; In English
Report No.(s): PB2001-108497 ; MAS-R9811 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche
We consider numerical methods for nonstiff initial-value problems for Volterra integro-differential equations. Such problems may be considered as initial-value problem for ordinary differential equations with expensive righthand side functions because each righthand side evaluation requires the application of a quadrature formula. The often considerable costs suggest the use of methods that require only one righthand side evaluation per step. One option is a conventional linear multistep method. However, if a parallel computer system is available, then one might also look for methods with more righthand sides per step, but such that they can all be evaluated in parallel. In this paper, we construct such parallel methods and we show that on parallel computers they are by far superior to the conventional linear multistep methods which do not have scope for parallelism. Moreover, the (real) stability interval is considerably larger.
NTIS
Parallel Computers ; Differential Equations ; Volterra Equations ; Integral Equations ; Numerical Analysis ; Boundary Value Problems

20020012270 Institut des Hautes Etudes Scientifiques , Bures-sur-Yvette France
Proof of the Tsygan Formality Conjecture for Chains
Shoikhet, B. ; Jun. 2001 ; 32p ; In English ; Portions of this document are not fully legible
Report No.(s): PB2001-108454 ; IHES/M/01/28 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
No abstract available.
NTIS
Proving ; Algebra

20020012541 Center for Mathematics and Computer Science , Amsterdam Netherlands
Oscillatory Stoermer-Cowell Methods. Modelling, Analysis and Simulation
van der Houwen, P. J. ; Mesina, E. ; Sommeijer, B. P. ; Jul. 1998 ; 28p ; In English
Report No.(s): PB2001-108499 ; MAS-R9813 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche
We consider explicit methods for initial-value problems for special second-order ordinary differential equations where the righthand side does not contain the derivative of y and where the solution components are known to be periodic with frequencies wj lying in a given nonnegative interval (w,w). The aim of the paper is to exploit this extra information and to modify a given integration method in such a way that the method parameters are 'tuned' to the interval (w,w). Such an approach has already been proposed by Gautschi in 1961 for linear multistep methods for first-order differential equations in which the dominant frequencies wj are a priori known. In this paper, we only assume that the interval (w,w) is known. Two 'tuning' techniques, respectively based on a least squares and a minimax approximation, are considered and applied to the classical explicit Stormer-Cowell methods and the recently developed parallel explicit Stormer-Cowell methods.
NTIS
Numerical Analysis ; Boundary Value Problems ; Differential Equations ; Numerical Integration ; Derivation

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20020006224 Texas Univ. , Dept. of Electrical and Computer Engineering , Austin, TX USA
A Bayesian Pairwise Classifier for Character Recognition
Kumar, Shailesh ; Ghosh, Joydeep ; Crawford, Melba ; Jan. 2001 ; 9p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0230
Report No.(s): AD-A395393 ; ARO-37634.22-PH ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
In this chapter, we develop a Bayesian Pairwise Classifier framework that is suitable for pattern recognition problems involving a moderately large number of classes, and apply it to two character recognition datasets. A C-class pattern recognition problem (e.g.; C = 26 for recognition of English Alphabet) is divided into a set of (2C) two-class problems. For each pair of classes, a Bayesian classifier based on a mixture of Gaussians (MOG) is used to model the probability density functions conditioned on a single feature. A forward feature selection algorithm is then used to grow the feature space, and an efficient technique is developed to obtain a MOG in the larger feature space from the MOG's in the smaller spaces. Apart from improvements in classification accuracy, the proposed architecture also provides valuable domain knowledge such as identifying what features are most important in separating a pair of characters, relative distance between any two characters, etc.
DTIC
Character Recognition ; Classifiers

20020007932 Los Alamos National Lab. , NM USA
Afreet: human-inspired spatio-spectral feature construction for image classification with support vector machines
Perkins, S. ; Harvey, N. ; Feb. 01, 2001 ; 9p ; In English
Report No.(s): DE2001-774619 ; LA-UR-01-891 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The authors examine the task of pixel-by-pixel classification of the multispectral and greyscale images typically found in remote sensing and medical applications. Simple machine learning techniques have long been applied to remote sensed image classification, but almost always using purely spectral information about each pixel. Humans can often outperform these systems, and make extensive use of spatial context to make classification decisions. They present AFREET: an SVM (support vector machines)-based learning system which attempts to automatically construct and refine spatio-spectral features in a somewhat human inspired fashion. Comparisons with traditionally used machine learning techniques show that AFREET achieves

significantly higher performance. The use of spatial context is particularly useful for medical imagery, where multispectral images are still rare.
NTIS
Imaging Techniques ; Image Classification ; Machine Learning ; Remote Sensing

20020008238 Purdue Univ. , Dept. of Statistics , West Lafayette, IN USA
Empirical Bayes Estimation With Kernel Sequence Method
Gupta, Shanti S. ; Lu, Jinjun ; Sep. 2001 ; 24p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0502
Report No.(s): AD-A395790 ; TR-01-11 ; ARO-40940.6-MA ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
In this paper, we consider the empirical Bayes estimation in the exponential family. A minimax lower bound is derived. It is shown that the best possible rate of empirical Bayes estimators is O(1/n) if Theta is bounded. Then we turn to find an empirical Bayes estimator with a rate close to this lower bound rate. Applying the kernel sequence method, we are able to construct an empirical Bayes estimator with a rate of O(1/n(1n n)7(1n 1n n)2). Under the same assumption, this rate is the fastest compared to the earlier results published in the literature.
DTIC
Bayes Theorem ; Exponential Functions ; Minimax Technique ; Kernel Functions

20020009118 Los Alamos National Lab. , NM USA
Novel Statistical Based Approach to Non-Linear Model Updating Using Response Features
Schultz, J. ; Mar. 01, 2001 ; 6p ; In English
Report No.(s): DE2001-776136 ; LA-UR-01-1297 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This research presents a new method to improve analytical model fidelity for non-linear systems. The approach investigates several mechanisms to assist the analyst in updating an analytical model based on experimental data and statistical analysis of parameter effects. The first is a new approach at data reduction called feature extraction. This is an expansion of the 'classic' update metrics to include specific phenomena or characters of the response that are critical to model application. This is an extension of the familiar linear updating paradigm of utilizing the eigen-parameters or frequency response functions (FRFs) to include such devices as peak acceleration, time of arrival or standard deviation of model error. The next expansion of the updating process is the inclusion of statistical based parameter analysis to quantify the effects of uncertain or significant effect parameters in the construction of a meta-model. This provides indicators of the statistical variation associated with parameters as well as confidence intervals on the coefficients of the resulting meta-model. Also included in this method is the investigation of linear parameter effect screening using a partial factorial variable array for simulation. This is intended to aid the analyst in eliminating from the investigation the parameters that do not have a significant variation effect on the feature metric. Finally an investigation of the model to replicate the measured response variation is examined.
NTIS
Mathematical Models ; Nonlinearity ; Statistical Analysis

20020009179 Texas Univ. , Dept. of Electrical and Computer Engineering , Austin, TX USA
Robust Order Statistics Based Ensembles for Distributed Data Mining , Chapter 6
Tumer, Kagan ; Ghosh, Joydeep ; Jan. 2001 ; 27p ; In English
Contract(s)/Grant(s): DAAD19-99-1-0012 ; DAAG55-98-0-0230
Report No.(s): AD-A395854 ; ARO-37634.26-PH ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This chapter is rooted in the ensemble framework and shows how order statistics can be used in the design of a "meta-learner" that examines the outputs of multiple distributed classifiers and provides a final decision. Order statistics is one of the key tools of robust statistics, tailored to handling data with outliers in a distributed data mining scenario in which there is wide variability among the individual classifers because of the underlying quality of the local data that they examine, a meta-learner should be able to tolerate a few outlier classifer results. The robust properties of order statistics based approaches such as median filtering and m-estimators (Arnold, Balakrishnan, and Nagaraja 1992), have been observed in many disciplines. Thus they are an obvious candidate for meta-learning in such environments.
DTIC
Statistical Analysis ; Data Mining ; Robustness (Mathematics) ; Distributed Processing

20020009648 Los Alamos National Lab. , NM USA

Measures of distortion in possibilistic approximations of consistent random sets and intervals

Joslyn, C. , Los Alamos National Lab. , USA ; Apr. 01, 2001 ; 7p ; In English

Report No.(s): DE2001-777457 ; LA-UR-01-1902 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The availability of probability or possibility measures for random set (Dempster-Shafer evidence theoretical) structures are highly desirable. Probabilistic conditions involve disjointness or specificity, while possibilistic conditions involve consonance of the underlying focal elements. Consistency results in possibilistic distributions, but not measures, but then a unique approximation is available. Especially in random interval measurement situations, this condition is common. In this paper we develop some of the mathematical ideas necessary to develop a measure of the distortion introduced by this consonant approximation of a consistent random set.

NTIS

Probability Theory ; Set Theory

20020009669 Oak Ridge Associated Universities, Inc. , TN USA

Turnover Compartmentalization: A Statistical Tracer Theory for Analysis of Whole-System Retention Data

Bergner, Per-Erik E. ; May 1967 ; 32p ; In English

Report No.(s): AD-A396080 ; ORAU-104 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The application of tracer methods have, especially in medicine, opened a new class of physical problems, which have seemingly been given little consideration. Probably this is because the theoretical physicists today are so much occupied by quantum mechanics and theory of relativity that there is hardly any interest left over for what belongs to old fashioned statistical mechanics. Therefore, in the interpretation of tracer data, people have been forced to rely mainly on inductive methods, i.e., the construction of 'models' that are not derived from basic principles but borrow their significance from how well they fit data. In an attempt to find a more deductive approach, I started some years ago a construction of what was intended to be a general physical tracer theory, a tracer dynamics. Although the emerging theory was general enough, and made possible a more precise formulation of some existing problems, it did not lead to anything of much practical result.

DTIC

Statistical Analysis ; Statistical Mechanics

20020010124 Oak Ridge National Lab. , TN USA

Vector Approach to Regression Analysis and Its Implications to Heavy-Duty Diesel Emissions

McAdams, H. T. , Oak Ridge National Lab. , USA ; Feb. 14, 2001 ; 192p ; In English

Contract(s)/Grant(s): AC05-96OR22464

Report No.(s): DE2001-777660 ; ORNL/TM-2000/5 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An alternative approach is presented for the regression of response data on predictor variables that are not logically or physically separable. The methodology is demonstrated by its application to a data set of heavy-duty diesel emissions. Because of the covariance of fuel properties, it is found advantageous to redefine the predictor variables as vectors, in which the original fuel properties are components, rather than as scalars each involving only a single fuel property. The fuel property vectors are defined in such a way that they are mathematically independent and statistically uncorrelated. Because the available data set does not allow definitive separation of vehicle and fuel effects, and because test fuels used in several of the studies may be unrealistically contrived to break the association of fuel variables, the data set is not considered adequate for development of a full-fledged emission model. Nevertheless, the data clearly show that only a few basic patterns of fuel-property variation affect emissions and that the number of these patterns is considerably less than the number of variables initially thought to be involved. These basic patterns, referred to as eigenfuels may reflect blending practice in accordance with their relative weighting in specific circumstances. The methodology is believed to be widely applicable in a variety of contexts. It promises an end to the threat of collinearity and the frustration of attempting, often unrealistically, to separate variables that are inseparable.

NTIS

Exhaust Emission ; Diesel Engines ; Regression Analysis ; Vector Analysis

20020010241 Sandia National Labs. , Albuquerque, NM USA

Resampling Based Approach to Optimal Experimental Design for Computer Analysis of a Complex System

Rutherford, B. ; Aug. 04, 1999 ; 7p ; In English

Report No.(s): DE2001-9503 ; SAND99-0363C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The investigation of a complex system is often performed using computer generated response data supplemented by system and component test results where possible. Analysts rely on an efficient use of limited experimental resources to test the physical system, evaluate the models and to assure (to the extent possible) that the models accurately simulate the system order investigation. The general problem considered here is one where only a restricted number of system simulations (or physical tests) can be performed to provide additional data necessary to accomplish the project objectives. The levels of variables used for defining input scenarios, for setting system parameters and for initializing other experimental options must be selected in an efficient way. The use of computer algorithms to support experimental design in complex problems has been a topic of recent research in the areas of statistics and engineering. This paper describes a resampling based approach to form dating this design. An example is provided illustrating in two dimensions how the algorithm works and indicating its potential on larger problems. The results show that the proposed approach has characteristics desirable of an algorithmic approach on the simple examples. Further experimentation is needed to evaluate its performance on larger problems.
NTIS
Complex Systems ; Computer Techniques ; Design Analysis ; Experiment Design ; Data Systems

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20020008667 Argonne National Lab. , IL USA
DSDP3: Dual scaling algorithm for general positive semidefinite programming
Benson, S. J. ; Ye, Y. ; Mar. 19, 2001 ; 13p ; In English
Report No.(s): DE2001-776737 ; ANL/MCS/CP-104336 ; No Copyright ; Avail: Department of Energy Information Bridge
We implement a dual scaling algorithm for positive semidefinite programming to handle a broader class of problems than could be solved with previous implementations of the algorithm. With appropriate representations of constraint matrices, we can solve general semidefinite programs and still exploit the structure of large-scale combinatorial optimization problems. Computational results show that our preliminary implementation is competitive with primal-dual solvers on many problems requiring moderate precision in the solution and is superior to primal-dual solvers for several types of problems.
NTIS
Algorithms ; Combinatorial Analysis ; Optimization

20020009178 Texas Univ. , Dept. of Electrical and Computer Engineering , Austin, TX USA
Knowledge Reuse Mechanisms of Categorizing Related Image Sets
Bollacker, Kurt D. ; Ghosh, Joydeep ; Jan. 2001 ; 27p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0230 ; DAAG04-95-1-0494
Report No.(s): AD-A395856 ; ARO-37634.29-PH ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This chapter introduces the concept of classifier knowledge reuse as a means of exploiting domain knowledge taken from old, previously created, relevant classifiers to assist in a new classification task. Knowledge reuse helps in constructing better generalizing classifiers given few training examples and for evaluating images for search in an image database. In particular, we discuss a knowledge reuse framework in which a supra-classifier improves the performance of the target classifier using information from existing support classifiers. Soft computing methods can be used for all three types of classifiers involved. We explore supra-classifier design issues and introduce several types of supra-classifiers, comparing their relative strengths and weaknesses. Empirical examples on real world image data sets are used to demonstrate the effectiveness of the supra-classifier framework for classification and retrieval/search in image databases.
DTIC
Data Bases ; Knowledge Representation ; Image Processing ; Classifications

20020009182 Johns Hopkins Univ. , Dept. of Computer Science , Baltimore, MD USA
Large Algorithmic Methods for Dynamic System Management ***Final Report , 1 Sep. 1995-31 Aug. 1999***
Awerbuch, Baruch ; Leighton, F. T. ; May 30, 2001 ; 5p ; In English
Contract(s)/Grant(s): DAAH04-95-1-0607
Report No.(s): AD-A395730 ; ARO-32617.1-MA ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
The issue of uncertainty-tolerant computing has been largely ignored by algorithm designers, who focused on developing elegant mathematical structures for solving traditional combinatorial problems. Our goal is to build new algorithmic primitives

for handling issues of uncertainty. The comprehensive algorithmic theory of decision-making in the presence of uncertainty may be applicable in domains outside of computer science, including control systems, economics, manufacturing, etc.
DTIC
Algorithms ; Mathematical Programming ; Systems Management ; Combinatorial Analysis

20020009512 Army Communications-Electronics Command , Fort Monmouth, NJ USA
Approximate Processing for Real-Time Problem-Solving in Phoenix: A beginning
Powell, Gerald M. ; Nov. 1990 ; 25p ; In English
Report No.(s): AD-A395977 ; CECOM-TR-01-7 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report focuses on the problem of developing real-time problem solving capabilities which will yield the best possible solution given the available time and computational resources. The research was part of a project called Phoenix, which aims to develop intelligent real-time planners for fighting simulated forest fires. Phoenix is designed to be a testbed for experiments in distributed control, which is one of the key characteristics of battlefield planning. The report describes research focused on: a) adapting the elements of approximate processing, which have been developed for distributed knowledge-based signal interpretation, to a planning problem having striking similarities to those observed in battlefield planning, and b) developing an approach for evaluating architectures for such real-time planning systems through the use of hypothesis testing, experiment design and statistical analysis.
DTIC
Problem Solving ; Command and Control ; Military Operations ; Simulation

20020012269 National Defence Research Establishment , Linkoeping, Sweden
SimCity 3000: An Alternative to Micro-Worlds
Kylesten, B. ; Soederberg, H. ; Oct. 2000 ; 32p ; In Swedish
Report No.(s): PB2001-108496 ; FOA-R-00-01612-505-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The purpose with the study has been to analyze if it would be possible to complement or replace traditional micro-world with commercial PC-games, in studies of dynamical decision-making. In this study was the PC-game SimCity 3000 used, which was compared to the micro-world NEWFIRE. The results indicate that commercial PC-games can, with advantage, be used in this kind of studies, even if the used PC-game in its present form is not suitable, this because of lack in functionality. to be able to use commercial PC-games in this kind of studies it is necessary to develop methods for specifying and choosing the right kind of game. There is also a need for methods to evaluate and measure training and education performed with PC-games. Finally, methods for specifying functionality are needed, so PC-games can be used as low-budget simulators. The study was performed during October 1999.
NTIS
Decision Making ; Simulators ; Games

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20020006790 New York Univ. , Courant Inst. of Mathematical Sciences , New York, NY USA
Mathematical Nonlinear Optics
McLaughlin, David W. ; Oct. 01, 2001 ; 20p ; In English
Contract(s)/Grant(s): F49620-98-1-0256
Report No.(s): AD-A395538 ; AFRL-SR-BL-TR-01-0536 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This research concerns the development of the modern mathematical theory of nonlinear dispersive waves focusing on areas relevant for nonlinear optics and developing fundamental understanding which is essential to applications of direct importance to the Air Force. The work has concentrated upon optical turbulence and spatio-temporal chaos, dispersive wave turbulence, and nonlinear optics - culminating in the initiation of a study of reverse saturable absorbers for laser hardening applications. The major findings include: (1) the onset of spatio-temporal chaos occurs with only two instabilities; (2) a new spectra observed for dispersive wave turbulence; (3) the performance of coupled bistable switches and optical arrays; and (4) a classification of polarization instability for coupled nonlinear Schrodinger equations.
DTIC
Nonlinear Optics ; Nonlinear Equations ; Optical Bistability ; Applications of Mathematics

20020008014 Norwegian Defence Research Establishment , Kjeller, Norway

Pipelined FFT-Architectures ***Valg av Pipelinet FFT-Arkitektur: Med Vekt pa Bruk av Flyttalls Aritmetikk***

Gundersen, Rune , Norwegian Defence Research Establishment , Norway ; Sep. 27, 2001 ; 28p ; In Norwegian ; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 726/170

Report No.(s): FFI/RAPPORT-2001/04532 ; ISBN 82-464-0548-9 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This report contains a discussion of several published FFT-architectures. We want an FFT-architecture which has a minimum number of arithmetic units because we are using floating-point arithmetics. We choose an FFT-architecture which suits our construction criteria. The chosen FFT-architecture utilizes the arithmetic units optimum.

Author

Arithmetic and Logic Units ; Floating Point Arithmetic

20020009675 Sandia Corp. , Albuquerque, NM USA

Dynamic Penetration of Selected Projectiles into Particulate Media

Thompson, L. J. ; Jul. 1966 ; 212p ; In English

Report No.(s): AD-A396047 ; SC-RR-66-376 ; No Copyright ; Avail: CASI ; A10 , Hardcopy ; A03 , Microfiche

This is an overall study of the whole process of projectile penetration into soil. The governing differential equations for the soil target medium are developed using the equations of motion and the continuity condition. Constitutive relationships are derived from Mohr-Coulomb theory for a rigid plastic material and from viscosity theory. The other necessary equations are generated from an experimental investigation of the penetration mechanism.

DTIC

Projectiles ; Penetration ; Differential Equations ; Terminal Ballistics

20020010581 Geophysical Observatory , Helsinki, Finland

On Some Complex Function Spaces and Classes

Rattya, Jouni , Geophysical Observatory , Finland ; 2001 ; ISSN 1239-6303 ; 78p ; In English

Report No.(s): Rept-124 ; ISBN 951-41-0905-8 ; Copyright ; Avail: Issuing Activity

The theory of complex function spaces and classes has been actively studied during the last few decades. The present research in this field is based on classical function spaces and classes such as the Bloch space, the Hardy spaces, the Bergman spaces and the class of normal functions. The research of these spaces and classes has led to studying the weighted Dirichlet spaces, the Besov spaces as well as the alpha-Bloch and the alpha-normal functions, and more recently, the spaces F(p, q, s) and the Besov-type classes. Important special cases of latter ones are the spaces Q(sub s) and the classes Q ((sup #)(sub s)). The interest in the spaces Q(sub s) and the classes Q ((sup #)(sub s)) stems from the fact that, for appropriate values of s, they coincide with several well-known function spaces and classes: the Bloch space, the class of normal functions, BMOA (bounded mean oscillation) and UBC. While the theory of function spaces and classes is of independent interest, today it is recognized that this theory is connected with many other areas of mathematics. It has been successfully applied, for example, to differential equations, composition operators in functional analysis and potential theory. However, the theory is still far from complete and recent research on Riemann surfaces, analytic functions of several variables and harmonic functions has attracted considerable attention. In this paper, analytic function spaces and meromorphic function classes are studied. In Section 1, the required notations, terminology and definitions are presented. The remaining sections may be divided into three parts. Part one (Sections 2 and 3) focuses on the precise relationships (in the sense of certain strict set inclusions) between various analytic function spaces and meromorphic function classes. to facilitate the subsequent analysis, two basic results about analytic functions, with Hadamard gaps, are established (Lemma 2.1.1 and Theorem 2.1.3). These results provide the technique, albeit classical, to answer questions raised in the literature (see, for example, Corollary 2.2.6 and Corollary 3.3.8) and to generalize some known results about the alpha-Besov-type classes (cf. Theorem 3.3.1 and Theorems 3.3.4-3.3.7). Part two (Section 4) of this paper establishes the main results which characterize the functions in F(p, q, 8) and F(sub 0) (p, q, s) in terms of their n-th derivatives (Theorems 4.2.1-4.2.4). Theorems 4.2.1 and 4.2.3 have immediate applications to entire functions and Carleson measures. In part three (Section 5), two new families of function spaces are defined. It is shown that they coincide with the spaces F(p, q, s) and F(sub 0) (p, q, s), respectively, for suitable parameter values and therefore new characterizations of some well-known function spaces are obtained (cf. Sections 5.2 and 5.3). Finally, the paper concludes with several questions and open problems (Section 6).

Author

Analytic Functions ; Function Space ; Meromorphic Functions

20020011710 Institut des Hautes Etudes Scientifiques , Bures-sur-Yvette France

Tsygan Formality and Duflo Formula

Shoikhet, B. , Institut des Hautes Etudes Scientifiques , France ; June 2001 ; 18p ; In English ; Portions of this document are not fully legible

Report No.(s): PB2001-108456 ; IHES/M/01/29 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

We prove the 0-(co)homology part of the conjecture on the cup-products on tangent cohomology in the Tsygan formality. We discuss its applications to the Duflo formula.

NTIS

Homology ; Formalism ; Lie Groups

20020011731 Stanford Linear Accelerator Center , Menlo Park, CA USA

Spectral Method for 3-dimensional Poisson's Equation in Cylindrical Coordinates with Regular Boundaries

Batygin, Y. K. ; Jun. 26, 2001 ; 4p ; In English

Report No.(s): DE2001-784945 ; SLAC-PUB-8880 ; No Copyright ; Avail: Department of Energy Information Bridge

Method of calculation of space charge field of the beam using an expansion of space charge potential and space charge distribution as Fourier-Bessel series is discussed. Coefficients of series are connected by an algebraic equation, which substantially simplifies solutions of the problem. Efficiency and accuracy of the method are discussed. Suggested method is effective in multidimensional problems of study of intense charged-particle beams.

NTIS

Charged Particles ; Cylindrical Coordinates ; Poisson Equation ; Space Charge ; Linear Accelerators ; Beams (Radiation) ; Fourier-Bessel Transformations

20020012265 Center for Mathematics and Computer Science , Amsterdam Netherlands

Computational Sieving Applied to Some Classical Number-Theoretic Problems. Modelling, Analysis and Simulation

te Riele, H. J. J. ; Oct. 1998 ; 20p ; In English

Report No.(s): PB2001-108509 ; MAS-R9821 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche

Many problems in computational number theory require the application of some sieve. Efficient implementation of these sieves on modern computers has extended our knowledge of these problems considerably. This is illustrated by three classical problems: the Goldbach conjecture, factoring large numbers, and computing the summatory function of the Mobius function.

NTIS

Sieves ; Number Theory

20020012305 Stanford Linear Accelerator Center , Menlo Park, CA USA

Derived Categories and Zero-Brane Stability

Lawrence, A. ; Jul. 25, 2001 ; 25p ; In English

Report No.(s): DE2001-784971 ; SLAC-PUB-8812 ; No Copyright ; Avail: Department of Energy Information Bridge

We define a particular class of topological field theories associated to open strings and prove the resulting D-branes and open strings form the bounded derived category of coherent sheaves. This derivation is a variant of some ideas proposed recently by Douglas. We then argue that any 0-brane on any Calabi-Yau threefold must become unstable along some path in the Kahler moduli space. As a byproduct of this analysis we see how the derived category can be invariant under a birational transformation.

NTIS

Field Theory (Physics) ; String Theory

20020012307 Stanford Linear Accelerator Center , Menlo Park, CA USA

M-theory on Manifolds of G2 Holonomy and Type IIA Orientifolds

Kachru, S. ; Jul. 25, 2001 ; 15p ; In English

Report No.(s): DE2001-784969 ; SLAC-PUB-8799 ; No Copyright ; Avail: Department of Energy Information Bridge

We demonstrate that M-theory compactifications on 7-manifolds of G2 holonomy, which yield 4d N-1 supersymmetric systems, often admit at special loci in their moduli space a description as type IIA orientifolds. In this way, we are able to find new dualities of special IIA orientifolds including dualities which relate orientifolds of IIA strings on manifolds of different topology with different numbers of wrapped D-branes. We also discuss models which incorporate, in a natural way, compact embeddings of gauge theory/gravity dualities similar to those studied in the recent work of Atiyah, Maldacena and Vafa.

NTIS

Gauge Theory ; Gravitation ; Supersymmetry ; Topology

20020012329 Stanford Linear Accelerator Center , Menlo Park, CA USA
Notes from the Underground: A Propos of Givental's Conjecture
Song, Y. S. ; Apr. 11, 2001 ; 14p ; In English
Report No.(s): DE2001-784898 ; SLAC-PUB-8798 ; No Copyright ; Avail: Department of Energy Information Bridge
These brief notes record our puzzles and findings surrounding Givental's recent conjecture which expresses higher genus Gromov-Witten invariants in terms of the genus-0 data. We limit our considerations to the case of a projective line, whose Gromov-Witten invariants are well-known and easy to compute. We make some simple checks supporting his conjecture.
NTIS
Invariant Imbeddings ; Invariance

20020012332 Stanford Linear Accelerator Center , Menlo Park, CA USA
Open String Instantons and Relative Stable Morphisms
Song, Y. S. ; Apr. 27, 2001 ; 22p ; In English
Report No.(s): DE2001-784891 ; SLAC-PUB-8736 ; No Copyright ; Avail: Department of Energy Information Bridge
We show how topological open string theory amplitudes can be computed by using relative stable morphisms in the algebraic category. We achieve our goal by explicitly working through an example which has been previously considered by Ooguri and Vafa from the point of view of physics. by using the method of virtual localization, we successfully reproduce their results for multiple covers of a holomorphic disc, whose boundary lies in a Lagrangian submanifold of a Calabi-Yau 3-fold, by Riemann surfaces with arbitrary genera and number of boundary components. In particular we show that in the case we consider there are no open string instantons with more than one boundary component ending on the Lagrangian submanifold.
NTIS
Instantons ; Algebra ; Lagrangian Function ; Riemann Manifold ; Topology ; String Theory

20020012333 Stanford Linear Accelerator Center , Menlo Park, CA USA
Hurwitz Enumeration Problem of Branched Covers and Hodge Integrals
Song, Y. S. ; Apr. 11, 2001 ; 36p ; In English
Report No.(s): DE2001-784890 ; SLAC-PUB-8619 ; No Copyright ; Avail: Department of Energy Information Bridge
Many classical problems in enumerative geometry have been receiving renewed interests in recent years, the main reason being that they can be translated into the modern language of Gromov-Witten theory and, moreover, that can be consequently solved. One such classical problem which has been under recent active investigation is the Hurwitz enumeration problem of counting topologically distinct, almost simple, ramified covers of the projective line or more generally of any Riemann surface.
NTIS
Integrals ; Geometric Accuracy ; Enumeration

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20020006041 NASA Ames Research Center , Moffett Field, CA USA
Gravitational Acceleration as a Cue for Absolute Size and Distance
Hecht, Heiko , NASA Ames Research Center , USA ; Kaiser, Mary K. , NASA Ames Research Center , USA ; Banks, Martin S. , California Univ. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 538-04-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
When an object's motion is influenced by gravity, such as the rise and fall of a thrown ball, the vertical component of acceleration is roughly constant at 9.8 m/sec2. In principle, an observer could use this information to estimate the absolute size and distance of the object (Saxberg, 1987a; Watson, Banks, von Hofsten, & Royden, 1992). In three experiments, we examined the ability to utilize the size and distance information provided by gravitational acceleration. Observers viewed computer simulations of an object rising and falling on a trajectory parallel to the gravitational vector. The simulated objects were three balls of different diameters presented across a wide range of simulated distances. Observers were asked to identify which ball was presented and the distance at which it was presented. The results of Experiment 1 showed that size and distance judgments were significantly better than chance, but not as accurate as expected if the information contained in the dynamics of free fall were used

fully utilized. The results of Experiment 2 showed that acceleration information is used, but that observers can also make use of velocity information. Finally, the results of Experiment 3 showed that observers can use projected size information, but that their size and distance judgments are much more accurate when motion information is present as well. These results show that observers can use the information in the dynamics of free fall to estimate absolute size and distance, but their estimates are not as accurate as they could be if the information were used effectively.
Author
Gravitation ; Acceleration (Physics) ; Psychophysics ; Diameters ; Distance

20020006067 Brookhaven National Lab. , Upton, NY USA
Short-Range Wakefield in a Flat Pillbox Cavity Generated by a Sub-Relativistic Beam Bunch
Wang, ; Palmer, ; Gallardo, ; Jun. 18, 2001 ; 6p ; In English
Report No.(s): DE2001-785370 ; BNL-68563 ; No Copyright ; Avail: Department of Energy Information Bridge
The short-range wakefield between two parallel conducting plates generated by a sub-relativistic beam bunch has been solved analytically by the image charge method in time domain. Comparing with the traditional modal analysis in frequency domain, this algorithm simplifies the mathematics and reveals in greater details the physics of electromagnetic field generation, propagation, reflection and causality. The calculated results have an excellent agreement with MAFIA and ABCI simulations in all range of beam velocities.
NTIS
Bunching ; Parallel Plates ; Cavities

20020006070 Brookhaven National Lab. , Upton, NY USA
Design of a magnet system for a muon cooling ring experiment
Kahn, ; Hanson, ; Schwandt, ; Balbekov, ; Raja, ; Jun. 18, 2001 ; 4p ; In English
Report No.(s): DE2001-785367 ; BNL-68560 ; No Copyright ; Avail: Department of Energy Information Bridge
A muon cooling ring is currently being investigated as a possible muon cooling experiment that can demonstrate 6D cooling. The cooling ring consists of long sole-noid channels with liquid H2 absorbers and RF cavities, shorter field flipped solenoids with LiH wedge absorbers and wedge shaped 45deg bending dipole magnets. This study examines the magnetic system of the muon ring cooler. The purpose at this point is to establish physical fields for the magnetic systems that can be used in tracking studies.
NTIS
Muons ; Cooling ; Electromagnetic Fields ; Radio Frequencies

20020006078 Los Alamos National Lab. , NM USA
Uncertain system modeling of sns rf control system
Kwon, S. ; Regan, A. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783288 ; LA-UR-01-3158 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper addresses the modeling problem of the linear accelerator RF system for SNS. The cascade of the klystron and the cavity is modeled as a nominal system. In the real world, high voltage power supply ripple, Lorentz Force Detuning, microphonics, cavity RF parameter perturbations, distortions in RF components, and loop time delay imperfection exist inevitably, which must be analyzed. The analysis is based on the accurate modeling of the disturbances and uncertainties. In this paper, a modern control theory is applied for modeling the disturbances, uncertainties, and for analyzing the closed loop system robust performance.
NTIS
Linear Accelerators ; Spallation ; Feedback Control ; Klystrons

20020006079 Los Alamos National Lab. , NM USA
Bench test of a residual gas ionization profile monitor (RGIPM)
Sellyey, W. C. ; Gilpatrick, J. D. ; Senior, R. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783285 ; LA-UR-01-3160 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
An RGIPM has been designed, constructed and bench tested to verify that all components are functioning properly and that the desired resolution of about 50 um rms can be achieved. This paper will describe major considerations that went into the bench test and some results.
NTIS
Residual Gas ; Gas Ionization

20020006080 Los Alamos National Lab. , NM USA

Design and experience with the ws/hs assembly movement using labview vis, national instrument motion controllers, and compumotor electronic drive units and motors

Barr, D. S. ; Day, L. A. ; Jun. 01, 2001 ; 4p ; In English

Report No.(s): DE2001-783281 ; LA-UR-01-3138 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Low-Energy Demonstration Accelerator (LEDA), designed and built at the Los Alamos National Laboratory, is part of the Accelerator Production of Tritium (APT) program and provides a platform for measuring high-power proton beam-halo formation. The technique used for measuring the beam halo employs nine combination Wire Scanner and Halo Scraper (WS/HS) devices. This paper will focus on the experiment gained in the use of National Instrument (NI) LabVIEW VI's and motion controllers, and Compumotor electronic drive units and motors. The base configuration couples a Compumotor motor driven by a Parker-Hannifin Gemini GT Drive unit. The drive unit is controlled by a NI PXI-7344 controller card, which in turn is controlled by a PC running custom built NI LabVIEW VI's. The function of the control VI's is to interpret instructions from the main control system, the Experimental Physics and Industrial Control System (EPICS), and carry out the corresponding motion commands. The main control VI has to run all nineteen WS/HS motor axes used in the accelerator. A basic discussion of the main accelerator control system, EPICs which is hosted on a VXI platform, and its interface with the PC based LabVIEW motion control software will be included.

NTIS

Accelerators ; Controllers

20020006090 Los Alamos National Lab. , NM USA

Automated control and real-time data processing of wire scanner/halo scraper measurements

Day, L. A. ; Gilpatrick, J. D. ; Jun. 01, 2001 ; 5p ; In English

Report No.(s): DE2001-783246 ; LA-UR-01-3203 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Low-Energy Demonstration (LEDA), assembled and operating at Las Alamos National Laboratory, provides the platform for obtaining measurements of high-power proton beam-halo formation. Control system software and hardware have been integrated and customized to enable the production of real-time beam-halo profiles. The Experimental Physics and Industrial Control System (EPICS) hosted on a VXI platform, Interactive Data Language (IDL) programs hosted on UNIX platforms, and LabVIEW (LV) Virtual Instruments hosted on a PC platform have been integrated and customized to provide real-time, synchronous motor control, data acquisition, and data analysis of data acquired through specialized DSP instrumentation. These modules communicate through EPICS Channel Access (CA) communication protocol extensions to control and manage execution flow ensuring synchronous data acquisition and real-time processing of measurement data. This paper describes the software integration and management scheme implemented to produce these real-time beam profiles.

NTIS

Accelerators ; Proton Beams

20020006147 Thomas Jefferson National Accelerator Facility , Newport News, VA USA

N(*) Spectrum using an O(a)-Improved Fermion Action

Richards, D. G. ; Aug. 01, 2000 ; 4p ; In English

Report No.(s): DE2001-773286 ; JLAB-THY-00-42 ; DOE/ER/40150-1793 ; HEP-LAT/0011 ; No Copyright ; Avail: Department of Energy Information Bridge

The construction of operators and calculational methods for the determination of the N* spectrum are discussed. The masses of the parity partners of the nucleon and delta are computed from the O(a)-improved data of the UKQCD Collaboration, and a clear splitting observed between the mass of the nucleon and its parity partner.

NTIS

Fermions ; Numerical Analysis ; Lattices (Mathematics) ; Field Theory (Physics)

20020006149 Thomas Jefferson National Accelerator Facility , Newport News, VA USA

Residual Chiral Symmetry Breaking in Domain-Wall Fermions

Jung, C. ; Edwards, R. G. ; Ji, X. ; Gadiyak, V. ; Aug. 01, 2000 ; 4p ; In English

Report No.(s): DE2001-773284 ; JLAB-THY-00-40 ; DOE/ER/40150-1791 ; HEP-LAT/0010 ; No Copyright ; Avail: Department of Energy Information Bridge

We study the effective quark mass induced by the finite separation of the domain walls in the domain-wall formulation of chiral fermion as the function of the size of the fifth dimension (L(sub s)), the gauge coupling (beta) and the physical volume (V). We measure the mass by calculating the small eigenvalues of the hermitian domain-wall Dirac operator H(sub DWF)(m(sub 0)

= 1.8) in the topologically-nontrivial quenched SU(3) gauge configurations. We find that the induced quark mass is nearly independent of the physical volume, decays exponentially as a function of L(sub s), and has a strong dependence on the size of quantum fluctuations controlled by (beta). The effect of the choice of the lattice gluon action is also studied.
NTIS
Fermions ; Broken Symmetry ; Chirality ; Quarks ; Domain Wall

20020006151 Fermi National Accelerator Lab. , Batavia, IL USA
epsilon(prime)/epsilon and rare KL decays from KTeV Experiment
Hsiung, Y. B. ; Jan. 16, 2001 ; 9p ; In English
Report No.(s): DE2001-773203 ; FERMILAB-CONF-00/345-E ; No Copyright ; Avail: Department of Energy Information Bridge

The authors update the current status for the measurement of the direct-CP violation parameters (epsilon)(prime)/(epsilon) in the KTeV experiment at Fermilab. Substantial statistics have been accumulated during the 1996-7 run and 1999 run for both (epsilon)(prime)/(epsilon) and rare K(sub L) decay searches. The first KTeV result on (epsilon)(prime)/(epsilon) published last year was Re((epsilon)(prime)/(epsilon)) = (28.0 (+/-) 4.1) x 10(sup -4) based on the 23% data from 1996-7 run. Combining with the previous E731, NA31 and the recent preliminary NA48 results, the grand average is Re((epsilon)(prime)/(epsilon)) = (19.3 (+/-) 3.6) x 10(sup -4) (with S = 1:49), more than 5(sigma) above zero. More data from both KTeV and NA48 after completing the analysis will further improve the precision of this measurement in the near future and hopefully further improve the agreement. New results on the branching ratio and form factor measurements of K(sub L) (r-arrow) (mu)(sup +) (mu)(sup (minus)) (gamma) using 1997 data are also presented. We find that BR(K(sub L) (r-arrow) (mu)(sup +) (mu)(sup (minus)) (gamma)) = (3.66 (+/-) 0.04(sub stat) (+/-) 0.07(sub syst)) x 10(sup -7). The form factor parameter (alpha)(sub K)* is measured to be (alpha)(sub K)* = (minus)0.157(sub -0.027)(sup +0.025). We make the first measurement of the parameter (alpha) from the D'Ambrosio, Isidori, and Portoles form factor, finding (alpha) = -1.53 (+/-) 0.09. This measurement of (alpha) limits the CKM parameter (rho) -0.2.
NTIS
Form Factors ; Statistics

20020006161 Brookhaven National Lab. , Upton, NY USA
Using a commercial mathematics software package for on-line analysis at the BNL Accelerator Test Facility
Malone, R. ; Wang, X. J. ; Jun. 14, 1999 ; 9p ; In English
Report No.(s): DE2001-772451 ; BNL-67832 ; KA0403000 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

By writing both a custom windows (NTTM) dynamic link library and generic companion server software, the intrinsic functions of Mathsoft Mathcad(TM) have been extended with new capabilities which permit direct access to the control system databases of Brookhaven National Laboratory Accelerator (BNL) Test Facility. Under this scheme, a Mathcad worksheet executing on a personal computer becomes a client which can both import and export data to a control system server via a network stream socket connection. The result is an alternative, mathematically oriented view of controlling the accelerator interactively.
NTIS
Particle Accelerators ; Control Theory ; Research Facilities ; Access Control ; On-Line Systems

20020006168 Fermi National Accelerator Lab. , Batavia, IL USA
Theory of the autozero box and the transverse tune measurement system of the Tevatron
Tan, C. Y. ; May 04, 1999 ; 47p ; In English
Report No.(s): DE2001-6617 ; FERMILAB-TM-2078 ; No Copyright ; Avail: Department of Energy Information Bridge

This paper is divided into two major parts: the theory of how the autozero box is used to suppress the revolution lines and the theory of how the transverse tune is measured. We will show that the autozero box will be unable to suppress all the revolution lines if there are relative phase errors between the plates of the stripline pickup and these unsuppressed lines will determine the minimum dynamic range needed for tune measurement. For tune measurement, we will show that the theoretical size of the tune line for a 1 V potential difference across the kickers would require a 16-bit analog to digital converter.
NTIS
Numerical Control ; Particle Accelerators

20020006191 Sandia Corp. , Albuquerque, NM USA

Impact Physics

Graham, Robert ; Dec. 1958 ; 105p ; In English

Report No.(s): AD-A395534 ; SCR-59 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche

This bibliography consists of a rather complete collection of references and abstracts on the subjects of: (1) plastic wave propagation in bounded solids; (2) behavior of metals under explosive conditions; (3) dynamic photoelasticity; (4) penetration phenomena. Other topics covered in less detail are: (5) behavior of material at high strain rates; (6) lateral impact; and (7) impact measurement devices. General references at the beginning of the bibliography cite articles or books which cover the field of impact. An author index and a chronological listing of articles within a particular topic are included.

DTIC

Bibliographies ; Metals ; Penetration ; Photoelasticity ; Impact

20020006212 Eltron Research, Inc. , Boulder, CO USA

Water Maintenance-Free Inorganic Proton Conductors for PEM Fuel Cells ***Final Report , 7 Feb.-6 Aug. 2001 on Phase 1***

Mackay, Richard ; Wu, Zhonglin ; Schrader, Lucas D. ; Namowicz, Kenneth J. ; Sammells, Anthoy F. ; Aug. 31, 2001 ; 29p ; In English

Contract(s)/Grant(s): DAAD19-01-C-0029

Report No.(s): AD-A395437 ; 185 ; ARO-42080.1-CH-SBI ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This Phase I project identified and characterized novel inorganic proton conducting composite membranes which do not require water maintenance systems. These materials can be used as membranes in proton exchange membrane fuel cells as well as a wide variety of hydrogen separation applications. This technology could be of significant economic and technical benefit to the Army and industries by providing low cost, high reliability, high efficiency, low temperature fuel cells without water management systems. Additionally, these membranes could act as novel reactor assemblies for carrying out hydrogenation and dehydrogenation reactions at potentially lower costs and higher yields compared to conventional processes. Performance was found to depend on membrane preparation. Hot pressing method was best for preparing fully dense membranes. Techniques for mixing and milling composites, as well as particle size of second phase were all found to affect the performance of the solid electrolytes. Order-disorder transition temperature of solid electrolyte into a superprotonic conducting phase was found to be influenced by the presence of the second phase in the composite. A maximum ionic conductivity measured was 6 x 10(exp -3) S/cm, and maximum power density of 4 mW/sq cm in H2/O2 fuel cell.

DTIC

Protons ; Conductors ; Membranes ; Fuel Cells ; Solid Electrolytes

20020006236 Los Alamos National Lab. , NM USA

Spallation studies on shock loaded u-6 wt pct nb

Tonks, D. ; Jan. 10, 2001 ; 5p ; In English

Report No.(s): DE2001-772991 ; LA-UR-99-3551 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Several spallation experiments have been performed on the 6 wt pct alloy of uranium using gas gun driven normal plate impacts with VISAR instrumentation and soft recovery. The nominal shock pressures achieved were 28, 34, 42, 50, 55, and 82 kbar. This paper will focus on spallation modeling, e.g. using the 1 D characteristics code CHARADE to simulate the free surface particle velocity. The spallation model involves the ductile growth and coalescence of voids. Metallographical examination of recovered samples and details of the experimental apparatus are discussed in a separate paper.

NTIS

Uranium Alloys ; Spallation ; Computerized Simulation

20020006246 Federal Energy Technology Center , Morgantown, WV USA

Hemispheric center for environmental technology

Ebadian, M. A. ; Jun. 30, 1999 ; 96p ; In English

Report No.(s): DE2001-772522 ; DE--FG21-95EW55094--70 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

To enhance the measurement capability of EICs to alpha spectrometry, measurements at FIU-HCET were performed on different energy alpha sources, and response factors of ST electrets in 960-mL chamber were determined. Earlier, EIC was considered as only a charge-integrating device without spectrometric capability. This is a potentially significant development accomplished by FIU-HCET. It could appreciably lower the current cost of spectral characterization. FIU-HCET has been invited

to participate in the Operating Engineers' National Hazmat program's assessment of the Mini Mitter, commercially known as the VitalSense(trademark) Telemetric Monitoring System. This evaluation is scheduled for early July 1999. Additional health and safety technology evaluations, in which FIU-HCET will also participate, are also scheduled for later in the summer. The Technology Information System (TIS), MISD, and DASD are now complete and accessible through the Internet website http://www.DandD.org/tis.
NTIS
Electrets ; Charge Coupled Devices ; Safety Devices

20020006329 Fermi National Accelerator Lab. , Batavia, IL USA
Higgs boson discovery prospects at the Tevatron
Roco, M. T. P. ; Grannis, P. ; May 27, 1999 ; 10p ; In English
Report No.(s): DE2001-6983 ; FERMILAB-CONF-99/118-E ; No Copyright ; Avail: Department of Energy Information Bridge
Preliminary results from a Fermilab study of the sensitivity for Higgs boson production at the upgraded Tevatron are presented. The study extends previous results by systematically combining results for all decay channels, considering the production of higher mass Higgs bosons and interpreting the results in the context of super-symmetric Higgs production as well as Standard Model production. New analysis methods significantly improve the sensitivity. With 20 fb(sup (minus)1) of accumulated data, the Higgs discovery reach can be extended to M(sub H) = 180 GeV.
NTIS
Higgs Bosons ; Particle Accelerators

20020006333 Los Alamos National Lab. , NM USA
Atlas acceptance test
Cochrane, J. C. ; Parker, J. V. ; Jun. 01, 2001 ; 6p ; In English
Report No.(s): DE2001-783268 ; LA-UR-01-3259 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The acceptance test program for Atlas, a 23 MJ pulsed power facility for use in the Los Alamos High Energy Density Hydrodynamics program, has been completed. Completion of this program officially releases Atlas from the construction phase and readies it for experiments. Details of the acceptance test program results and of machine capabilities for experiments will be presented.
NTIS
Acceptability ; Flux Density

20020006521 Los Alamos National Lab. , NM USA
Decoherence effects of motion-induced radiation
Neto, P. ; Dalvit, D. ; Dec. 01, 2000 ; 10p ; In English
Report No.(s): DE2001-772604 ; LA-UR-00-6072 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The radiation pressure coupling with vacuum fluctuations gives rise to energy damping and decoherence of an oscillating particle. Both effects result from the emission of pairs of photons, a quantum effect related to the fluctuations of the Casimir force. We discuss different alternative methods for the computation of the decoherence time scale. We take the example of a spherical perfectly-reflecting particle, and consider the zero and high temperature limits. We also present short general reviews on decoherence and dynamical Casimir effect.
NTIS
Radiation Pressure ; Oscillations ; Damping ; Particles

20020006527 Los Alamos National Lab. , NM USA
Numerical simulations of converging shocks in pulsed power driven experiments
Kanzleiter, R. ; Atchison, W. ; Dec. 01, 2000 ; 26p ; In English
Report No.(s): DE2001-772848 ; LA-UR-00-5933 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The final shot of the current Near Term Liner Experiment (NTLX) series occurred on September 29, 2000. Utilization of a pulsed power source with a standardized liner/target "cartridge" produced a uniform implosion to drive hydrodynamic experiments. Diagnostics showed that high quality data of shock propagation can be obtained from pulsed power liner drivers as in the current NTLX series. Very good agreement in calculating shock locations was obtained between the codes used to model the NTLX series, RAGE and RAVEN. RAVEN also accurately predicts liner/target impact as measured by B-Dot probes. Large differences are observed between the calculated and measured positions of converging shock waves even in simple geometrical configurations. Liner/target impact is accurately calculated and similar results are produced for shock velocities in Lucite. RAGE

and RAVEN use different hydrodynamic algorithms, yet agree, this focuses current efforts on EOS issues within the outer tin target to resolve discrepancies. Further diagnostics covering shock breakout from the outer tin target and shock propagation shortly thereafter would be highly beneficial.
NTIS
Hydrodynamics ; Implosions ; Shock Waves

20020006531 Los Alamos National Lab. , NM USA
Analytical monte carlo method for radiation transport calculations
Martin, W. ; Brown, F. ; Feb. 01, 2001 ; 12p ; In English
Report No.(s): DE2001-774260 ; LA-UR-01-680 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Recently, the Low-Energy Demonstration Accelerator (LEDA) portion of the Accelerator Production of Tritium (APT) project reachd its 100-mA, eight hour continuous wave (CW) beam operation milestone. The LEDA accelerator is a prototype of the low energy front end of the linear accelerator (linac) that would have been used in an APT plant. LEDA consists of a 75 keV proton injector, 6.7 MeV, 350 MHz CW radio-frequency quadrupole (RFQ) with associated high power and low level RF (radio frequency) systems, a short high energy beam transport (HEBT) and high power (670 kW CW) beam dump. Details of the LEDA design features will be discussed along with the operational health physics experiences that occurred during the LEDA commissioning phase.
NTIS
Monte Carlo Method ; Radiation Transport

20020006535 Los Alamos National Lab. , NM USA
Integrating a linear interpolation function across triangular cell boundaries
Wiseman, J. R. ; Brock, J. S. ; Apr. 01, 2000 ; 19p ; In English
Report No.(s): DE2001-774390 ; LA-UR-00-3330 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Computational models of particle dynamics often exchange solution data with discretized continuum-fields using interpolation functions. These particle methods require a series expansion of the interpolation function for two purposes: numerical analysis used to establish the model's consistency and accuracy, and logical-coordinate evaluation used to locate particles within a grid. This report presents discrete expansions for a linear interpolation function commonly used within triangular cell geometries. Discrete expansions, unlike a Taylor's series, account for interpolation discontinuities across cell boundaries and, therefore, are valid throughout a discretized domain. Verification of linear discrete expansions is demonstrated on a simple test problem.
NTIS
Interpolation ; Computation ; Discretization (Mathematics) ; Particle Theory

20020006773 Los Alamos National Lab. , NM USA
Unsplit, two-dimensional advection algorithm
Mosso, S. J. ; Swartz, B. K. ; Mar. 01, 2001 ; 14p ; In English
Report No.(s): DE2001-775969 ; LA-UR-01-1476 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The paper describes a method of representing the distribution of advected quantities over zones with a conservative, multi-dimensional, monotonically limited, quadratic interpolant. The method is applicable to two- and three-dimensional, regular and irregular grids. The intent of this method is to reduce dissipation associated with advection.
NTIS
Advection ; Algorithms ; Hydrodynamics

20020006784 Naval Research Lab. , Washington, DC USA
Self-Magnetic Field Effects on Electron Emission as the Critical Current is Approached ***Interim Report***
Ottinger, P. F. ; Cooperstein, G. ; Schumer, J. W. ; Swanekamp, S. B. ; Sep. 28, 2001 ; 16p ; In English
Report No.(s): AD-A395550 ; NRL/MR/6770-01-8567 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The self-magnetic field associated with the current in a planar diode is shown to reduce electron emission below the Child-Langmuir current density. As the magnetic field increases, the diode current is limited to the critical current. Here, a ID analysis is carried out to calculate the suppressed current density in the presence of a transverse magnetic field. The problem is shown to be similar to that of the limiting current (i.e., Hull current) calculated in a crossed field gap, in which a constant transverse magnetic field is applied across the gap to insulate the electron flow. In the case considered here, the magnetic field is produced by the diode current itself and this self-magnetic field decreases with distance along the gap. It is shown that the emitted current

density is only modestly reduced from the Child-Langmuir current density. The 1-D analysis remains valid until critical current is approached, at which point orbit crossing occurs and a 2-D kinetic analysis is required. The minimum diode length required to reach critical current is also derived.
DTIC
Magnetic Fields ; Current Density ; Critical Current ; Diodes

20020006816 Cambridge Univ. , Cambridge UK
Workshops on Models of Fracture
Willis, J. R. ; Nov. 1999 ; 38p ; In English
Contract(s)/Grant(s): F61775-99-W-F-062
Report No.(s): AD-A395619 ; CSP-99-5062 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The Final Proceedings for Models of Fracture, 1 November 1999 - 12 November 1999. This is an interdisciplinary conference. Topics include nonlinear modeling of crack propagation in solids, damage mechanics, variational methods in crack theory, interactions between micro- and macro-cracks, fractal structures, and structural mechanics.
DTIC
Conferences ; Fracture Mechanics ; Mathematical Models ; Nonlinearity

20020006828 Oak Ridge National Lab. , TN USA
Experimental Studies on Attenuation of Pressure Waves Induced by Thermal Shocks
Kim, S. H. ; Feb. 13, 2001 ; 6p ; In English
Report No.(s): DE2001-775414 ; P01-110046 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
High magnitude pressure waves are expected in the mercury-filled Spallation Neutron Source target system. An appropriate measure is needed to protect the target system from such high pressure waves. It has been known that inclusion of devices like scattering centers in the pressure field will attenuate pressure waves by scattering waves between scattering centers. A series of experiments have been conducted to test such a concept. After verifying the concept by performing simple scoping experiments, fives series of experiments were conducted with various configuration to measure changes in sound speed and pressure amplitude with inclusion of various scattering centers. Results indicate that for the conditions of our test, no significant change in sound speed was observed; however, substantial attenuation of pressure waves was detected with scattering centers in mercury.
NTIS
Thermal Shock ; Attenuation ; Acoustic Velocity ; Elastic Waves ; Pressure Distribution

20020006844 Fermi National Accelerator Lab. , Batavia, IL USA
Rare Decay Results from KTeV and ((rho)(sub CKM), (eta)(sub CKM))
Bellantoni, L. ; Feb. 14, 2001 ; 12p ; In English ; 5th ; 5th Workshop on Heavy Quarks at Fixed Target , 9-12 Sept. 2000 , Rio De Janeiro , Brazil
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2001-774580 ; FERMILAB-CONF-00/314-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Rare decay results from KTeV are reviewed, emphasizing modes that in principle provide information about the CKM matrix. The KTeV results shown here are from the 1997 data sample, which consists of about 2.7 x 10(sup 11) K(sub L)(sup 0) decay samples. KTeV also took data in 1999, giving a total data sample about 2.5 times what is presented here for three body decays and about 3.2 times what is presented here for four body decays. A summary of the KTeV detector is in the Appendix. Our recent results in lepton flavor violating modes are also presented.
NTIS
Leptons ; Particle Decay ; Particle Interactions

20020006845 Fermi National Accelerator Lab. , Batavia, IL USA
Two-loop perturbative quark mass renormalization from large (beta) Monte Carlo
Juge, K. J. ; Feb. 14, 2001 ; 4p ; In English ; 18th ; XVIII International Symposium on Lattice Field Theory , 08/17/2000--08/22/2000 , Bangalore , India
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2001-774578 ; FERMILAB-CONF-00/291-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We present the calculation of heavy Wilson quark mass renormalization constants from large beta Monte Carlo simulations. Simulations were performed at various beta larger than 9, each on several spatial lattice sizes to allow for an infinite volume extrapolation. We use twisted boundary conditions to suppress tunneling and work in Coulomb gauge with appropriate adjustments for the temporal links. The one-loop coefficient obtained from this method is in agreement with the analytical result and a preliminary result for the second order coefficient is reported.
NTIS
Monte Carlo Method ; Quarks ; Mass Distribution

20020007920 Brookhaven National Lab. , Upton, NY USA
Ring RF and longitudinal dynamics in the SNS
Blaskiewicz, M. ; Brennan, J. M. ; Brodowski, J. ; Delong, J. ; Meth, M. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773970 ; BNL-67358 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Average beam currents of 40 A will be present in the Spallation Neutron Source. Even though the entire cycle time is only one synchrotron oscillation the longitudinal phase space determines peak beam current and momentum spread. Both factors play a role in space charge and instability dynamics. Longitudinal simulations with beam loading and longitudinal space charge have been done in the design phase.
NTIS
Neutron Sources ; Spallation ; Beam Currents

20020007925 Fermi National Accelerator Lab. , Batavia, IL USA
C++ particle data table interface
Garren, L. A. ; Mar. 20, 2001 ; 3p ; In English
Report No.(s): DE2001-776047 ; FERMILAB-CONF-01/027 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
As a result of discussions within the HEP community, we have written a C++ package which can be used to maintain a table of particle properties, including decay mode information. The classes allow for multiple tables and accept input from a number of standard sources.
NTIS
C++ (Programming Language) ; Particle Theory

20020008011 Norwegian Defence Research Establishment , Kjeller, Norway
Flat Trajectory Ballistics , Part 1 ***Flatbaneballistikk , Del 1 , Generell Teori***
Grandum, Oyvind , Norwegian Defence Research Establishment , Norway ; Mar. 20, 2001 ; 70p ; In Norwegian ; Original contains color illustrations
Contract(s)/Grant(s): FFIBM Proj. 748/130
Report No.(s): FFI/RAPPORT-2001/01062 ; ISBN 82-464-0551-9 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
Relevant theory of exterior ballistics, aerodynamics and physics is compiled, extended and made ready for application to flat trajectory weapons. Emphasis is made on a rigid mathematical foundation, covering the combined yawing and rolling motion of symmetric and slightly asymmetric projectiles, spin control and yaw card measurement techniques, and also other topics relevant for flat trajectory ballistics.
Author
Aerodynamics ; Ballistics ; Applications Programs (Computers)

20020008096 Helsinki Univ. of Technology , Espoo, Finland
UBI Materia, IBI Geometria
Sihvola, A. ; Sep. 2000 ; 20p ; In English
Report No.(s): PB2001-107368 ; ISBN 951-22-5152-3 ; Copyright ; Avail: National Technical Information Service (NTIS) , Microfiche
This study discusses the connection between geometry and matter. The theme of the paper, ubi materia, ibi geometria, is illuminated from the point of view of post-Renaissance science and also in terms of modern bi-anisotropic electromagnetics research. The citation is pinpointed in Johannes Kepler's philosophical texts, and an attempt is made to understand its meaning.

The validity of 'ubi materia, ibi geometria' for the electromagnetic bi-anisotropics research is reconfirmed and a modified interpretation is proposed for it.
NTIS
Geometry ; Matter (Physics)

20020008121 Fermi National Accelerator Lab. , Batavia, IL USA
Supersymmetric Radiative Corrections at Large Tan Beta
Logan, H. E. ; Feb. 20, 2001 ; 10p ; In English
Report No.(s): DE2001-774730 ; FERMILAB-CONF-01/010-T ; No Copyright ; Avail: Department of Energy Information Bridge

In the minimal supersymmetric extension of the Standard Model (MSSM), fermion masses and Yukawa couplings receive radiative corrections at one loop from diagrams involving the supersymmetric particles. The corrections to the relation between down-type fermion masses and Yukawa couplings are enhanced by tan(beta), which makes them potentially very significant at large tan(beta). These corrections affect a wide range of processes in the MSSM, including neutral and charged Higgs phenomenology, rare B meson decays, and renormalization of the CKM matrix. We give a pedagogical review of the sources and phenomenological effects of these corrections.
NTIS
Correction ; Particle Decay ; Phenomenology ; Supersymmetry ; Yukawa Potential

20020008122 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Helicity Dependence in Photodisintegration of the Deuteron
Wojtsekhowski, B. ; vanOers, W. T. H. ; Oct. 01, 2000 ; 2p ; In English
Report No.(s): DE2001-774728 ; JLAB-PHY-01-05 ; DOE/ER/40150-1804 ; No Copyright ; Avail: Department of Energy Information Bridge

The weak proton neutron interaction can be studied through parity violation in deuteron photodisintegration. The experiment's feasibility is presently under study. The intensity and polarization of the electron beam at CEBAF allow to produce a record intensity of circularly polarized beam of a few MeV photons (approximately 10(exp 15) per second). The status and the program of development will be presented.
NTIS
Deuterons ; Disintegration ; Feasibility

20020008123 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Pair-Polarimeter for High Energy Protons
Wojtsekhowski, B. ; Tedeschi, D. ; Vlahovic, B. ; Danagulian, S. ; Oct. 14, 2000 ; 2p ; In English
Report No.(s): DE2001-774727 ; JLAB-PHY-01-04 ; DOE/ER/40150-1804 ; No Copyright ; Avail: Department of Energy Information Bridge

The angle correlation in e(+)e(-) pair production by linear polarized photon was proposed for photon polarization measurements by Yang and Berlin and Madansky. An accurate quantum electrodynamics (QED) calculation with analysis of the possible experimental setup was done by L. Maximon and H. Olsen. The effect was used successfully for measurement of the beam polarization. The limitation of the method at photon energies above 100 MeV arises from the small value of an angle between pair components. They propose a new polarimeter for high energy photons based on the well known correlation in electron-positron pair production from an amorphous converter. The detector design utilizes silicon micro-strip detectors that allow the construction of a compact device useful in the few GeV photon energy range. The most important features of these detectors are the capability to detect two tracks separated by a very small distance (approximately 100 microns) and very good position resolution, (approximately a few microns). Because the typical opening angle in e(+)e(-) pair is about 1/gamma and available space for a polarimeter is about 1 meter, the distance e(+)e(-) is about a fraction of a millimeter. It means that at the photon energies of interest, most of pairs have a distance e(+)e(-) much larger than the micro strip detector limitation.
NTIS
Pair Production ; Photons ; Quantum Electrodynamics ; Protons

20020008134 Oak Ridge National Lab. , TN USA
Frontiers in Nuclear Structure
Nazarewicz, W. ; Jan. 16, 2001 ; 14p ; In English ; Bologna 2000 - Structure of the Nucleus at the Dawn of the Century
Report No.(s): DE2001-774667 ; P01-109649 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The main objective of this brief review was to discuss various facts of nuclear structure physics. The list of topics covered is by no means complete due to time and space constraints. In years to come, they shall see substantial progress in their understanding of molecular structure--a rich and interdisciplinary field. An important element in this task is to extend the study of nuclei into new domains. New radioactive beam facilities, together with advanced multi-detector arrays and mass/change separators, is essential in probing nuclei in new domains where new phenomena, likely to be different from anything they have observed to date, will occur. The new data are expected to bring qualitatively new information about the fundamental properties of the nucleonic many-body system and will be crucial for developing a unified description of the nucleus.
NTIS
Nuclear Structure ; Nuclear Physics

20020008138 Brookhaven National Lab. , Upton, NY USA
Experimental study of beam collimation in low energy proton rings
Catalan-Lasheras, N. ; Fedotov, A. V. ; Gassner, D. ; Kurennoy, S. ; Biryukov, V. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773969 ; BNL-67362 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

With a maximum level of uncontrolled loss of 10(sup -4) of the total beam, the design of the Spallation Neutron Source (SNS) accumulator ring is severely constrained by loss budget considerations. It is then mandatory to have an accurate prediction of the collimation systems efficiency and uncontrolled loss distribution at low energy (1 GeV). Significant effort is being invested in benchmarking of the codes for collimation simulation at SNS. In particular, we are performing experiments in the U-70 ring at Protvino, Russia. This proton machine can operate at 1.3 GeV, close to the SNS baseline of 1 GeV. In these experiments, we plan to measure the dependence of the collimation efficiency on the impact parameter. We also study the behavior of different materials when used as primary scrapers. This paper describes the experimental setup and procedures for the experiment and presents the first experimental results.
NTIS
Neutron Sources ; Collimation ; Protons ; Simulation ; Particle Production ; Beams (Radiation)

20020008139 Brookhaven National Lab. , Upton, NY USA
Optimization of the collimation system for the SNS accumulator ring
Catalan-Lasheras, N. ; Lee, Y. Y. ; Ludewig, H. ; Simon, N. ; Wei, J. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773968 ; BNL-67363 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The collimation system for the Spallation Neutron Source (SNS) accumulator ring will dissipate about 2 kW of beam power and is designed for a capture efficiency close to 95% of the halo. Preliminary studies, assuming no errors and a uniform distribution of losses, indicated that a maximum level of uncontrolled loss of 0.01% of the total beam is achievable. On the other hand, the energy lost in the primary scraper could concentrate uncontrolled losses in areas of maximum dispersion. We use Monte Carlo simulations to clarify some beam dynamic issues that could compromise the high efficiency required. The material interacting with the beam and the shape of the three structures forming the collimator system have been carefully chosen to maximize the collimation efficiency and minimize activation. Moreover, a realistic distribution of losses around the machine allows identification of potential hot points. This paper describes the latest version of the collimation system and summarizes the main results of these numerical studies.
NTIS
Neutron Sources ; Collimators ; Monte Carlo Method ; Collimation ; Spallation

20020008140 Brookhaven National Lab. , Upton, NY USA
SNS project wide beam current monitors
Kesselman, M. ; Witkover, R. ; Doolittle, L. ; Power, J. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773967 ; BNL-67366 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Spallation Neutron Source (SNS) to be constructed at ORNL (Oak Ridge National Laboratory) is a collaboration of six U.S. National Laboratories. Beam current monitors for SNS will be used to monitor H-minus and H-plus beams ranging from 10mA (tune-up in the Front End, Linac and HEBT (High Energy Beam Transport)) to over 60 A fully accumulated in the Ring and RTBT (resonant tunneling base transistor). The time structure of the beams to be measured range from 645 nanosec 'mini' bunches, at the 1.05 MHz Ring revolution rate, to an overall 1 ms long macro pulse. While the beam current monitors for the SNS have requirements depending upon their location within the system, the development of a unified approach to satisfy requirements

of the various locations with common components is a major design objective. This paper will describe the development of the beam current monitors. Various approaches considered for the detectors and signal conditioning will be presented.
NTIS
Particle Accelerators ; Beam Currents ; Neutron Sources

20020008141 Brookhaven National Lab. , Upton, NY USA
Diffusive aperture due to long-range beam-beam interaction
Papaphilippou, Y. ; Zimmermann, F. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773966 ; BNL-67369 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Weak-strong tracking simulations for the Large Hadron Collider (LHC) show that long range beam-beam collisions give rise to a well defined diffusive aperture beyond which particles are lost quickly. We calculate the tune shift with amplitude and single-resonance driving terms for beam-beam collisions with an arbitrary transverse offset, and then apply Chirikov resonance overlap criterion to construct an analytical estimate of the diffusive aperture induced by long range collisions. The analytical results are compared with tracking data for the LHC.
NTIS
Particle Accelerators ; Beam Interactions ; Hadrons ; Particle Collisions

20020008142 Brookhaven National Lab. , Upton, NY USA
Correction schemes for the normal octupole and decapole errors in the LHC dipoles
Papaphilippou, Y. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-773965 ; BNL-67370 ; KC0204019 ; No Copyright ; Avail: Department of Energy Information Bridge
Different correction schemes for curing the effect of the normal octupole and decapole multipole errors of the LHC (Large Hadron Collider) main dipoles, at injection, are investigated. Frequency and diffusion maps are constructed and compared for two working points and for different values of the momentum deviation. The excitation of individual resonant driving terms is estimated through high order normal form construction techniques.
NTIS
Multipoles ; Correction ; Hadrons ; Particle Collisions ; Particle Accelerators

20020008143 Brookhaven National Lab. , Upton, NY USA
Crossing a coupling spin resonance with an RF dipole
Bai, M. ; Roser, T. ; Oct. 16, 2000 ; 5p ; In English
Report No.(s): DE2001-773963 ; BNL-67834 ; KA040301 ; No Copyright ; Avail: Department of Energy Information Bridge
In accelerators, due to quadrupole roll errors and solenoid fields, the polarized proton acceleration often encounters coupling spin resonances. In the Brookhaven AGS (Alternating Gradient Synchrotron), the coupling effect comes from the solenoid partial snake which is used to overcome imperfection resonances. The coupling spin resonance strength is proportional to the amount of coupling as well as the strength of the corresponding intrinsic spin resonance. The coupling resonance can cause substantial beam polarization loss if its corresponding intrinsic spin resonance is very strong. A new method of using an horizontal RF (radio frequency) dipole to induce a full spin flip crossing both the intrinsic and its coupling spin resonances is studied in the Brookhaven's AGS. Numerical simulations show that a full spin flip can be induced after crossing the two resonances by using a horizontal RF dipole to induce a large vertical coherent oscillation.
NTIS
Quadrupoles ; Particle Spin ; Coupling ; Synchrotrons

20020008196 Oak Ridge National Lab. , TN USA
ORLaND: Oak Ridge Laboratory for Neutrino Detectors
Plasil, F. ; Jun. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-786340 ; P01-110967 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The proposed Oak Ridge Laboratory for Neutrino Detectors (ORLaND) to be located adjacent to the Spallation Neutron Source (SNS), is described. ORLaND will take advantage of the fact that the SNS will be the world's best intermediate energy pulsed neutrino source in the world. A broad range of neutrino measurements is contemplated by means of a number of detectors,

including the large CoNDOR detector. Specifics of neutrino oscillation investigations, and of the possible impact of certain neutrino measurements on our understanding of supernova explosions, are discussed.
NTIS
Neutrinos ; Spallation ; Neutron Counters

20020008202 Fermi National Accelerator Lab. , Batavia, IL USA
Study of thermal cycling and radiation effects on indium and solder bump bonding
Cihangir, S. ; Sep. 12, 2001 ; 3p ; In English
Report No.(s): DE2001-786190 ; FERMILAB-CONF-01/251-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The BTe-V hybrid pixel detector is constructed of readout chips and sensor arrays which are developed separately. The detector is assembled by flip-chip mating of the two parts. This method requires the availability of highly reliable, reasonably low cost fine-pitch flip-chip attachment technology. We have tested the quality of two bump-bonding technologies; indium bumps (by Advanced Interconnect Technology Ltd. (AIT) of Hong Kong) and fluxless solder bumps (by MCNC in North Carolina, U.S.A.). The results have been presented elsewhere. In this paper we describe tests we performed to further evaluate these technologies. We subjected 15 indium bump-bonded and 15 fluxless solder bump-bonded dummy detectors through a thermal cycle and then a dose of radiation to observe the effects of cooling, heating and radiation on bump-bonds.
NTIS
Indium ; Bonding ; Thermal Cycling Tests ; Radiation Effects

20020008401 Oak Ridge National Lab. , TN USA
Arbitrarily High Order Transport Method of the Characteristic. Type for Tetrahedral Grids
Azmy, Y. Y. ; Jun. 27, 2001 ; 18p ; In English
Report No.(s): DE2001-786333 ; P01-110941 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A formalism is derived for the Arbitrarily High Order Transport (AHOT) method of the Characteristic type (AHOT-C) in three-dimensional geometry for unstructured grids (UG). The resulting equations are implemented in a computer code, AHOT-C-UG, in the C language. The transport solution on the unstructured grid is stored as two inter-linked lists of cell and face flux moments. This arrangement allows the transport sweep to select the order of evaluation dynamically so that the typical recursive ordering the discrete ordinate's mesh sweep is maintained without the need to store a precomputed order for each ordinate. The dynamic cell sweep order thus reduces the memory demand without excessively increasing execution time. Comparison of AHOT-C-UG's solutions to fine mesh TORT solutions illustrate high accuracy of the new method. In particular, large half a million cell numerical tests illustrate a convergence rate for the error as O(h), where h is a measure of the longest edge in the tetrahedral grid. Execution time on a 700 MHz Intel Pentium III running requirement is of the order of 240 bytes per tetrahedral cell, where 64-bit arithmetic precision is employed throughout.
NTIS
Tetrahedrons ; Computational Geometry ; Computational Grids ; Unstructured Grids (Mathematics) ; C (Programming Language)

20020008642 Argonne National Lab. , IL USA
Physics division annual report, October 2000
Thayer, K. ; Oct. 16, 2000 ; 281p ; In English
Report No.(s): DE2001-772137 ; ANL-00/20 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This report summarizes the research performed in the past year in the Argonne Physics Division. The Division programs include operation of ATLAS as a national heavy-ion user facility, nuclear structure and reaction research with beams of heavy ions, accelerator research and development especially in superconducting radio frequency technology, nuclear theory and medium energy nuclear physics. The Division took significant strides forward in its science and its initiatives for the future in the past year. Major progress was made in developing the concept and the technology for the future advanced facility of beams of short-lived nuclei, the Rare Isotope Accelerator. The scientific program capitalized on important instrumentation initiatives with key advances in nuclear science. In 1999, the nuclear science community adopted the Argonne concept for a multi-beam superconducting linear accelerator driver as the design of choice for the next major facility in the field a Rare Isotope Accelerator (RIA) as recommended by the Nuclear Science Advisory Committee 1996 Long Range Plan. Argonne has made significant R&D progress on almost all aspects of the design concept including the fast gas catcher (to allow fast fragmentation beams to be stopped and reaccelerated) that in large part, defined the RIA concept the superconducting rf technology for the driver accelerator, the multiple-charge-state concept (to permit the facility to meet the design intensity goals with existing ion-source

technology), and designs and tests of high-power target concepts to effectively deal with the full beam power of the driver linac. An NSAC subcommittee recommended the Argonne concept and set as tie design goal Uranium beams of 100-kwatt power at 400 MeV/u. Argonne demonstrated that this goal can be met with an innovative, but technically in-hand, design.
NTIS
Charged Particles ; Nuclear Physics ; Plant Design ; Isotopes ; Ion Sources

20020008663 Stanford Linear Accelerator Center , Stanford, CA USA
Electroweak Measurements with Heavy Quarks at SLD
Bellodi, G. , Stanford Linear Accelerator Center , USA ; Oct. 03, 2000 ; 9p ; In English
Report No.(s): DE2001-784724 ; SLAC-PUB-8637 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The SLD (SLAC (Stanford Linear Accelerator Center) Large Detector) detector collected a sample of 550K hadronic events at the Z peak from e+ / e- collisions at the SLC (SLAC Linear Collider) during the 1993 to 1998 period. Polarized electron beams, a small and stable interaction point and the excellent performance of the 3-D (three dimensional) CCD (charge coupled device) vertex detector provide a unique environment for precision electroweak tests of the Standard Model. Improved measurements of heavy quark electroweak parameters are presented here.
NTIS
Electroweak Interactions (Field Theory) ; Linear Accelerators ; Quarks ; Particle Collisions

20020009028 Brookhaven National Lab. , Upton, NY USA
Symposium Highlights
Roser, ; Oct. 16, 2000 ; 8p ; In English ; 14th International Symposium on Spin Physics
Report No.(s): DE2001-776726 ; BNL-67934 ; No Copyright ; Avail: Department of Energy Information Bridge
Some of the highlights of the 14th International Symposium on Spin Physics are presented with emphasis on recent and planned progress in experimental tools and tools and facilities.
NTIS
Conferences ; Spin Dynamics

20020009070 Nebraska Univ. , Lincoln, NE USA
Crystal Engineering in Two Dimensions: Friction and Ferroelectrics ***Final Report , 1 Sep. 1996-31 Mar. 2001***
Eckhardt, Craig J. ; Oct. 26, 2001 ; 8p ; In English
Contract(s)/Grant(s): DAAH04-96-1-0394
Report No.(s): AD-A396068 ; ARO-36325.5-CH-DPS ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
Langmuir films of novel amphiphiles that present reversible collapse and two immiscible liquid phases are reported. The amphiphiles are distinguished by very large ”bulge” groups that are significantly larger than the amphiphile chain. Brewster Angle Microscopy studies and absorption isotherms are used to demonstrate these findings. A major theoretical advance is reported using a solid state approach through mean field theory to model all observed solid like phases of Langmuir films of alkanoic acids or alcohols. Adaptation of the model amphiphiles to form molecules for formation of self-assembled monolayers with controlled frictional properties was unsuccessful.
DTIC
Ferroelectricity ; Friction ; Langmuir-Blodgett Films

20020009497 Brookhaven National Lab. , Upton, NY USA
From nuclei to hypernuclei: A retrospective view of medium energy physics at Brookhaven
Chrien, R. E. ; Oct. 23, 2000 ; 12p ; In English
Report No.(s): DE2001-780686 ; BNL-68231 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A new frontier in physics originated with programs at two Brookhaven National Laboratory facilities - the Cosmotron and the Alternating Gradient Synchrotron. The development of this frontier over a half century is described, as it turned from conventional nuclear physics to the hypernuclei and the study of strange matter.
NTIS
Nuclear Physics ; Research Facilities

20020009574 Brookhaven National Lab. , Upton, NY USA

Proceeding of workshop on photo-injector for energy recovery linac

Wang, ; Jan. 22, 2001 ; 357p ; In English

Report No.(s): DE2001-780780 ; BNL-52624 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Workshop on Photo-injectors for Energy Recovery Linac was held at National Synchrotron Light Source (NSLS) of Brookhaven National Laboratory (BNL) on January 22 and 23, 2001. Fifty people attended the workshop; they came from three countries, representing universities, industries and national laboratories. This is the first workshop ever held on photo-injectors for CW operation, and for the first time, both DC and RF photo-injectors were discussed at the workshop. Workshop covered almost all major issues of photo-injectors, photocathode, laser system, vacuum, DC, 433 MHz/B-factory cavities based RF gun, 1.3 GHz RF gun and beam instrumentation. High quantum efficiency and long live time photocathode is the issue discussed during the workshop. Four working group leaders have done great jobs summarizing the workshop discussion, and identifying the major issues for future R and D.

NTIS

Linear Accelerators ; Synchrotrons ; Continuous Radiation

20020009611 Lawrence Livermore National Lab. , Livermore, CA USA

Dynamic Multi-Rigid-Body Systems with Concurrent Distributed Contacts: Theory and Examples

Trinkle, J. C. ; Tzitzouris, J. A. ; Pang, J. S. ; Mar. 01, 2001 ; 29p ; In English

Report No.(s): DE2001-780283 ; SAND2001-0076 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Consider a system of rigid bodies with multiple concurrent contacts. The multi-rigid-body contact problem is to predict the accelerations of the bodies and the normal friction loads acting at the contacts. This paper presents theoretical results for the multi-rigid-body contact problem under the assumptions that one or more contacts occur over locally planar, finite regions and that friction forces are consistent with the maximum work inequality. Existence and uniqueness results are presented for this problem under mild assumptions on the system inputs. In addition, the performance of two different time-stepping methods for integrating the dynamics are compared on two simple multi-body systems.

NTIS

Rigid Structures ; Mathematical Models ; Friction ; Many Body Problem

20020009684 Brookhaven National Lab. , Upton, NY USA

Hera luminosity upgrade superconducting magnet production at BNL

Parker, ; Anerella, ; Escallier, ; Ghosh, ; Jain, ; Sep. 17, 2000 ; 4p ; In English

Report No.(s): DE2001-781375 ; BNL-68284 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Production of two types of superconducting multi-function magnets, needed for the HEX4 Luminosity Upgrade is underway at BNL. Coil winding is now completed and cryostat assembly is in progress. Magnet type GO and type GG cold masses have been satisfactorily cold tested in vertical dewars and the first fully assembled GO magnet system has been horizontally cold tested and shipped to DESY. Warm measurements confirm that the coils meet challenging harmonic content targets. In this paper we discuss GO and GG magnet design and construction solutions, field harmonic measurements and quench test results.

NTIS

Superconducting Magnets ; Luminosity

20020009685 Brookhaven National Lab. , Upton, NY USA

Electron cooling for RHIC

Ben-Zvi, ; Ahrens, ; Brennan, ; Harrison, ; Kewisch, ; Jun. 18, 2001 ; 3p ; In English

Report No.(s): DE2001-781374 ; BNL-68291 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We introduce plans for electron-cooling of the Relativistic Heavy Ion Collider (RHIC). This project has a number of new features as electron coolers go: It will cool 100 GeV/nucleon ions with 50 MeV electrons; it will be the first attempt to cool a collider at storage-energy; and it will be the first cooler to use a bunched beam and a linear accelerator as the electron source. The linac will be superconducting with energy recovery. The electron source will be based on a photocathode gun. The project is carried out by the Collider-Accelerator Department at BNL in collaboration with the Budker Institute of Nuclear Physics.

NTIS

Heavy Ions ; Electrons ; Cooling

20020010114 Lawrence Livermore National Lab. , Livermore, CA USA

Edge reclamation in position-sensitive photomultiplier tubes

Nakae, L. ; Ziock, K. ; Jun. 16, 1999 ; 12p ; In English

Report No.(s): DE2001-9378 ; UCRL-JC-133338 ; GJ1200000 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We have investigated the performance of a position-sensitive, gamma-ray detector based on a CsI(Na) scintillator coupled to a Hamamatsu R3292 Position-Sensitive Photomultiplier Tube (PSPMT). The R3292 has an active area 10.0 cm in diameter (quoted). Utilization of the full active area of the photocathode is a goal that has been previously unrealized due to edge effects. Initial measurements with a 0.75 cm thick CsI(Na) crystal indicate that the performance (position resolution linearity) starts to degrade as one reaches a radius of only 3.5 cm, reducing the active area by 60%. Measuring the anode wires we have found that this fall off is not solely due to crystal edge effects, but rather is inherent to the tube crystal system. In this paper we describe the results of our measurements and how good performance can be maintained across a full 10cm of the tube face through the use of a few additional electronics channels.

NTIS

Crystals ; Photomultiplier Tubes

20020010115 Los Alamos National Lab. , NM USA

Electron/Photon Verification Calculations Using MCNP4B

Gierga, D. P. ; Adams, K. J. ; Apr. 01, 1999 ; 100p ; In English

Report No.(s): DE2001-9448 ; LA-13440 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

MCNP4BW was released in February 1997 with significant enhancements to electron/photon transport methods. These enhancements have been verified against a wide range of published electron/photon experiments, spanning high energy bremsstrahlung production to electron transmission and reflection. The impact of several MCNP tally options and physics parameters was explored in detail. The agreement between experiment and simulation was usually within two standard deviations of the experimental and calculational errors. Furthermore, sub-step artifacts for bremsstrahlung production were shown to be mitigated. A detailed suite of electron depth dose calculations in water is also presented. Areas for future code development have also been explored and include the dependence of cell and detector tallies on different bremsstrahlung angular models and alternative variance reduction splitting schemes for bremsstrahlung production.

NTIS

Bremsstrahlung ; Electrons ; Augmentation ; Proving ; Photons

20020010206 Brookhaven National Lab. , Upton, NY USA

L polarization in unpolarized hadron reactions

Anselmino, ; Boer, ; Dalesio, ; Murgia, ; Apr. 23, 2001 ; 7p ; In English

Report No.(s): DE2001-781129 ; BNL-68243 ; No Copyright ; Avail: Department of Energy Information Bridge

The transverse polarization observed in the inclusive production of (Lambda) hyperons in the high energy collisions of unpolarized hadrons is tackled by considering a new set of spin and (kappa)(perpendicular) dependent quark fragmentation functions. Simple phenomenological expressions for these new 'polarizing fragmentation functions' are obtained by a fit of the data on (Lambda)'s and (bar (Lambda))'s produced in p - N processes.

NTIS

Hadrons ; Hyperons

20020010231 Fermi National Accelerator Lab. , Batavia, IL USA

Search for di-lepton signatures from minimal low energy supergravity in (bar p)p collisions at (radical)s 1.8 = TeV

Genik, R. J. ; Aug. 05, 1999 ; 9p ; In English

Report No.(s): DE2001-9410 ; FERMILAB-CONF-99/211-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We report on a search for supersymmetry using the DO detector. The 1994-96 data sample of (radical)s = 1:8 TeV (bar p)p collisions was analyzed for events containing two leptons (e or (mu)), two or more jets, and missing transverse energy. Assuming minimal supergravity, with free parameters m(sub 0), m(sub 1/2) and tan (beta), various thresholds were employed to optimize the search. No excess of events was observed. We present exclusion contours in the (m(sub 0), m(sub 1/2)) plane for tan (beta) = 2-6.

NTIS

Supersymmetry ; Proton-Antiproton Interactions ; Exclusion

20020010233 Los Alamos National Lab. , NM USA

Lansce activity report

Robinson, A. ; Archuleta, A. ; Maes, B. ; Strottman, D. ; Hoffman, E. ; Feb. 01, 1999 ; 220p ; In English

Report No.(s): DE2001-9454 ; LA-13547-SR ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Los Alamos Neutron Science Center Activity Report describes scientific and technological progress and achievements in LANSCE Division during the period of 1995 to 1998. This report includes a message from the Division Director, an overview of LANSCE, sponsor overviews, research highlights, advanced projects and facility upgrades achievements, experimental and user program accomplishments, news and events, and a list of publications. The research highlights cover the areas of condensed-matter science and engineering, accelerator science, nuclear science, and radiography. This report also contains a compact disk that includes an overview, the Activity Report itself, LANSCE operations progress reports for 1996 and 1997, experiment reports from LANSCE users, as well as a search capability.

NTIS

Radiography ; Condensed Matter Physics ; Neutrons

20020010236 Sandia National Labs. , Albuquerque, NM USA

Selective Oxidation Technology and its Applications Toward Electronic and Optoelectronic Devices

Spahn, O. B. ; Allerman, A. A. ; Choquette, K. D. ; Vawter, G. A. ; Klem, J. F. ; Jul. 01, 1999 ; 17p ; In English

Report No.(s): DE2001-9462 ; SAND99-0921 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Selective oxidation of AlGaAs compounds has facilitated dramatic improvements in the performance of near IR VCSELS. Under the auspices of this proposal we have: (1) expanded our understanding of both the strengths and the limitations of this technology; (2) explored its applicability to other Al bearing materials; (3) utilized this technology base to demonstrate a variety of new electronic and optoelectronic devices; and (4) established the reliability and manufacturability of oxidized devices such as VCSELS. Specifically, we have investigated conditions required to maximize control of the oxidation process as well as those required to facilitate inhibit etching of the resultant oxide. Concurrently, studies were performed to extend the technology to other Al-bearing compounds such as Al(Ga)AsSb, InAl(Ga)P and Al(Ga)N. Several new devices utilizing the selective oxidation technology of AlGaAs, as well as Al(Ga)AsSb were be considered. On a separate front, we also explored the possibility of using oxidized AlGaAs and InAl(Ga)P to form GaAs/AIGaAs FETs. Finally, reliability and manufacturability issues of the high performance VCSELS fabricated using selective oxidation technology, were addressed.

NTIS

Gallium Arsenides ; Optoelectronic Devices ; Aluminum Gallium Arsenides ; Near Infrared Radiation

20020010620 Sandia National Labs. , Albuquerque, NM USA

High Accuracy, High Energy He-Erd Analysis of H, C, and T

Browning, J. F. ; Langley, R. A. ; Doyle, B. L. ; Banks, J. C. ; Wampler, W. R. ; Jul. 22, 1999 ; 15p ; In English

Report No.(s): DE2001-9571 ; SAND99-0954C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A new analysis technique using high-energy helium ions for the simultaneous elastic recoil detection of all three hydrogen isotopes in metal hydride systems extending to depths of several (micro)m's is presented. Analysis shows that it is possible to separate each hydrogen isotope in a heavy matrix such as erbium to depths of 5 (micro)m using incident 11.48MeV (sup 4)He(sup 2) ions with a detection system composed of a range foil and (Delta)E-E telescope detector. Newly measured cross sections for the elastic recoil scattering of (sup 4)He(sup 2) ions from protons and deuterons are presented in the energy range 10 to 11.75 MeV for the laboratory recoil angle of 30(degree).

NTIS

Deuterons ; Cross Sections ; Elastic Scattering ; Metal Hydrides

20020010621 Sandia National Labs. , Albuquerque, NM USA

Simultaneous Nuclear Reaction Analysis of Boron and Phosphorus in Thin Borophosphosilicate Glass Films Using (A,P) Reactions

Walsh, D. S. ; Doyle, B. L. ; Jun. 22, 1999 ; 18p ; In English

Report No.(s): DE2001-9570 ; SAND99-0953C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A method combining ((alpha),p) NRA and ellipsometry has been developed for measuring the Boron and Phosphorus content of borophosphosilicate glass (BPSG) used for interlevel dielectrics in integrated circuits. Yields from the (sup 31)P((alpha),p(sub 0))(sup 34)S (Q = 0.63 MeV) and (sup 10)B((alpha),p(sub 0)) (sup 13)C (Q = 4.06 MeV) reactions are coupled with ellipsometry thickness measurements to calculate the average atomic percent of B and P in the film. Due to the relatively low Q value of the (sup 31)P((alpha),p(sub 0))(sup 34)S reaction and the thickness range of the glass films ((le) 1.2 micrometers) they analyze, fairly

high energy alpha particles, and Mylar range foils on the detector are required. Alpha energy, detector angle and range foil thickness were determined by reaction yields and the need to separate the yield peaks of interest from competing ((alpha),p) reactions and backscattered alphas. They have determined that 6.0 MeV incident alphas with a detector angle of 135(degree) and about 100 micrometers of Mylar range foil are optimum for the system. The yield for the (sup 10)B((alpha),p(sub 0)) (sup 13)C reaction is quite constant in the energy range of interest ((approximately) 5.8 to 6 MeV) but the yield for the (sup 31)P((alpha),p(sub 0))(sup 34)S is not. Consequently, a simple conversion from standard BPSG reference samples (independently quantified by ICP mass spectrometry) is adequate to calculate a film's %B content. The %P calculation is more complex, involving a three-dimensional fit of the P yield data and measured film thickness to the film %P content. This fit is based upon yield data from a matrix of standard film samples. The technique is sensitive to 0.1% with an accuracy of (+-)3 to (+-)10% depending on the sample. This measurement method is used routinely at Sandia National Laboratories in support of their fabrication process lines.
NTIS
Alpha Particles ; Boron ; Glass ; Backscattering ; Mass Spectroscopy ; Dielectrics

20020010922 Lawrence Livermore National Lab. , Livermore, CA USA
Conceptual design for an electron beam
Garcia, M. ; Feb. 15, 1999 ; 10p ; In English
Report No.(s): DE2001-9112 ; UCRL-ID-134254 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report is a brief description of a model electron beam, which is meant to serve as a pulsed heat source that vaporizes a metal fleck into an under-dense; cloud. See Reference 1. The envelope of the electron beam is calculated from the paraxial ray equation, as stated in Reference 2. The examples shown here are for 5 A, 200 keV beams that focus to waists of under 0.4 mm diameter, within a cylindrical volume of 10 cm radius and length. The magnetic fields assumed in the examples are moderate, 0.11 T and 0.35 T, and can probably be created by permanent magnets.
NTIS
Electron Beams ; Heat Sources ; Magnetic Fields

20020010930 Lawrence Livermore National Lab. , Livermore, CA USA
Toward More Precise Beam Position Measurements
Clark, J. C. ; Fessenden, T. J. ; Holmes, C. ; May 12, 1999 ; 10p ; In English
Report No.(s): DE2001-9090 ; UCRL-ID-134514 ; No Copyright ; Avail: Department of Energy Information Bridge
For the past year or so we have been examining the properties and limitations of the beam bugs in use in the ETA program at the Lawrence Livermore National Laboratory (LLNL) with a view toward improving the accuracy of beam position and current measurements. When considering measurements of beam position, it is very important to distinguish between relative and absolute position measurements. A relative position measurement determines only the amplitude and direction of the motion of the beam within the transport tube. If one knew where the beam was, one could determine its new position. A relative measurement is essentially independent of errors in mechanical fabrication or electrical components. The minimum measurable displacement is only limited by the strength of the electrical signals or the signal to noise ratio of the position signal. An absolute position measurement is much more challenging. All inaccuracies in mechanical components and fabrication, electrical components, installation and assembly errors must be considered and controlled along with the issues common to relative position measurements. However, if the object is to strike a small specific point on a target or pass the beam through a small hole, absolute beam position measurements are required. The following is a summary of our progress including conclusions and recommendations for developments and improvements. This is, of course, only a step in beam bug development and there is plenty of room for others to contribute.
NTIS
Beams (Radiation) ; Installing ; Position (Location)

20020010961 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Quark-Hadron Duality: Resonances and the Onset of Scaling
Melnitchouk, W. ; Mar. 01, 2001 ; 9p ; In English
Report No.(s): DE2001-780874 ; JLAB-THY-01-16 ; DOE/ER/40150-1844 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We discuss the origin of Bloom-Gilman duality and the relationship between resonances and scaling in deep inelastic scattering. We present a simple quantum mechanical model which reproduces the essential features of Bloom-Gilman duality at

low Q(sup 2), and describe applications of local duality relating structure functions at x(approximately)1 and elastic electromagnetic form factors.
NTIS
Scaling ; Resonance ; Quarks ; Hadrons ; Duality Theorem ; Particle Interactions

20020012311 Stanford Linear Accelerator Center , Menlo Park, CA USA
Experimental Issues for Precision Electroweak Physics at a High-Luminosity Z Factory
Rowson, P. C. ; Jul. 25, 2001 ; 6p ; In English
Report No.(s): DE2001-784964 ; SLAC-PUB-8745 ; No Copyright ; Avail: Department of Energy Information Bridge
We discuss the ultimate precision for ALR, and therefore for the weak mixing angle, at a high luminosity Linear Collider. Drawing on our experience at the SLC, and considering various machine parameter sets for the NLC and for TESLA, it emerges that a compromise between peak luminosity and precision will be a likely outcome. This arises due to the severe requirements on the uncertainty in the luminosity weighted collision energy (ECM). We consider the cases with and without a polarized positron beam.
NTIS
Electroweak Interactions (Field Theory) ; Positrons ; Linear Accelerators ; Particle Collisions

20020012548 Stanford Linear Accelerator Center , Menlo Park, CA USA
Bulk Physics at a Graviton Factory
Rizzo, T. G. ; Apr. 24, 2001 ; 11p ; In English
Report No.(s): DE2001-784904 ; SLAC-PUB-8810 ; No Copyright ; Avail: Department of Energy Information Bridge
A general prediction of the 5-d Randall-Sundrum (RS) hierarchy model is the emergence of spin-2 Kaluza Klein (KK) gravitons with weak scale masses and couplings. The lowest order effective theory of the RS model is given by 5-d Einstein gravity which uniquely fixes the self-interactions of gravitons. We demonstrate that large numbers of light KK resonances could be produced at a future lepton-collider-based 'Graviton Factory'. Measuring the self-interactions of these KK gravitons will probe the accuracy of the 5-d Einstein gravity picture and, in addition, yield indirect information on the as yet untested self-coupling of the 4-d graviton. The self-interactions of the gravitons can be studied by measuring the decays of the heavier states to the lighter ones. We show that these decays have sufficient rates to be studied at future colliders and that they are also, in principle, sensitive to higher derivative operators, such as the Gauss-Bonnet term. In a generalized RS model, with non-universal 5-d fermion masses, FCNC's will be induced. We show that precise measurements of the rare decays of KK graviton/gauge states into flavor non-diagonal final states at a Graviton Factory can be used to map the 5-d fermion mass matrix.
NTIS
Gravitons ; Linear Accelerators ; Atomic Physics

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20020006187 Science Applications, Inc. , McLean, VA USA
Criteria and Thresholds for Adverse Effects of Underwater Noise on Marine Animals ***Final Report , Oct. 1996-May 2000***
Cavanagh, Raymond C. ; May 2000 ; 141p ; In English
Contract(s)/Grant(s): F41624-96-C-9005 ; Proj-2103
Report No.(s): AD-A395599 ; AFRL-HE-WP-TR-2000-0092 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
This is one of five companion reports, each of which deals with one aspect of the problem of assessing the effect of noise from military aircraft on marine life: sonic booms, subsonic aircraft noise, sound properties in air compared to sound properties in water, criteria and thresholds for risk. The purpose of this effort is to establish technically sound estimation procedures for determining the effects of military aircraft noise on marine life in water. Objectives include developing procedures for predicting properties of sound waves in air and under water as generated by both subsonic and supersonic aircraft; estimating the effects of sound on marine life, both in air and under water; determining populations of marine life at risk, as fictions of aircraft, flight path, and time of year. This volume focuses on criteria and quantitative thresholds of sound for use in estimating the risk of injury or harassment to marine life. Precedent and current technical views are used to estimate that range of thresholds. The material is suitable for use

in formal NEPA (National Environmental Policy Act) documentation and as background for legal arguments. While the emphasis of this report is on aircraft-generated noise, most of the material can be applied to cases of other noise sources.
DTIC
Environment Management ; Underwater Acoustics ; Marine Biology ; Aircraft Noise ; Law (Jurisprudence)

20020006495 Woods Hole Oceanographic Inst. , MA USA
Sequential, Long Baseline Navigation for REMUS, An Autonomous Underwater Vehicle
Stokey, Roger P. ; Austin, Tom ; Oct. 14, 2001 ; 9p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0135
Report No.(s): AD-A395663 ; WHOI-CONTR-9894 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Many of the problems of operating an AUV (autonomous underwater vehicle) can be reduced to one of navigation: How accurately do you know where you are? Navigational precision determines the ability to follow truck lines, the ability to map a target to world coordinates, and ultimately, even determines the areas where you ore willing to operate the vehicle. This paper presents the technique used for long baseline acoustic navigation by REMUS (Remote Environmental Measuring Units), a low cost AUV developed by the Oceanographic Systems Laboratory (OSL) of the Woods Hole Oceanographic Institution. Adopting the traditional long base line approach to this vehicle presents a complex problem because it must be low power, low cost and small in size, and in addition must work in a shallow water environment. The REMUS system uses a single data acquisition system and DSP to interrogate and receive multiple transponders in a sequential manner. It uses spread spectrum technology which reduces the impact of multi-path in the shallow water environment. A moored pair of acoustic transponders whose coordinates are determined using differential or P-code GPS allow the vehicle to navigate in world coordinates. The DSP minimizes the hardware requirements, thus lowering the associated hardware cost, size, and complexity. This paper describes the techniques used and provides results of this system using frequencies in the 20-30 khz band, giving a range of up to 1500 meters in water 4 meters deep, and also 10-15 khz band, giving a range of up to 7000 meters in waters 14 meters deep.
DTIC
Autonomy ; Navigation ; Underwater Vehicles ; Oceanography ; Acoustics

20020006780 Space and Naval Warfare Systems Center , San Diego, CA USA
Investigating the Dolphin's Peripheral Hearing System: Acoustic Sensitivity About the Head and Lower Jaw ***Final Report***
Brill, R. L. ; Moore, P. W. ; Helweg, D. A. ; Danklewkz, L. A. ; Aug. 2001 ; 21p ; In English ; Original contains color images ; Original contains color plates: All DTIC reproductions will be in black and white. Prepared in cooperation with SAIC, San Diego, CA
Contract(s)/Grant(s): N001498WX20086
Report No.(s): AD-A395555 ; ONR-TR-1865 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

For this report, jawphones were used to behaviorally measure the relative hearing thresholds at four frequencies (10, 30, 60, and 90 kHz) on more than 40 sites of a dolphin's head, from the tip of the rostrum to the base of the pectoral fins. Measurements were converted into iso-sensitivity curves projected onto a two-dimensional, heuristic representation of the head area investigated. The results suggest high-frequency sensitivity along the lower jaw with greater sensitivity forward of the panbone area, sensitivity to low frequency in the area of the external auditory meatus, and an asymmetry in sensitivity favoring the left side of the head. These results may have correlates in the underlying anatomy and suggest that the dolphin's peripheral hearing system is more complex than has previously been assumed.
DTIC
Dolphins ; Hearing ; Sensitivity ; Thresholds (Perception)

20020006782 Defence Science and Technology Organisation , Aeronautical and Maritime Research Lab. , Fishermans Bend, Australia
Mapping Seabed Vegetation with Sidescan Sonar
Mulhearn, P. J. ; June 2001 ; 37p ; In English ; Original contains color images
Report No.(s): AD-A395552 ; DSTO-TN-0381 ; DSTO/AMRL-AR-011-918 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Beds of marine vegetation such as sea grass and the larger algae may, if dense enough, mask the presence of seabed mines. An investigation is underway in Sydney Harbor of the extent to which seabed vegetation is discernable on sidescan sonar images. to date it has been found that, in some cases, sidescan sonar images provide very similar coverage to air photographs of sea grass beds. When sea grass is seen this readily on sidescan it is likely to be a problem for mine hunting. In those cases where sonar images and air photographs disagree, it is probable that the sea grass is relatively sparse, but this requires further investigation. At most

sites the presence of the larger marine algae could not be discerned on sidescan imagery, suggesting in many cases, but one cannot say all, that algae will not present a problem for mine hunting.
DTIC
Vegetation ; Images ; Sonar ; Sea Grasses ; Thematic Mapping

20020006805 Science Applications International Corp. , McLean, VA USA
Subsonic Aircraft Noise At and Beneath the Ocean Surface: Estimation of Risk for Effects on Marine Mammals ***Interim Report , Oct. 1996-Apr. 2000***
Eller, Anthony I. ; Cavanagh, Raymond C. ; Jun. 2000 ; 85p ; In English
Contract(s)/Grant(s): F41624-96-C-9005 ; Proj-2103
Report No.(s): AD-A395453 ; AFRL-HE-WP-TR-2000-0156 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
This is one of five companion reports, each of which deals with one aspect of the problem of assessing the effects of noise from military aircraft on marine life: metrics for sound properties in air compared to sound properties in water; criteria and thresholds for injury and harassment of protected marine life; animal population statistics; and risks of impact from subsonic/supersonic aircraft noise. The purpose of the effort is to establish technically sound estimation procedures for determining the effects of military aircraft noise on marine life, without which the Air Force risks inadvertent violations of the law and becomes vulnerable to litigation and interference with military operations. Objectives include developing procedures for predicting properties of sound waves in air and under water as generated by both subsonic and supersonic aircraft flights; estimating the effects of sound on marine life, both in air and under water; and determining populations of marine life at risk, as functions of aircraft, flight path, and time of year. This volume specifically focuses on the risks of impact to marine mammals from subsonic aircraft noise.
DTIC
Marine Mammals ; Marine Biology ; Aircraft Noise ; Supersonic Aircraft ; Sound Waves ; Noise Pollution ; Environment Effects ; Animals

20020006820 National Center for Physical Acoustics , University, MS USA
2000 Physical Acoustics Summer School (PASS 00). Volume II: Transparencies
Bass, Henry E. ; Furr, Elizabeth A. ; Sep. 30, 2001 ; 530p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0044
Report No.(s): AD-A395608 ; No Copyright ; Avail: CASI ; A23 , Hardcopy ; A04 , Microfiche
Volume I of the Proceedings of the 2000 Physical Acoustics Summer School contains verbatim transcriptions of the lectures given at the summer school. Volume II of these proceedings contains copies of the transparencies used by the lecturers and Volume III contains background materials that were sent to student and discussion leader participants prior to the summer school.
DTIC
Acoustics ; Conferences ; Lectures ; Education

20020006821 National Center for Physical Acoustics , University, MS USA
2000 Physical Acoustics Summer School (PASS 00). Volume I: Transcripts ***Final Report , 22 Jun. 1998-30 Sep. 2001***
Bass, Henry E. ; Furr, Elizabeth A. ; Sep. 30, 2001 ; 519p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0044
Report No.(s): AD-A395607 ; No Copyright ; Avail: CASI ; A22 , Hardcopy ; A04 , Microfiche
Volume I of the Proceedings of the 2000 Physical Acoustics Summer School contains verbatim transcriptions of the lectures given at the summer school. Volume II of these proceedings contains copies of the transparencies used by the lecturers and Volume III contains background materials that were sent to student and discussion leader participants prior to the summer school.
DTIC
Acoustics ; Conferences ; Education ; Atmospheric Physics ; Lectures

20020006881 Sandia National Labs. , Albuquerque, NM USA
Mass-Transport-Limited Electrodeposition of High-Surface-Area Coatings for Surface Acoustic Wave Sensor Technology
Ricco, A. J. ; Staton, A. W. ; Yelton, W. G. ; Jun. 10, 1999 ; 8p ; In English
Report No.(s): DE2001-7889 ; SAND99-1491C ; No Copyright ; Avail: Department of Energy Information Bridge
The sensitivity of surface acoustic wave (SAW) sensors has been enhanced by increasing the active surface area of these devices. Electrodepositions of Ni, Pd, and Pt in a mass-transport-limited mode with trace foreign metals yield highly dendritic

crystal structures of uniform macroscopic thickness. The concentration of metal ions, supporting electrolyte, agitation, and additives greatly impact the crystal morphology of the deposit. This methodology can be used simply and economically to provide high-area films in selective regions.
NTIS
Acoustics ; Crystal Structure ; Dendritic Crystals ; Electrodeposition ; Metal Ions ; Morphology ; Signal Detectors ; Sound Waves

20020006883 Sandia National Labs. , Albuquerque, NM USA
Mass-Transport-Limited Electrodeposition of High-Surface-Area Coatings for Surface Acoustic Wave Sensor Technology
Ricco, A. J. ; Staton, A. W. ; Yelton, W. G. ; Jun. 07, 1999 ; 8p ; In English
Report No.(s): DE2001-7884 ; SAND99-1439C ; No Copyright ; Avail: Department of Energy Information Bridge
The sensitivity of surface acoustic wave (SAW) sensors has been enhanced by increasing the active surface area of these devices, Electrodepositions of Ni, Pd, and Pt in a mass-transport-limited mode with trace foreign metals yield highly dendritic crystal structures of uniform macroscopic thickness. The concentration of metal ions, supporting electrolyte, agitation, and additives greatly impact the crystal morphology of the deposit. This methodology can be used simply and economically to provide high-area films in selective regions.
NTIS
Electrodeposition ; Signal Detectors ; Sound Waves ; Acoustics ; Coatings ; Dendritic Crystals ; Metal Ions ; Morphology

20020006894 National Center for Physical Acoustics , University, MS USA
2000 Physical Acoustics Summer School (PASS 00). Volume III: Background Materials ***Final Report , 22 Jun. 1998-30 Sep. 2001***
Bass, Henry E. ; Furr, Elizabeth A. ; Sep. 30, 2001 ; 155p ; In English ; Original contains color images
Contract(s)/Grant(s): N00014-98-1-0044
Report No.(s): AD-A395606 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
Volume I of the Proceedings of the 2000 Physical Acoustics Summer School contains verbatim transcriptions of the lectures given at the summer school. Volume II of these proceedings contains copies of the transparencies used by the lecturers and Volume III contains background materials that were sent to student and discussion leader participants prior to the summer school.
DTIC
Acoustics ; Conferences ; Education ; Lectures

20020006934 NASA Ames Research Center , Moffett Field, CA USA
Numerical Wave Propagation 211 Based on Wave Primitives
Davis, Sanford S. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; ICASE/LaRC Workshop on Benchmark Problems in Computational Aeroacoustics , 24-26 Oct. 1994 , Hampton, VA , USA ; Sponsored by Institute for Computer Applications in Science and Engineering , USA
Contract(s)/Grant(s): RTOP 505-59-50 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Compact higher order finite difference equations are applied to a sequence of problems in wave propagation and aeroacoustics. Systems of PDE's are reduced to a sequence of simple wave primitives using a local eigenvector decomposition. The wave primitives are first order PDE's in two independent variable and allow natural boundary conditions to be imposed for both single- and multidimensional problems. The method uses a "discrete dispersion relation" approach to obtain high order approximations to the wave primitives on a 3 spatial point / 2 time level computational molecule. The scheme is fourth order accurate for the class of system with constant coefficients, e.g., those that support exponential solutions. Weakly non-linear PDE's are solved in a similar manner using a variant of the "method of frozen coefficients." Experience with the new algorithm for linear, non-linear, and multi-dimensional test problems will be described.
Author
Wave Propagation ; Finite Difference Theory ; Difference Equations ; Aeroacoustics

20020006940 Pratt and Whitney Aircraft , East Hartford, CT USA

Broadband Noise of Fans - With Unsteady Coupling Theory to Account for Rotor and Stator Reflection/Transmission Effects

Hanson, Donald B. , Pratt and Whitney Aircraft , USA ; November 2001 ; 96p ; In English

Contract(s)/Grant(s): NAS3-27727 ; RTOP 781-30-11

Report No.(s): NASA/CR-2001-211136 ; E-12989 ; NAS 1.26:211136 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

This report examines the effects on broadband noise generation of unsteady coupling between a rotor and stator in the fan stage of a turbofan engine. Whereas previous acoustic analyses treated the blade rows as isolated cascades, the present work accounts for reflection and transmission effects at both blade rows by tracking the mode and frequency scattering of pressure and vortical waves. The fan stage is modeled in rectilinear geometry to take advantage of a previously existing unsteady cascade theory for 3D perturbation waves and thereby use a realistic 3D turbulence spectrum. In the analysis, it was found that the set of participating modes divides itself naturally into ”independent mode subsets” that couple only among themselves and not to the other such subsets. This principle is the basis for the analysis and considerably reduces computational effort. It also provides a simple, accurate scheme for modal averaging for further efficiency. Computed results for a coupled fan stage are compared with calculations for isolated blade rows. It is found that coupling increases downstream noise by 2 to 4 dB. Upstream noise is lower for isolated cascades and is further reduced by including coupling effects. In comparison with test data, the increase in the upstream/downstream differential indicates that broadband noise from turbulent inflow at the stator dominates downstream noise but is not a significant contributor to upstream noise.

Author

Turbofan Engines ; Engine Noise ; Rotor Stator Interactions ; Noise Measurement ; Turbulent Flow

20020008231 Department of Defense , Washington, DC USA

International Symposium (14th); Military Aspects of Blast and Shock (MABS) Held in Las Cruces, New Mexico, U.S.A. on 10-15 September 1995

Sep. 15, 1995 ; 731p ; In English

Report No.(s): AD-A395892 ; No Copyright ; Avail: CASI ; A99 , Hardcopy ; A06 , Microfiche

The contents include: 1) Airblast and Shock Phenomenology; 2) Structures and Blast Effects; 3) Measurement Techniques; 4) Large Blast Simulators; 5) Non-Ideal Airblast and Thermal Effects; 6) Biological Effects of Airblast; 7) Julius J. Meszaros Memorial Lecture; and 8) Workshops.

CASI

Conferences ; Shock Waves ; Military Operations ; Aerial Explosions ; Phenomenology

20020008658 Research Inst. of National Defence , Stockholm, Sweden

Multipath Expansion as a Tool for Correcting Field Computations by Rya-Tracing

Ivansson, S. , Research Inst. of National Defence , Sweden ; Dec. 1999 ; 32p ; In English

Report No.(s): PB2001-108079 ; FOA-R-99-01381-409-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The ability to compute pertinent components of a wave field is important in connection with active sonar applications of underwater acoustics. In fact, traditional scattering laws for modeling reverberation and target echo time series require that a well defined angle-time arrival structure is at hand. A basic field decomposition for the range-independent case is furnished by multipath expansion (MPE) of a resonant Green’s function denominator.

NTIS

Sonar ; Underwater Acoustics ; Ray Tracing ; Multipath Transmission ; Time Series Analysis

20020009176 Woods Hole Oceanographic Inst. , MA USA

Modal Mapping in Shallow Water Using Synthetic Aperture Horizontal Arrays

Frisk, George V. ; Becker, Kyle M. ; Doutt, James A. ; Jan. 1998 ; 5p ; In English

Contract(s)/Grant(s): N00014-96-1-0422 ; N00014-98-1-0441

Report No.(s): AD-A395861 ; WHOI-CONTR-10242 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

An experimental technique is described for mapping the wavenumber spectrum of the normal mode field as a function of position in a shallow water waveguide with three-dimensional variation in its acoustic properties. These modal maps provide a characterization of the modal properties of the waveguide, can be used as input data to inversion techniques for inferring the 3-D geoacoustic properties of the bottom, and improve our ability to localize and track source. The experimental configuration consists of a source radiating One or more pure tones to a field of freely drifting buoys, each containing a hydrophone, GPS navigation,

and radio telemetry. A key component of the method In the establishment of a local differential GPS system between the source ship and each buoy, thereby enabling the determination of the positions of the buoys relative to the ship with submeter accuracy. In this manner, the drifting buoy create 2-D synthetic aperture horizontal array along which the modal evolution of the waveguide can be observed in the spatial domain, or after beam forming, in the horizontal wavenumber domain. Typical results from two modal mapping experiments (MOMAX) are presented in which field aid moving source configurations were used to transmit pure tones in the band 50-300 Hz to several buoys at ranges up to 10 km. MOMAX I was conducted in about 70 m of water off the New Jersey coast in March, 1997, while MOMAX II was carried out in 50-150 m water depths in the Gulf of Mexico in February, 1999. A striking feature of these data is the remarkable stability and regularity of the phase, although the magnitude displays a complex multimodel interference pattern. A phase model is described which accurately predicts the source-receiver speed from these phase measurements. In addition, examples of modal maps are presented which illustrate the influence of lateral variations in the waveguide properties on the spatially evolving spectral content of the modal field.
DTIC
Shallow Water ; Acoustic Properties ; Mathematical Models ; Global Positioning System ; Mapping ; Horizontal Orientation ; Synthetic Aperture Radar

20020009552 Los Alamos National Lab. , NM USA
Magnetized Target Fusion. A Proof-of-Principle Research Proposal
Schoenberg, K. F. ; Siemon, R. E. ; May 19, 1998 ; 94p
Report No.(s): DE2001-763201 ; LA-UR-98-2413 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We propose a three-year, $6.6 million per year, Proof-of-principle (PoP) program to establish the scientific basis of Magnetized Target Fusion (MTF) as a faster and cheaper approach to fusion energy. to explore this truly different fusion concept we will take advantage of compact toroid (CT) research developed by the magnetic fusion energy program (MFE) in the past 20 years. The CT plasma is the target, which we will implode using well-established liner technology developed by DOE (Department of Energy) and DoD (Department of Defense) defense programs research in recent years. The magnetic topology of the CT should provide enough thermal energy confinement to allow compressional heating of the plasma to fusion-relevant conditions. Fusion energy will be generated in a micro-second pulse during which pressure (plasma and magnetic) is inertially confined by the imploding liner wall. This specific CT approach to small-size, high-density in just a few years at modest cost using available pulse & power facilities. Success in understanding will require both experiments and large-scale numerical computation.
NTIS
Targets ; Magnetization ; Toroidal Plasmas ; Controlled Fusion

20020009567 National Chung Hsing Univ. , Dept. of Mechanical Engineering , Taichung, Taiwan, Province of China
Actuator Placement and Zero Effect on Global Wide-Band Noise Reduction in Ducts with Hybrid System Identification Technique
Lin, Jong-Yih , National Chung Hsing Univ. , Taiwan, Province of China ; Yu, Yuh-Tyan , National Chung Hsing Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 549-558 ; In English
Contract(s)/Grant(s): NSC-89-2213-E-005-050 ; Copyright ; Avail: Issuing Activity
To achieve global wide-band noise reduction in a physical acoustic duct, actuating dynamics of the duct were described as two blackbox transfer functions obtained by a hybrid system identification technique. The derived actuating dynamics were then incorporated into a real -state-space acoustic duct model for active noise control (ANC). The relative dispositions of two sites, the secondary source and the performance point, along the duct were also investigated to eliminate the effect of lightly damped zeros seen in feed-forward ANC design. A better performance was obtained when the two sites were far apart and the secondary source was near to the primary noise source. Computer simulation analysis revealed noise reduction of 20 dB or more for periodic disturbance at a fixed frequency within 50-350 Hz, whereas there was 5-17-dB noise reduction for that within 60-345 Hz in the real experiments. Less noise reduction near both ends of the frequency range (50 and 350 Hz.) in experiments might result from the limited frequency range used for the system identification. Global noise reduction was also obtained for disturbances at various frequencies in experiments. In addition, there was effective noise reduction for bandlimited white noise within 50-350 Hz. Taken together, computer simulation and experimental results demonstrate a global wide-band noise reduction performance.
Author
Actuators ; Noise Reduction ; White Noise ; Broadband ; Acoustic Ducts

20020010569 NASA Ames Research Center , Moffett Field, CA USA

Reduction of Background Noise in the NASA Ames 40- by 80-Foot Wind Tunnel

Jaeger, Stephen M. , Sterling Federal Systems, Inc. , USA ; Allen, Christopher S. , Sterling Federal Systems, Inc. , USA ; Soderman, Paul T. , NASA Ames Research Center , USA ; [1995] ; 4p ; In English ; 1995 CEAS/AIAA Aeroacoustics Conference , 12-15 Jun. 1995 , Munich , Germany ; Sponsored by National Oceanic and Atmospheric Administration , USA

Contract(s)/Grant(s): RTOP 505-59-52 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

Background noise in both open-jet and closed wind tunnels adversely affects the signal-to-noise ratio of acoustic measurements. to measure the noise of increasingly quieter aircraft models, the background noise will have to be reduced by physical means or through signal processing. In a closed wind tunnel, such as the NASA Ames 40- by 80- Foot Wind Tunnel, the principle background noise sources can be classified as: (1) fan drive noise; (2) microphone self-noise; (3) aerodynamically induced noise from test-dependent hardware such as model struts and junctions; and (4) noise from the test section walls and vane set. This paper describes the steps taken to minimize the influence of each of these background noise sources in the 40 x 80.

Author

Noise Measurement ; Aerodynamic Noise ; Background Noise ; Signal to Noise Ratios ; Wind Tunnels

20020010939 Lawrence Livermore National Lab. , Livermore, CA USA

Novel ultrasound scintillator

Ashby, E. ; Ciarlo, D. ; Kallman, J. S. ; Thomas, G. ; Feb. 09, 1999 ; 15p ; In English

Report No.(s): DE2001-8346 ; UCRL-ID-133154 ; REPT-98-LW-035 ; No Copyright ; Avail: Department of Energy Information Bridge

This development project addressed the need for a faster, less expensive method of transmission ultrasound. It utilized the principle of frustrated total internal reflection to transduce acoustic pressure into optical modulation. These data were acquired an entire 2D plane at a time. This report described the modeling and verification of a final sensor design.

NTIS

Ultrasonics ; Scintillation Counters ; Design Analysis ; Sensors ; Two Dimensional Models

20020011607 Minnesota Univ. , Dept. of Aerospace Engineering and Mechanics , Minneapolis, MN USA

Report on the Development of the Space-Time CE/SE Method for Large Eddy Simulations of Supersonic Jet Noise

Carper, Matthew A. , Minnesota Univ. , USA ; October 2001 ; 52p ; In English

Contract(s)/Grant(s): NCC3-754 ; Copyright ; Avail: Issuing Activity

A numerical scheme discretizing space and time simultaneously is presented and analyzed. Specifically, the space-time conservation element and solution element (CE/SE) method is compared against currently employed methods, namely the compact difference method of Lele and the essentially non-oscillatory schemes of Jiang and Shu modified by Weirs. The quantification of errors of various low-dissipation numerical schemes considered candidates for large eddy simulations of turbulent flows is the product of this work. The error analysis is unique in that it is required to measure errors by numerical tests rather than spectral methods due to the unified space-time mesh used with the CE/SE method. to examine the differences of these methods we compute, among other problems, an entropy wave propagating in an inviscid free stream on a periodic domain. Modified wave numbers and the numerical anisotropy of the CE/SE method, otherwise unavailable, are obtained from numerical tests based on this problem. The final task presented is the application of the CE/SE method to a direct numerical simulation of compressible turbulence.

Author

Error Analysis ; Large Eddy Simulation ; Turbulent Flow ; Space-Time Functions ; Numerical Analysis

20020011852 National Defence Research Establishment , Div. of Systems and Underwater Technology , Stockholm, Sweden

Model Analysis of a Bistatic Scattering Experiment

Karasalo, I. ; Dec. 2000 ; 26p ; In English

Report No.(s): PB2001-108156 ; FOA-R-00-01723-409-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

Computational predictions of bistatic acoustic scattering from an object buried in the seabed are compared with experimental data from a trial conducted at a shallow water site in the Baltic Sea in May 1999. The object, a concrete-filled tractor tyre buried in the sediment, was insonified by Ricker pulses from an ROV-mounted parametric transmitter. The scattered field was registered by an eight-hydrophone vertical array at ca 16 m range as well as a single hydrophone placed on the seafloor vertically above the tyre. The experimental results are compared to predictions by full-field theory for acoustic scattering from 3D bodies in a layered fluid-solid medium. The tyre is modeled as an acoustically penetrable fluid body with parameters characteristic of concrete. The

field is computed numerically by the XFEM-S code based on a frequency-domain boundary integral equation (BIE) formulation and Fourier synthesis of transient fields. Parallel execution on a PC cluster is used to enable computationally demanding broad-band excitations of the presented type to be handled within manageable time.
NTIS
Acoustic Scattering ; Boundary Integral Method ; Integral Equations ; Excitation ; Ultrasonic Radiation

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20020006068 Brookhaven National Lab. , Upton, NY USA
Thermal shock analysis of windows interacting with energetic, focused beam of the BNL muon target experiment
Simos, ; Kirk, ; Prigl, ; Brown, ; McDonald, ; Jun. 18, 2001 ; 4p ; In English
Report No.(s): DE2001-785369 ; BNL-68562 ; No Copyright ; Avail: Department of Energy Information Bridge
In this paper, issues associated with the interaction of a proton beam with windows designed for the muon targetry experiment E951 at BNL are explored. Specifically, a 24 GeV proton beam up to 16 TP per pules and a pulse length of 100 ns is tightly focused (to 0.5 mm rms radius) on an experimental target. The need to maintain an enclosed environment around the target implies the use of beam windows that will survive the passage of the proton beam. The required beam parameters in such a setting will induce very high thermal, quasi-static and shock stresses in the window structure that exceed the strength of most common materials. In this effort, a detailed analysis of the thermal/shock response of beam windows is attempted through a transient thermal and stress wave propagation formulation that incorporates energy deposition rates calculated by the hadron interaction code MARS. The thermal response of the window structure and the subsequent stress wave generation and propagation are computed using the finite element analysis procedures of the ANSYS code. This analysis attempts to address issues pertaining to an optimal combination of material, window thickness and pulse structure that will allow for a window to safely survive the extreme demands of the experiment.
NTIS
Thermal Shock ; Proton Beams ; Wave Propagation ; Stress Waves

20020006081 Los Alamos National Lab. , NM USA
Operational results of the spallation neutron source (sns) polyphase converter-modulator for the 140 kv klystron rf systems
Reass, W. A. ; Doss, J. D. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783278 ; LA-UR-01-3155 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper describes the first operational results of the 140 kV, 1 MW average, 11 MW peak, zero-voltage-switching, 20 kHz polyphase bridge, boost converter-modulator for klystron pulse application. The DC-DC converter derives the buss voltages from a standard 13.8 kV to 2100 Y substation cast-core transformer. Energy storage and filtering is provided by self-clearing metallized hazy polyproplene traction capacitors. Three 'H-Bridge' Insulated Gate Bipolar Transistor (IGBT) switching networks are used to generate the polyphase 20 kHz transformer primary drive waveforms. The 20 kHz drive waveforms are chirped the appropriate duration to generate the desired klystron pulse width. Pulse-Width Modulation (PWM) of the individual 20 kHz pulses is utilized to provide regulated output waveforms with adaptive feedforward and feedback techniques. The boost transformer design utilizes amorphous nanocrystalline material that provides the required low core loss at design flux levels and switching frequencies. Resonant shunt peaking is used on the transformer secondary to boost output voltage and resonate transformer leakage inductance. With the appropriate transformer leakage inductance and peaking capacitance, zero-voltage-switching of the IGBT's is attained, minimizing switching losses. Reviews of these design parameters and an examination of the first operational results will be performed.
NTIS
Neutron Sources ; Klystrons

20020006082 Los Alamos National Lab. , NM USA
Rf system design for the spallation neutron source
Rees, D. ; Lynch, M. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783277 ; LA-UR-01-3154 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Spallation Neutron Source (SNS) accelerator includes a nominally 1000 MeV, 2 mA average current linac consisting of a radio frequency quadrapole (RFQ), drift tube linac (DTL), coupled cavity linac (CCL), a medium and high beta super conducting (SC) linac, and two buncher cavities for beam transport to the ring. Los Alamos is responsible for the RF systems for all sections of the linac. The SNS linac is a pulsed proton linac and the RF system must support a 1 msec beam pulse at up to a 60 Hz repetition rate. The RFQ and DTL utilize seven, 2.5 MW klystrons and operate at 402.5 MHz. The CCL, SC, and buncher cavities operate at 805 MHz. Six, 5 NW klystrons are utilized for the CCL and buncher cavities while eighty-one 550 kW klystrons are used for the SC cavities. All of the RF hardware for the SNS linac is currently in production. This paper will present details of the RF system-level design as well as specific details of the SNS RF equipment. The design parameters will be discussed. One of the design challenges has been achieving a reasonable cost with the very large number of high-power klystrons. The approaches we used to reduce cost and the resulting design compromises will be discussed.
NTIS
Neutron Sources ; Linear Accelerators ; Bunching ; Systems Engineering ; Spallation

20020006383 Brookhaven National Lab. , Upton, NY USA
Ionization cooling scenario for a neutrino factory
Fernow, ; Gallardo, ; Palmer, ; Lebrun, ; Jun. 18, 2001 ; 6p ; In English
Report No.(s): DE2001-785364 ; BNL-68556 ; No Copyright ; Avail: Department of Energy Information Bridge
The neutrino factory program aims to produce well-characterized neutrino fluxes, orders of magnitude larger than those available from conventional beams. An important feature of the machine design is a cooling section for reducing the muon transverse emittance to a level that can be accepted by the downstream accelerators and be contained in the storage ring. We describe simulations of a high-performance ionization cooling channel for the front end of a neutrino factory. The design considered here consists of a solenoidal lattice with alternating polarity and 2.75 m and 1.65 m cell lengths. Simulations show that the cooling increases the phase space density into the acceptance of the following linac by a factor of 3.
NTIS
Cooling Systems ; Ionization ; Neutrinos

20020009140 Brookhaven National Lab. , Upton, NY USA
Energy distribution of two-electron ionization of helium in an intense laser field
Lafon, ; Chaloupka, ; Sheehy, ; Dimauro, ; Paul, ; Sep. 24, 2000 ; 11p ; In English
Report No.(s): DE2001-777933 ; BNL-68114 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
It is well known that a neutral atom interacting with a strong laser field will ionize at sufficiently high intensity even for photon energies well below the ionization threshold. When the required number of photons becomes very large, this process is best described by the suppression of the Coulomb barrier by the laser oscillating electric field, allowing the electron to tunnel into the continuum. As the laser intensity is increased, more tightly bound electrons may be successively liberated by this mechanism. Such a sequential multiple ionization, long accepted as a reasonable approach to the formidable problem of a multielectron atom interacting nonperturbatively with an intense electromagnetic field, provides fair estimates of the various charge state appearance intensities while the tunneling rates are in excellent agreement with single ionization yields. However, more accurate measurements revealed systematic and very large deviations from the tunneling rates: near appearance intensity under standard experimental conditions, the observed double ion yield is several orders of magnitude larger than predicted by the sequential rate. It soon became clear that electrons could not be considered as independent and that electron-electron correlation had to be taken into account. Dynamic correlations have been considered in several theories. First qualitatively in the shakeoff model; then empirically through the e-2e cross-section in the quantum/classical three-step model (tunnel ionization, acceleration by the oscillating electric field and e-2e recollision with the ion); recently through the so-called intense field many-body-S-matrix theory and a purely empirical model of collective tunnel ionization. The validity of these ideas has been examined using numerical models. The measurement of total ion yields over a dynamic range exceeding ten orders of magnitude, a major breakthrough made possible by the availability of high-repetition rate lasers at the beginning of the 90's was for a long time the only quantitative data to confront theory.
NTIS
Electric Fields ; Ionization ; Lasers ; Dynamic Range ; Mathematical Models

20020009503 Fermi National Accelerator Lab. , Batavia, IL USA

W/Z + b bbar/Jets at NLO Using the Monte Carlo MCFM

Campbell, J. M. ; May 29, 2001 ; 4p ; In English

Report No.(s): DE2001-781158 ; FERMILAB-CONF-01/072-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We summarize recent progress in next-to-leading QCD calculations made using the Monte Carlo MCFM. In particular, we focus on the calculations of p(bar p) (r-arrow) Wb(bar b), Zb(bar b) and highlight the significant corrections to background estimates for Higgs searches in the channels WH and ZH at the Tevatron. We also report on the current progress of, and strategies for, the calculation of the process p(bar p) (r-arrow) W/Z + 2 jets.

NTIS

Higgs Bosons ; Particle Accelerators ; Correction

20020009580 Brookhaven National Lab. , Upton, NY USA

Recent results from E885: A search for doubly strange objects

May, ; Oct. 23, 2000 ; 7p ; In English

Report No.(s): DE2001-780688 ; BNL-68227 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

E885, an experiment performed at the Brookhaven National Laboratory Alternate Gradient Synchrotron (BNL AGS) achieved high sensitivity in a search for (Lambda)(Lambda) hypernuclei, (Xi) hypernuclei, and the H particle. Evidence was found for (Xi) hypernuclei. Possible extensions of the methods used are discussed.

NTIS

Hypernuclei ; Sensitivity ; Strangeness

20020009581 Brookhaven National Lab. , Upton, NY USA

Study of the Delta I = 1/2 rule in the weak decay of S-shell hypernuclei: BNL E931

Gill, ; Oct. 23, 2000 ; 5p ; In English

Report No.(s): DE2001-780687 ; BNL-68229 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

It is empirically observed that the non-leptonic decay of strange hadrons is enhanced when the change in isospin is 1/2. This is generalized in the ”(Delta)I = 1/2 rule” that states that all such decays proceed predominantly through (Delta)I = 1/2 amplitudes. However, there is no definitive explanation for this apparently universal rule. Non-mesonic decay of (Lambda)-hypernuclei can occur through a weak decay process (Lambda)N (r-arrow) (eta)N. When stimulated by a neutron, two neutrons are emitted from the nucleus, and when stimulated by a proton, a proton and neutron are emitted. by measuring the relative decay widths ((Gamma)(sub n)/(Gamma)(sub p)) in the full set of s-shell hypernuclei, a sensitive test of the (Delta)I = 1/2 rule, and the determination of its applicability to non-mesonic decays can be made. In addition, information about the spin-isospin dependence of the weak decay process can be extracted. A measurement of (Gamma)(sub n)/(Gamma)(sub p), to an accuracy of even 50% will be sufficient to address important issues relating to the (Delta)I = 1/2 rule and to the weak decay process. The experiment will measure the ratio (Gamma)(sub n)/(Gamma)(sub p), following the decay of (sup 4)H which is produced by a stopped K(sup (minus)) beam in a liquid Helium target. The Neutral Meson Spectrometer will be used to identify stopped kaon events by detection of the gamma rays that follow the decay of the emitted (pi)(sup 0). Arrays of charged particle and neutron detectors will measure the relative neutron and proton emission probabilities. An engineering run was performed in 1998, without the Helium target, which demonstrated that the technique is feasible. The full experiment is scheduled at the Alternating Gradient Synchrotron for the spring 2001 running period.

NTIS

Hypernuclei ; Particle Decay ; Hadrons ; Isotopic Spin

20020009585 Brookhaven National Lab. , Upton, NY USA

Electron microscopy analysis of the intermediate phases formed during the nucleation of YBaCu3O(sub 7-(delta)) film

Wu, ; Zhu, ; Slovyov, ; Wiesmann, ; Suenaga, ; Aug. 05, 2001 ; 3p ; In English

Report No.(s): DE2001-780680 ; BNL-68153 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Recently, considerable efforts have been made in growing bi-axially aligned thick YBa2Cu3O7 (YBCO) films on a flexible, textured metallic substrate for electrical power applications. The BaF2 post-deposition annealing process is one of the most promising methods. to understand the nucleation and growth mechanism of YBCO in this process, extended transmission electron

microscopy analysis has been made. Here, we report on the evolution of Ba-Y oxy-fluoride which is pertinent to the epitaxial YBCO nucleation process on SRTiO3 (STO) substrate.
NTIS
YBCO Superconductors ; Superconducting Films ; Nucleation ; Transmission Electron Microscopy

20020009589 Lawrence Livermore National Lab. , Livermore, CA USA
Is there elliptic flow without transverse flow
Huovinen, P. ; Kolb, P. F. ; Heinz, U. ; Apr. 03, 2001 ; 4p ; In English
Report No.(s): DE2001-780595 ; LBNL-47683 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Azimuthal anisotropy of final particle distributions was originally introduced as a signature of transverse collective flow. We show that finite anisotropy in momentum space can result solely from the shape of the particle emitting source. However, by comparing the differential anisotropy to recent data from STAR collaboration we can exclude such a scenario, but instead show that the data favour strong flow as resulting from a hydrodynamical evolution.
NTIS
Anisotropy ; Ellipticity ; Transverse Momentum

20020009591 Lawrence Livermore National Lab. , Livermore, CA USA
Primary ion sources for EBIS
Keller, R. ; Mar. 21, 2001 ; 11p ; In English
Report No.(s): DE2001-78059 ; LBNL-47647 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper gives an introduction into the topic of primary ion sources that can be used to feed ions of normally solid elements into EBIS devices. Starting with a set of typical requirements for primary ion sources, some major types of ion generators are discussed first, with emphasis on their working principles rather than trying to give a fully representative listing of used and proposed generators. Beam-transport issues between primary ion source and EBIS are then examined, and generic characteristics of suitable beam-formation and transport systems are explained.
NTIS
Electron Beams ; Ion Sources ; Ions

20020009662 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA
Quantitative Linear Optical Scattering Spectroscopy of Two-Dimensionally Textured Planar Waveguides
Mandeville, William J. ; Jun. 2001 ; 155p ; In English
Report No.(s): AD-A396167 ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
Linear white light spectroscopy in conjunction with rigorous computer modeling reveals the fundamental nature of the electromagnetic excitations associated with the simple lattice and defect superlattice texturing of 2D planar waveguides. by achieving unprecedented agreement between experimentally measured and rigorously simulated band structures of leaky modes associated with the second, and up to the seventh, zone-folded Brillouin zones of square and triangular lattice structures, a thorough characterization of the polarization and dispersive properties of these electromagnetic modes has been achieved. An evaluation of the usefulness of a newly developed diffraction measurement technique for probing band structure is presented in conjunction with data and simulations for waveguides with defect superlattices. Textured planar waveguides, as a powerful medium for engineering devices which control the propagation of light, are explored via the thorough characterization of a novel polymer waveguide, and a GaAs waveguide that was engineered to possess a flat band for use in non-linear optics applications; in addition an original design is discussed for an angle and polarization insensitive notch filter based on a localized defect mode.
DTIC
Light Scattering ; Spectroscopy ; Planar Structures ; Linearity ; Optical Properties ; Scattering

20020009671 State Univ. of New York , Research Foundation , Buffalo, NY USA
Lasers for Linear and Non-Linear Spectroscopy of Semiconductor Heterostructures and Nanostructures ***Final Report , 10 Apr. 2000-9 Apr 2001***
Petrou, Athos ; Oct. 18, 2001 ; 8p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0107
Report No.(s): AD-A396073 ; ARO-40717.1-EL-RIP ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
A model FIRL-1OO far infrared laser system was purchased from Edinburgh Instruments. The FIR laser was installed and tested. In addition, three related experiments were carried out using the new apparatus in order to evaluate the performance under laboratory conditions. These experiments are: (1) FIR absorption from an n-type modulation doped GaAs/AlGaAs quantum well

structure. The electron cyclotron resonance was recorded for a number of laser lines; (2) FIR absorption from an n-type modulation doped lnGaAs/InAIAs quantum well structure. The effective mass of the confined electrons was determined; (3) Photoluminescence based Optically detected Resonance (PLODR) from an undoped CdMnTe/CdMgTe quantum well structure. In this experiment the excitonic photoluminescence intensity was modulated by the FIR laser. Both electron and hole cyclotron resonances were observed
DTIC
Far Infrared Radiation ; Infrared Lasers ; Cyclotron Resonance ; Electron Paramagnetic Resonance

20020009695 Brookhaven National Lab. , Upton, NY USA
Transversely polarized l production
Borer, ; May 22, 2000 ; 4p ; In English
Report No.(s): DE2001-781134 ; BNL-68276 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Transversely polarized (Lambda) production in hard scattering processes is discussed in terms of a leading twist T-odd fragmentation function which describes the fragmentation of an unpolarized quark into a transversely polarized (Lambda). We focus on the properties of this function and its relevance for the RHIC and HERMES experiments.
NTIS
Quarks ; Fragmentation ; Scattering

20020009699 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
From quarks to nucleons: Highlights from the Research Program in Hall A at JLAB
de Jager, K. ; Feb. 01, 2001 ; 6p ; In English
Report No.(s): DE2001-780831 ; JLAB-PHY-01-08 ; DOE/ER/40150-1842 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
After a brief introduction to the CEBAF accelerator, several recent results of the research programs in Hall A are discussed. All of those address the transition region between the meson-baryon and quark-gluon description of nuclear matter. Finally, the plans for upgrading CEBAF to 12 GeV are presented and the instrumentation under design for Hall A to carry out that research program is discussed.
NTIS
Quarks ; Nucleons ; Nuclear Research

20020009748 Brookhaven National Lab. , Upton, NY USA
Proceedings of riken bnl research center workshop on rhic spin physics iii and iv, polarized partons at high q2 region, august 3, 2000 at bnl, october 14, 2000 at kyoto university
Bunce, G. ; Vigdor, S. ; Mar. 15, 2001 ; 293p ; In English
Report No.(s): DE2001-780493 ; BNL-52617 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
International workshop on II Polarized Partons at High Q2 region 11 was held at the Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto, Japan on October 13-14, 2000, as a satellite of the international conference 'SPIN 2000' (Osaka, Japan, October 16-21,2000). This workshop was supported by RIKEN (The Institute of Physical and Chemical Research) and by Yukawa Institute. The scientific program was focused on the upcoming polarized collider RHIC. The workshop was also an annual meeting of RHIC Spin Collaboration (RSC). The number of participants was 55, including 28 foreign visitors and 8 foreign-resident Japanese participants, reflecting the international nature of the RHIC spin program. At the workshop there were 25 oral presentations in four sessions, (1) RHIC Spin Commissioning, (2) Polarized Partons, Present and Future, (3) New Ideas on Polarization Phenomena, (4) Strategy for the Coming Spin Running. In (1) the successful polarized proton commissioning and the readiness of the accelerator for the physics program impressed us. In (2) and (3) active discussions were made on the new structure function to be firstly measured at RHIC, and several new theoretical ideas were presented. In session (4) we have established a plan for the beam time requirement toward the first collision of polarized protons. These proceedings include the transparencies presented at the workshop. The discussion on 'Strategy for the Coming Spin Running' was summarized by the chairman of the session, S. Vigdor and G. Bunce.
NTIS
Accelerators ; Spin ; Yukawa Potential ; Collisions ; Proton-Proton Reactions ; Ionic Collisions

20020010111 Brookhaven National Lab. , Upton, NY USA

Spallation neutron source beam current monitor electronics

Kesselman, M. ; Jun. 18, 2001 ; 3p ; In English

Report No.(s): DE2001-782054 ; BNL-67998 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Spallation Neutron Source (SNS) to be constructed at ORNL is a collaboration of six laboratories. Beam current monitors for SNS will be used to monitor H-minus and H-plus beams ranging from the 15 mA (tune-up in the Front End and Linac) to over 60 A fully accumulated in the Ring. The time structure of the beams to be measured range from 645 nsec 'mini' bunches, at the 1.05 MHz ring revolution rate, to an overall 1 mS long macro pulse. Beam current monitors (BCMs) for SNS have requirements depending upon their location within the system. The development of a general approach to satisfy requirements of various locations with common components is a major design objective. This paper will describe the development of the beam current monitors and electronics.

NTIS

Neutron Sources ; Spallation ; Beam Currents ; Linear Accelerators

20020010122 Brookhaven National Lab. , Upton, NY USA

Energy distribution of two-electron ionization of helium in an intense laser field

Lafon, ; Chaloupka, ; Sheehy, ; Dimauro, ; Paul, ; Sep. 24, 2000 ; 11p ; In English

Report No.(s): DE2001-777866 ; BNL-68114 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

It is well known that a neutral atom interacting with a strong laser field will ionize at sufficiently high intensity even for photon energies well below the ionization threshold. When the required number of photons becomes very large, this process is best described by the suppression of the Coulomb barrier by the laser oscillating electric field, allowing the electron to tunnel into the continuum. As the laser intensity is increased, more tightly bound electrons may be successively liberated by this mechanism. Such a sequential multiple ionization, long accepted as a reasonable approach to the formidable problem of a multielectron atom interacting nonperturbatively with an intense electromagnetic field, provides fair estimates of the various charge state appearance intensities while the tunneling rates are in excellent agreement with single ionization yields. However, more accurate measurements revealed systematic and very large deviations from the tunneling rates: near appearance intensity under standard experimental conditions, the observed double ion yield is several orders of magnitude larger than predicted by the sequential rate. It soon became clear that electrons could not be considered as independent and that electron-electron correlation had to be taken into account. Dynamic correlations have been considered in several theories. First qualitatively in the shakeoff model; then empirically through the e-2e cross-section in the quantum/classical three-step model (tunnel ionization, acceleration by the oscillating electric field and e-2e recollision with the ion); recently through the so-called intense field many-body-S-matrix theory and a purely empirical model of collective tunnel ionization. The validity of these ideas has been examined using numerical models. The measurement of total ion yields over a dynamic range exceeding ten orders of magnitude, a major breakthrough made possible by the availability of high-repetition rate lasers at the beginning of the 90's, was for a long time the only quantitative data to confront theory.

NTIS

Electric Fields ; Helium ; Ionization ; Lasers ; Energy Distribution ; Electrons ; Gas Ionization

20020010154 Argonne National Lab. , IL USA

Relativistic Pseudopotentional Incorporating Core/Valence Polarization and Nonlocal Effects

Marino, M. M. ; Apr. 05, 2001 ; 24p ; In English

Report No.(s): DE2001-779803 ; ANL/MCS-TM-229 ; No Copyright ; Avail: Department of Energy Information Bridge

A relativistic pseudopotentional (RPP) for use in ab initio molecular electronic structure calculations is derived in the context of the relativistic effective core potential (REP) method of Lee et al. The resulting atom-specific RPP has salient features of the REP imbedded within it while retaining the form of a functional that is dynamically defined at runtime when used in calculations on molecules. The RPP is determined from Dirac-Fock wave functions for the isolated atom. Outercore two-electron interactions are incorporated into the RPP by means of variable coefficients that are defined in the context of the final molecular wave function. This form permits polarization of the outercore shells analogous to that occurring in all-electron molecular Hartree-Fock calculations while retaining these shells as part of the atomic pseudopotentional. Use of the RPP in post-Hartree-Fock molecular calculations permits the incorporation of core/valence correlation effects.

NTIS

Molecular Structure ; Valence ; Wave Functions

20020010161 Brookhaven National Lab. , Upton, NY USA

Spin effects in the fragmentation of transversely polarized and unpolarized quarks

Anselmino, ; Boer, ; Dalesio, ; Murgia, ; Apr. 23, 2001 ; 5p ; In English

Report No.(s): DE2001-780975 ; BNL-68244 ; No Copyright ; Avail: Department of Energy Information Bridge

We study the fragmentation of a transversely polarized quark into a non-collinear (k(perpendicular) (ne) 0) spinless hadron and the fragmentation of an unpolarized quark into a non collinear transversely polarized spin 1/2 baryon. These nonperturbative properties are described by spin and k(perpendicular) dependent fragmentation functions and are revealed in the observation of single spin asymmetries. Recent data on the production of pions in polarized semi-inclusive DIS and long known data on A polarization in unpolarized p-N processes are considered: these new fragmentation functions can describe the experimental results and the single spin effects in the quark fragmentation turn out to be surprisingly large.

NTIS

Fragmentation ; Polarization ; Particle Production ; Quarks ; Particle Spin

20020010165 Brookhaven National Lab. , Upton, NY USA

Calculation of fragmentation functions in two-hadron semi-inclusive processes

Bianconi, ; Boffi, ; Boer, ; Jakob, ; Radici, ; Apr. 24, 2001 ; 5p ; In English

Report No.(s): DE2001-781130 ; BNL-68242 ; No Copyright ; Avail: Department of Energy Information Bridge

We investigate the properties of interference fragmentation functions arising from the emission of two leading hadrons inside the same jet for inclusive lepton-nucleon deep inelastic scattering. Using an extended spectator model for the mechanism of the hadronization, we give a complete calculation and numerical estimates for the examples of a proton-pion pair produced with invariant mass on the Roper resonance, and of two pions produced with invariant mass close to the (rho) mass. We discuss azimuthal angular dependence of the leading order cross section to point up favourable conditions for extracting transversity from experimental data.

NTIS

Pair Production ; Hadrons

20020010186 Oak Ridge National Lab. , TN USA

Effusive-Flow of Pure Elemental Species in Tubular Transport Systems: Radioactive Ion Beam Applications

Bilheux, J. C. ; Apr. 16, 2001 ; 3p ; In English

Report No.(s): DE2001-779792 ; P01-110495 ; No Copyright ; Avail: Department of Energy Information Bridge

Maximum practically achievable intensities are required for research with accelerated radioactive ion beams (RIBs). Time delays due to diffusion of radioactive species from solid or liquid target materials and their effusive-flow transport to the ion source can severely limit intensities of short-lived radioactive beams, and therefore, such delays must be minimized. An analytical formula has been developed that can be used to calculate characteristic effusive-flow times through tubular transport systems, independent of species, tube material, and operational temperature for ideal cases. Thus, the equation permits choice of materials of construction on a relative basis that minimize transport times of atoms or molecules moving through the system, independent of transport system geometry and size. In this report, we describe the formula and compare results derived by its use with those determined by use of Monte-Carlo techniques.

NTIS

Ion Beams ; Radioactivity ; Time Lag

20020010187 Oak Ridge National Lab. , TN USA

Negative-Surface Ionization for Generation of Halogen Radioactive Ion Beams

Zaim, H. ; Apr. 16, 2001 ; 3p ; In English

Report No.(s): DE2001-779793 ; P01-110496 ; No Copyright ; Avail: Department of Energy Information Bridge

A simple and efficient negative surface ionization source has been designed, fabricated, and initially tested for on-line generation of radioactive ion beams of the halogens (Cl, Br, I, and At) for use in the nuclear-structure and nuclear-astrophysics research programs at the Holifield Radioactive Ion Beam Facility. The source utilizes a solid, spherical geometry LaB6 surface ionizer for forming highly electronegative atoms and molecules. Despite its widely publicized propensity for being easily poisoned, no evidences of this effect were experienced during testing of the source. Nominal efficiencies of 15% for Br(-) beam generation were obtained during off-line evaluation of the source with AlBr3 feed material when account is taken of the fractional

dissociation of the molecule. Principles of operation, design features, operational parameter data, initial performance results, and beam quality data (emittance) are presented in this article.
NTIS
Design Analysis ; Emittance ; Halogens ; Ion Beams ; Surface Ionization

20020010196 Brookhaven National Lab. , Upton, NY USA
White paper on proton: Nucleus collisions
Aronson, ; Peng, ; Mar. 01, 2001 ; 20p ; In English
Report No.(s): DE2001-780976 ; BNL-68238 ; No Copyright ; Avail: Department of Energy Information Bridge
The role of proton-nucleus (p-A) collisions in the study of strong interactions has a long history. It has been an important testing ground for QCD. At RHIC p-A studies have been recognized since the beginning as important elements of the program. These include so-called baseline measurements in cold nuclear matter, essential (along with p-p studies) to a systematic study of QCD at high temperatures and densities in the search for the quark gluon plasma. Also accessible is a study of QCD in the small x (parton saturation) regime, complementary to physics accessible in high-energy e-p and e-A collisions. The role of p-A physics at RHIC was reviewed and brought into sharp focus at a workshop conducted in October 2000 at BNL; the agenda is shown in Appendix 1. This document summarizes the case for p-A at RHIC during the period covered by the next Nuclear Physics Long Range Plan. In subsequent sections we cover the Physics Issues, Experiment Run Plans and Schedule, Detector Upgrade Issues, and Machine Issues & Upgrades.
NTIS
Protons ; Quantum Chromodynamics ; Strong Interactions (Field Theory) ; Particle Collisions ; Nuclei (Nuclear Physics)

20020010197 Fermi National Accelerator Lab. , Batavia, IL USA
Rare and forbidden decays of D Mesons
Sanders, D. A. ; May 23, 2001 ; 5p ; In English
Report No.(s): DE2001-781011 ; FERMILAB-CONF-01/068-E ; No Copyright ; Avail: Department of Energy Information Bridge
The authors summarize the results of two recent searches for flavor-changing neutral current, lepton-flavor violating, and lepton-number violating decays of D(sup +), D(sub s)(sup +), and D(sup 0) mesons (and their antiparticles) into modes containing muons and electrons using data from Fermilab charm hadroproduction experiment E791, they examined D(sup +) and D(sub s)(sup +) (pi)(ell)(ell) and (Kappa)(ell)(ell) decay modes and the D(sup 0) dilepton decay modes containing either (ell)(sup +)(ell)(sup (minus)), a (rho)(sup 0), (bar (Kappa))*(sup 0), or (phi) vector meson, or a non-resonant (pi)(pi), (Kappa)(pi), or (Kappa)(Kappa) pair of pseudoscalar mesons. No evidence for any of these decays was found. Therefore, the authors presented branching-fraction upper limits at 90% confidence level for the 51 decay modes examined. Twenty-six of these modes had no previously reported limits, and eighteen of the remainder were reported with significant improvements over previously published results.
NTIS
Antiparticles ; Particle Decay ; Vector Mesons ; Flavor (Particle Physics)

20020010204 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Summary of Few Nucleon Working Group
Schiavilla, R. ; Kolck, V. ; Weller, H. ; May 01, 2001 ; 27p ; In English
Report No.(s): DE2001-781093 ; JLAB-THY-01-10 ; DOE/ER/40150-1845 ; No Copyright ; Avail: Department of Energy Information Bridge
Systems of A (ge) 2 nucleons are arguably the most interesting area of application of hadronic effective field theories (EFTs), because of a great confluence of factors absent in A (le) 1 systems: the theoretical challenge of combining a momentum expansion and a resummation to produce bound states, and the abundance of experimental data. A (ge) 2 systems are also the newest playground for hadronic EFTs, even though Weinberg's seminal papers 1 date from almost ten years ago. The working group on few-body systems at Chiral Dynamics 2000 attests that this field is now viewed as part of mainstream Chiral Perturbation Theory (ChPT). Few-nucleon systems provide, more generally, a unique testing ground for the simple, traditional picture of the nucleus as a system of interacting nucleons. The nucleon-nucleon (NN) interaction, as revealed by pp and np scattering experiments and the deuteron's properties, has a very rich structure. In light nuclear systems, with only a few degrees of freedom, it is possible to obtain accurate solutions for a wide variety of nuclear properties directly from realistic models of the NN interaction. Within this deceptively simple picture, we can test our understanding of nuclear structure and dynamics over a wide range of energy, from the few keV of astrophysical relevance to the MeV regime of nuclear spectra to the tens to hundreds of MeV measured in nuclear

response experiments. Through the advances in computational techniques and facilities, the last few years have witnessed dramatic progress in the theory of light nuclei, as well as a variety of intriguing new experimental results. Important advances have occurred in studies of the spectra and structure of light nuclei, hadronic scattering, the response of light nuclei to external probes, and electroweak reactions involving few-nucleon systems at very low energy. by the Chiral Dynamics Workshop in Mainz in the summer of 1997, the first successes of Weinberg's power counting had been seen in the description of the A = 2 system, and in the derivation of A = 3 forces 3 and currents. Nevertheless, some questions of consistency had also been raised: the roles of regularization, fine-tuning, and chiral-symmetry-breaking interactions were unclear. A discussion of some of these issues can be found in a review talk at that conference. Much progress has been made since then. The contributions to the working group, summarized here, reflect the current state of affairs in the rich interplay between theory - including the connection to the more conventional approach outlined above - and experiment.
NTIS
Nucleon-Nucleon Interactions ; Nucleons ; Electroweak Interactions (Field Theory)

20020010212 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Sns hom damping requirements via bunch tracking
Sundelin, R. ; Jeon, D. ; Kim, S. ; Doleans, M. ; Jun. 01, 2001 ; 3p ; In English
Report No.(s): DE2001-781928 ; JLAB-OTP-01-01 ; DOE/ER/40150-1853 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Based on Higher Order Mode (HOM) field properties, the Spallation Neutron Source (SNS) HOM damping requirements have been determined by bunch tracking simulations. Transverse instabilities are found to be absent and transverse error magnifications are found to be acceptable if the loaded cavity Q for each mode is less than 10(exp 8) and the expected cavity-to-cavity frequency variation due to manufacturing tolerances is present. Longitudinal instabilities are absent if the loaded cavity Q for each HOM is less than 10(exp 8), the loaded cavity Q for each non-pi fundamental mode has the expected value, and the expected cavity-to-cavity frequency variation is present. Each of the two cavity types has three longitudinal modes that are close enough to a bunch spacing harmonic that one of the modes may occasionally get tuned onto the resonance; the power deposited as a function of Q has been calculated for this case. Deposited power and transverse instabilities/magnifications have also been determined analytically.
NTIS
Harmonics ; Neutron Sources ; Spallation

20020010214 Fermi National Accelerator Lab. , Batavia, IL USA
Particle production and radiation environment at a neutrino factory target station
Mokhov, N. V. ; Jun. 22, 2001 ; 3p ; In English
Report No.(s): DE2001-781957 ; FERMILAB-CONF-01/134 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Efficient production and collection of a large number of muons is needed to make a neutrino factory based on a muon storage ring viable. The results of extensive MARS simulations are reported for Megawatt proton beams on a carbon rod and mercury jet in a 20-T hybrid solenoid, followed by a matching section and decay channel. Beam energy and power in a 2 to 30 GeV range, beam spot size, beam and target tilt angle, target material and dimensions, and capture system parameters are optimized to get maximum muon yields at the end of the decay channel. Other particles transported down the beam line are also studied for the purpose of beam instrumentation. Prompt and residual radiation distributions are calculated and analysis of target integrity, quench stability and dynamic heat load to the superconducting coils, radiation damage and activation of materials near the beam is performed. Absorption of showers in the direction of a primary beam is considered.
NTIS
Particle Production ; Neutrinos ; Proton Beams

20020010215 Fermi National Accelerator Lab. , Batavia, IL USA
Beam-induced energy deposition in muon storage rings
Mokhov, N. V. ; Johnstone, C. J. ; Parker, B. ; Jun. 22, 2001 ; 3p ; In English
Report No.(s): DE2001-781960 ; FERMILAB-CONF-01/136 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Beam-induced radiation effects have been simulated for 20 and 50 GeV muon storage rings designed for a Neutrino Factory. It is shown that by appropriately shielding the superconducting magnets, quench stability, acceptable dynamic heat loads, and low residual dose rates can be achieved. Alternatively, if a specially-designed skew focusing magnet without superconducting coils

on the magnet's mid-plane is used, then the energy is deposited preferentially in the warm iron yoke or outer cryostat layers and internal shielding may not be required. In addition to the component irradiation analysis, shielding studies have been performed. Calculations of the external radiation were done for both designs but the internal energy deposition calculations for the 20 GeV Study-2 lattice are still in progress.
NTIS
Linear Accelerators ; Cryostats ; Radiation Effects ; Muons ; Energy Transfer

20020010220 New Mexico Univ. , Albuquerque, NM USA
Analytical and Numerical Solutions of Generalized Fokker-Planck Equations. Final Report
Prinja, A. K. ; Dec. 31, 2000 ; 80p ; In English
Report No.(s): DE2001-782033 ; DOE/ID/13634 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The overall goal of this project was to develop advanced theoretical and numerical techniques to quantitatively describe the spreading of a collimated beam of charged particles in space, in angle, and in energy, as a result of small deflection, small energy transfer Coulomb collisions with the target nuclei and electrons. Such beams arise in several applications of great interest in nuclear engineering, and include electron and ion radiotherapy, ion beam modification of materials, accelerator transmutation of waste, and accelerator production of tritium, to name some important candidates. These applications present unique and difficult modeling challenges, but from the outset are amenable to the language of 'transport theory', which is very familiar to nuclear engineers and considerably less-so to physicists and material scientists. Thus, our approach has been to adopt a fundamental description based on transport equations, but the forward peakedness associated with charged particle interactions precludes a direct application of solution methods developed for neutral particle transport. Unique problem formulations and solution techniques are necessary to describe the transport and interaction of charged particles. In particular, we have developed the Generalized Fokker-Planck (GFP) approach to describe the angular and radial spreading of a collimated beam and a renormalized transport model to describe the energy-loss straggling of an initially monoenergetic distribution. Both analytic and numerical solutions have been investigated and in particular novel finite element numerical methods have been developed. In the first phase of the project, asymptotic methods were used to develop closed form solutions to the GFP equation for different orders of expansion, and was described in a previous progress report. In this final report we present a detailed description of (i) a novel energy straggling model based on a Fokker-Planck approximation but which is adapted for a multigroup transport setting, and (ii) two unique families of discontinuous finite element schemes, one linear and the other nonlinear.
NTIS
Charged Particles ; Fokker-Planck Equation ; Neutral Particles ; Particle Interactions

20020010247 National Taiwan Univ. , Dept. of Chemical Engineering , Taipei, Taiwan, Province of China
Transport of Ions Through a Cylindrical Membrane: Effect of Radius
Chen, Shan-Chih , National Taiwan Univ. , Taiwan, Province of China ; Hsu, Jyh-Ping , National Taiwan Univ. , Taiwan, Province of China ; Tseng, Shiojenn , Tamkang Univ. , Taiwan, Province of China ; Journal of the Chinese Institute of Engineers ; September 2001 ; ISSN 0253-3839 ; Volume 24 , No. 5 , pp. 629-634 ; In English ; Copyright ; Avail: Issuing Activity
The performance of a cylindrical ion-selective membrane of arbitrary radius is investigated theoretically. In particular, the effect of the radius of the membrane on its current efficiency is examined without assuming local electroneutrality and Dorman equilibrium. Two types of fixed charge distribution are considered, namely, linear and sinusoidal. The results of numerical simulation reveal that the boundary condition at the axis of a membrane should be assumed appropriately, We show that if the inner radius of a membrane is smaller than its thickness, assuming bulk conditions at the membrane axis is inadequate. Also, the potential drop across a membrane will change its sign, which is disadvantageous to the transport of ions.
Author
Ions ; Electron Mobility ; Cylindrical Bodies ; Membrane Structures ; Charge Distribution

20020010882 Stanford Linear Accelerator Center , Menlo Park, CA USA
Efficient, High Brightness Sources of Polarized Neutrons and Photons and Their Uses
Spencer, J. E. ; May 18, 2000 ; 17p ; In English
Report No.(s): DE2001-784857 ; SLAC-PUB-7814 ; No Copyright ; Avail: Department of Energy Information Bridge
Since Chadwick's discovery of the neutron (1932) and Szilard's patent on mean for production (1935), there have been surprisingly few practical applications beyond their somewhat problematic use to produce power. For example, a presumably valid application was proposed within three months of Szilard's patent for what is now called Neutron Capture Therapy (NCT)

that is still in the research stage. Similarly, although research reactors have been around for some 50 years, they have been likened to a 'pig hunting for truffles.'
NTIS
Brightness ; Photons ; Neutrons ; Storage Rings (Particle Accelerators)

20020010883 Stanford Linear Accelerator Center , Menlo Park, CA USA
Measurement of the Parity Violating Parameter Ab with a Muon Tag at the SLD
Bellodi, G. ; Feb. 12, 2001 ; 214p ; In English
Report No.(s): DE2001-784856 ; SLAC-R-566 ; No Copyright ; Avail: Department of Energy Information Bridge
We present a direct measurement of the parity violation parameter Ab, derived from the left-right forward-backward asymmetry of b quarks tagged via muons from semileptonic decays. The value of Ab is extracted using a maximum likelihood fit to the differential cross section for fermion production.
NTIS
Muons ; Parity ; Fermions ; Particle Theory

20020010888 Stanford Linear Accelerator Center , Menlo Park, CA USA
Studies of b b-bar gluon and c c-bar vertices
Abe, T. ; Oct. 12, 2000 ; 5p ; In English
Report No.(s): DE2001-784737 ; SLAC-PUB-8661 ; No Copyright ; Avail: Department of Energy Information Bridge
The authors report on several new studies of bbg and ccg vertices using 3- and 4-jet hadronic Z(sup 0) decays by e(sup +)e(sup -) collision. The gluon energy spectrum is measured over the full kinematic range, providing an improved test of QCD and limits on anomalous bbg couplings. The parity violation in Z(sup 0) -> bbg decays is consistent with electroweak theory plus QCD. New tests of T- and CP-conservation at the bbg vertex are performed.
NTIS
Electroweak Model ; Gluons ; Hadrons ; Particle Decay ; Quantum Chromodynamics

20020010912 Thermoscience Inst. , Moffett Field, CA USA
Accurate Energetics for the Unimolecular Decomposition of HN2
Walch, Stephen P. , Thermoscience Inst. , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 537-02-20 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
We report internally contracted configuration interaction (ICCI) calculations along the constrained energy minimum (CEM) path for the addition of H to N2 with both CC-pVQZ and augmented CC-pVQZ basis sets. The results agree to within 0.5 kcal/mol with the larger basis set results of Walch, which were used to calibrate the HN2 potential energy surface used by Koizumi, Schatz, and Walch in coupled channel calculations to determine the lifetimes for unimolecular decay of the lowest vibrational levels of HN2. These small changes in the potential energy surface should have no significant effect on the computed lifetimes.
Author
Nitrogen ; Potential Energy ; Configuration Interaction

20020010919 Fermi National Accelerator Lab. , Batavia, IL USA
Measurement of the transverse momentum distributions of W and Z bosons produced in p(bar p) collisions at (radical)s = 1.8 TeV
Abbott, B. ; Jul. 26, 1999 ; 14p ; In English
Report No.(s): DE2001-9134 ; FERMILAB-CONF-99/204-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We present measurements of the transverse momentum distribution of W and Z bosons produced in p(bar p) collisions at (radical)s = 1.8 TeV. The data were collected with the DO detector at Fermilab during 1994-1996 Tevatron run. The results are in good agreement with theoretical predictions based on the perturbative QCD and soft gluon resummation combined calculation over the entire measured p(sub T) range (p(sub T) = 0--200 GeV/c).
NTIS
Bosons ; Transverse Momentum

20020010938 Lawrence Livermore National Lab. , Livermore, CA USA

Performing three-dimensional neutral particle transport calculations on tera scale computers

Woodward, C. S. ; Brown, P. N. ; Chang, B. ; Dorr, M. R. ; Hanebutte, U. R. ; Jan. 12, 1999 ; 8p ; In English

Report No.(s): DE2001-8352 ; UCRL-JC-132006 ; REPT-98-ERD-022 ; No Copyright ; Avail: Department of Energy Information Bridge

A scalable, parallel code system to perform neutral particle transport calculations in three dimensions is presented. to utilize the hyper-cluster architecture of emerging tera scale computers, the parallel code successfully combines the MPI message passing and paradigms. The code's capabilities are demonstrated by a shielding calculation containing over 14 billion unknowns. This calculation was accomplished on the IBM SP 'ASCI-Blue-Pacific' computer located at Lawrence Livermore National Laboratory (LLNL).

NTIS

Neutral Particles ; Parallel Processing (Computers) ; Three Dimensional Models ; Supercomputers

20020010948 Fermi National Accelerator Lab. , Batavia, IL USA

Space-Charge Compensation in Proton Boosters

Burov, A. ; Foster, W. ; Shiltsev, V. ; Jun. 26, 2001 ; 3p ; In English

Report No.(s): DE2001-781995 ; FERMILAB-CONF-01/130-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Recently, it was proposed to use negatively charged electron beams for compensation of beam-beam effects due to protons in the Tevatron collider. We show that a similar compensation is possible in space-charge dominated low energy proton beams. The idea has a potential of several-fold increase of the FNAL Booster beam brightness. Best results will be obtained using three electron lenses around the machine circumference, using co-moving electron beam with time structure and profile approximately to the proton beam. This technique, if feasible, will be more cost effective than the straightforward alternative increasing the energy of the injection linac.

NTIS

Proton Beams ; Protons ; Lenses

20020010954 Fermi National Accelerator Lab. , Batavia, IL USA

Higgs Searches at the Tevatron

Moneta, L. ; Jun. 22, 2001 ; 4p ; In English

Report No.(s): DE2001-781964 ; FERMILAB-CONF-01/119-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This paper describes the searches for the Higgs boson performed by the CDF and DO collaborations at the Tevatron p(bar p) Collider using the data collected in the 1992-95 run. Searches for standard model Higgs and as well for neutral and charged minimal SUSY Higgs bosons are also presented. No signal has been observed and limits are set for production cross sections.

NTIS

Higgs Bosons ; Particle Production ; Quantum Chromodynamics

20020011138 Stanford Linear Accelerator Center , Menlo Park, CA USA

Improved Measurement of the Probability for Gluon Splitting into b bbar in Z0 Decays

Burrows, P. ; Feb. 05, 2001 ; 21p ; In English

Report No.(s): DE2001-784866 ; SLAC-PUB-8737 ; No Copyright ; Avail: Department of Energy Information Bridge

We have measured gluon splitting into bottom quarks, g-bb, in hadronic Z0 decays collected by SLD between 1996 and 1998. The analysis was performed by looking for secondary bottom production in 4-jet events of any primary flavor.

NTIS

Gluons ; Hadrons ; Probability Theory ; Flavor (Particle Physics) ; Particle Decay

20020011139 Stanford Linear Accelerator Center , Menlo Park, CA USA

First Measurement of the CP-Violating Asymmetries with BABAR

Kolomwnaky, Y. T. ; Feb. 02, 2001 ; 5p ; In English

Report No.(s): DE2001-784867 ; SLAC-PUB-8738 ; No Copyright ; Avail: Department of Energy Information Bridge

The CP-violating phase of the three-generation Cabibbo-Kobayashi-Maskawa (CKM) quark mixing matrix can provide an elegant explanation of the CP-violating effects seen in decays of neutral K mesons. The unitarity relations between the elements of the CKM matrix can be expressed as six triangles of equal area in the complex plane.
NTIS
Asymmetry ; Flavor (Particle Physics) ; Mesons ; Quarks

20020011141 Stanford Linear Accelerator Center , Menlo Park, CA USA
How Can a Heavy Higgs Boson be Consistent with the Precision Electroweak Measurements.
Peskin, M. E. ; Feb. 01, 2001 ; 25p ; In English
Report No.(s): DE2001-784870 ; SLAC-PUB-8763 ; No Copyright ; Avail: Department of Energy Information Bridge
The fit of precision electroweak data to the Minimal Standard Model currently gives an upper limit on the Higgs boson mass of 170 GeV at 95% confidence. Nevertheless, it is often said that the Higgs boson could be much heavier in more general models. In this paper, we critically review models that have been proposed in the literature that allow a heavy Higgs boson consistent with the precision electroweak constraints. All have unusual features, and all can be distinguished from the Minimal Standard Model either by improved precision measurements or by other signatures accessible to next-generation colliders.
NTIS
Electroweak Interactions (Field Theory) ; Higgs Bosons ; Standard Model (Particle Physics) ; Precision

20020011158 Argonne National Lab. , IL USA
Semirelativistic constituent-quark model with Goldstone-boson-exchange hyperfine interactions
Wagenbrunn, R. F. ; Oct. 20, 1998 ; 7p ; In English
Report No.(s): DE20-0111050 ; ANL/PHY/CP-97469 ; No Copyright ; Avail: Department of Energy Information Bridge
We address the semirelativistic constituent-quark model with linear confinement and a hyperfine interaction deduced from Goldstone-boson exchange. In the version where the latter is represented by pseudoscalar meson exchange ((pi), K, (eta), (eta)(prime))and restricted to the spin-spin component only a unified description of all light- and strange-baryon spectra is provided in close agreement with phenomenology. We discuss the extension of the model that includes also the tensor components of the pseudoscalar meson exchange and in addition vector-meson ((rho), (omega), K, (phi)) and scalar-meson ((sigma)) exchanges. A preliminary version thereof provides a description of the baryon spectra with similar good quality.
NTIS
Bosons ; Quark Models

20020011230 Lawrence Livermore National Lab. , Livermore, CA USA
Transport-based condensed history algorithm
Tolar, D. R. ; Jan. 06, 1999 ; 7p ; In English
Report No.(s): DE2001-9791 ; UCRL-JC-132857 ; No Copyright ; Avail: Department of Energy Information Bridge
Condensed history algorithms are approximate electron transport Monte Carlo methods in which the cumulative effects of multiple collisions are modeled in a single step of (user-specified) path length s(sub 0). This path length is the distance each Monte Carlo electron travels between collisions. Current condensed history techniques utilize a splitting routine over the range 0 (le) s (le) s(sub 0). For example, the PEnELOPE method splits each step into two substeps; one with length (xi)s(sub 0) and one with length (1 (minus)(xi))s(sub 0), where (xi) is a random number from 0 < (xi) < 1. because s(sub 0) is fixed (not sampled from an exponential distribution), conventional condensed history schemes are not transport processes. Here the authors describe a new condensed history algorithm that is a transport process. The method simulates a transport equation that approximates the exact Boltzmann equation. The new transport equation has a larger mean free path than, and preserves two angular moments of, the Boltzmann equation. Thus, the new process is solved more efficiently by Monte Carlo, and it conserves both particles and scattering power.
NTIS
Algorithms ; Electron Scattering

20020011234 Lawrence Livermore National Lab. , Livermore, CA USA
Proton radiography as a means of material characterization
Aufderheide, M. B. ; Barnes, P. D. ; Bionta, R. M. ; Hartouni, E. P. ; Morris, C. L. ; Jun. 23, 1999 ; 8p ; In English
Report No.(s): DE2001-9799 ; UCRL-JC-134595 ; REPT-97-ERD-058 ; No Copyright ; Avail: Department of Energy Information Bridge

The authors describe how protons with energies of 800 MeV or greater can be used as radiographic probes for material characterization. A feature which distinguishes protons from x-rays is their charge, which results in multiple Coulomb scattering effects in proton radiographs. Magnetic lensing can ameliorate these effects and even allow mixed substances to be disentangled. They illustrate some of these effects using 800 MeV protons radiographs of a composite step wedge composed of Aluminum, Foam, and Graphite. They discuss how proton radiographs must be manipulated in order to use standard tomographic reconstruction algorithms. They conclude with a brief description of an upcoming experiment, which is performed at Brookhaven National Laboratory at 25 GeV.
NTIS
Characterization ; Protons ; Radiography ; X Rays ; Algorithms

20020011366 Stanford Linear Accelerator Center , Menlo Park, CA USA
Production of pi(+/-), K(+/-), p and p-bar in Quark, Antiquark and Gluon Jets
Kang, H. ; Jun. 11, 2001 ; 8p ; In English
Report No.(s): DE2001-784938 ; SLAC-PUB-8860 ; No Copyright ; Avail: Department of Energy Information Bridge
We present measurements of identified charged hadron production over a wide momentum range using the SLD Cherenkov Ring Imaging Detector. In addition to studying particle production in flavor-inclusive Z0 decays, we compare the production in decays into light, c and b flavor events. We also examine particle production in gluon jets with that in light quark jets. The jet flavors are selected by using displaced vertex information.
NTIS
Gluons ; Hadrons ; Particle Production ; Quarks

20020011735 Stanford Linear Accelerator Center , Menlo Park, CA USA
New Simulation Results for the Electron-Cloud Effect at the PEP-II Positron Ring
Cai, Y. ; Jun. 26, 2001 ; 4p ; In English
Report No.(s): DE2001-784950 ; SLAC-PUB-8885 ; No Copyright ; Avail: Department of Energy Information Bridge
We present simulation results for the emittance blowup due to the head-tail effect induced by the electron-cloud effect (ECE) in the low-energy ring (LER) at the PEP-II B factory at SLAC.
NTIS
Electron Clouds ; Emittance ; Positrons ; Computerized Simulation ; Linear Accelerators

20020011736 Stanford Linear Accelerator Center , Menlo Park, CA USA
G-2 of the Muon in Localized Gravity Models
Rizzo, T. G. ; Jul. 23, 2001 ; 16p ; In English
Report No.(s): DE2001-784951 ; SLAC-PUB-8469 ; No Copyright ; Avail: Department of Energy Information Bridge
The (g-2) of the muon is well known to be an important model building constraint on theories beyond the Standard Model. In this paper, we examine the contributions to (g-2)mu arising in the Randall-Sundrum model of localized gravity for the case where the Standard Model gauge fields and fermions are both in the bulk. Using the current experimental world average measurement for (g-2)mu, we find that strong constraints can be placed on the mass of the lightest gauge Kaluza-Klein excitation for a narrow part of the allowed range of the assumed universal 5-dimensional fermion mass parameter, v. However, employing both perturbativity and fine-tuning constraints we find that we can further restrict the allowed range of the parameter v to only one fourth of its previous size. The scenario with the SM in the RS bulk is thus tightly constrained, being viable for only a small region of the parameter space.
NTIS
Muons ; Standard Model (Particle Physics) ; Gravitation ; Fermions

20020011881 Stanford Linear Accelerator Center , Menlo Park, CA USA
Alpha(sub s) at Low Q(sup 2) from e+(e-) and tau Data
Menke, S. ; Jun. 04, 2001 ; 7p ; In English
Report No.(s): DE2001-784933 ; SLAC-PUB-8851 ; No Copyright ; Avail: Department of Energy Information Bridge
It has been shown in recent analyses by ALEPH and OPAL that precision QCD tests are possible with hadronic Tau decays by comparing spectral moments of the hadronic decay ratio of the tau with QCD calculations. In principle e+ e- data can be used

in a similar manner by evaluating spectral moments of R. The current e+ e- data is compared with the OPAL tau data and a prediction is made on the achievable accuracy of QCD tests with the projected precision of PEP-N.
NTIS
Hadrons ; Particle Decay ; Quantum Chromodynamics

20020011882 Stanford Linear Accelerator Center , Menlo Park, CA USA
Phase Slip in an Undulator with Pole and BPM Errors
Emma, P. J. ; Jun. 25, 2001 ; 4p ; In English
Report No.(s): DE2001-784934 ; SLAC-PUB-8852 ; No Copyright ; Avail: Department of Energy Information Bridge
A statistical analysis of a corrected electron trajectory through a planar FEL undulator is used to predict the optimal beam position monitor (BPM) spacing. The undulator is composed of modular sections, each containing many dipoles with random field and roll angle errors. Located between each section are inaccurate BPMs, steering correctors, and possibly quadrupole magnets. An analytical formula for electron-to-photon phase errors is derived and used to estimate the best BPM spacing. The results are applied to the LCLS FEL undulator, which has demanding requirements on electron trajectory straightness.
NTIS
Electron Trajectories ; Free Electron Lasers ; Statistical Analysis ; Photons

20020012298 Stanford Linear Accelerator Center , Menlo Park, CA USA
Theoretical Uncertainties in the Muon Anomalous Magnetic Moment
Melnikov, K. ; Jul. 25, 2001 ; 12p ; In English
Report No.(s): DE2001-784978 ; SLAC-PUB-8844 ; No Copyright ; Avail: Department of Energy Information Bridge
I present a fairly detailed discussion of various contributions to the anomalous magnetic moment of the muon au. I try to give an unbiased evaluation of the validity of the SM prediction for this quantity and to point out some delicate issues involved in its calculation. I conclude that the theory uncertainties in the SM prediction for the muon anomalous magnetic moment are underestimated and a great deal of work will be required to reduce these uncertainties to the level required by experiment.
NTIS
Magnetic Moments ; Muons ; Field Theory (Physics)

20020012301 Stanford Linear Accelerator Center , Menlo Park, CA USA
Indirect Signatures of CP Violation in the Processes gamma (gamma) yields gamma(gamma), (gamma)Z, and ZZ
Petriello, F. J. ; Jul. 25, 2001 ; 42p ; In English
Report No.(s): DE2001-784975 ; SLAC-PUB-8831 ; No Copyright ; Avail: Department of Energy Information Bridge
Future e+ e- colliders will likely have the option of operating in Gamma gamma or e gamma collision modes. These modes are reached by Compton scattering laser light off one or more of the incoming fermion beams, and then colliding the resulting high energy photons with the remaining fermion beam or with each other.
NTIS
Bosons ; Particle Production ; Linear Accelerators ; Quarks ; Elementary Particle Interactions

20020012302 Stanford Linear Accelerator Center , Menlo Park, CA USA
Isospin Symmetry Breaking within the HLS Model: A Full (rho, omega, phi) Mixing Scheme
Jul. 16, 2001 ; 38p ; In English
Report No.(s): DE2001-784974 ; SLAC-PUB-8827 ; No Copyright ; Avail: Department of Energy Information Bridge
We study the way isospin symmetry violation can be generated within the Hidden Local Symmetry (HLS) Model. We show that isospin symmetry breaking effects on pseudoscalar mesons naturally induces correspondingly effects within the physics of vector mesons, through kaon loops.
NTIS
Broken Symmetry ; Isotopic Spin ; Kaons ; Vector Mesons

20020012303 Stanford Linear Accelerator Center , Menlo Park, CA USA
Measurement of the decays B yields phi K and B yields phi K*
MacFarlane, D. B. ; Jul. 25, 2001 ; 7p ; In English
Report No.(s): DE2001-784973 ; SLAC-PUB-8823 ; No Copyright ; Avail: Department of Energy Information Bridge
The decays of B mesons into charmless hadronic final states provide important information for the study of CP violation and the search for new physics. Decays into final states containing a theta meson are particularly interesting because they are

dominated by b-s(d)ss penguins, with gluonic and electroweak contributions, while other Standard Model contributions are highly suppressed.
NTIS
Electroweak Interactions (Field Theory) ; Hadrons ; Mesons ; Particle Decay

20020012308 Stanford Linear Accelerator Center , Menlo Park, CA USA
Probing the Geometry of the Universe at the NLC
Davoudiasl, H. ; Jul. 25, 2001 ; 5p ; In English
Report No.(s): DE2001-784967 ; SLAC-PUB-8767 ; No Copyright ; Avail: Department of Energy Information Bridge
The hierarchy problem in particle physics has recently been approached from a geometric point of view in different models.
NTIS
Linear Accelerators ; Geometry ; High Energy Interactions

20020012313 Stanford Linear Accelerator Center , Menlo Park, CA USA
Expansion of Bound-State Energies in Powers of m/M
Melnikov, K. ; Jul. 25, 2001 ; 4p ; In English
Report No.(s): DE2001-784962 ; SLAC-PUB-8730 ; No Copyright ; Avail: Department of Energy Information Bridge
The theory of non-relativistic bound states in QED remains an important source of information about fundamental physical parameters, like the fine structure constant and the masses of the electron, muon and proton, among many others. Simple atoms, which are being studied in laboratories, differ significantly in the ratios of their constituent masses. Two situations can be distinguished. The first one is the case when the masses of the two constituents of the bound state are equal, with the positronium as the most important example. The second case is a bound state with two very different masses, e.g. hydrogen, muonium, and muonic hydrogen. Both situations represent two special limits of a general mass ratio case. In both limits certain simplifications are possible.
NTIS
Quantum Electrodynamics ; Energy Levels ; Mass Ratios ; Muonium ; Muons ; Fine Structure

20020012315 Stanford Linear Accelerator Center , Menlo Park, CA USA
CP Asymmetry in the Higgs Decay into the Top Pair Due to the Stop Mixing
Chang, D. ; Jul. 25, 2001 ; 14p ; In English
Report No.(s): DE2001-784960 ; SLAC-PUB-8714 ; No Copyright ; Avail: Department of Energy Information Bridge
We investigate a potentially large CP violating asymmetry in the decay of a neutral scalar or pseudoscalar Higgs boson into the ti pair. The source of the CP nonconservation is the complex mixing in the stop tL,R sector. One of the interesting consequences is the different rates of the Higgs boson decays into CP conjugate polarized states.
NTIS
Bosons ; Particle Decay ; Asymmetry ; Pair Production

20020012320 Stanford Linear Accelerator Center , Menlo Park, CA USA
O(alpha(sup 3) ln alpha) Corrections to Positronium Decay Rates
Melnikov, K. ; Jul. 25, 2001 ; 10p ; In English
Report No.(s): DE2001-784954 ; SLAC-PUB-8557 ; No Copyright ; Avail: Department of Energy Information Bridge
Positronium decays into two and three photons provide an interesting test of bound states Quantum Electrodynamics (QED). While the parapositronium (p-Ps) decay rate is well described by QED, it is known that the decay of orthopositronium (o-Ps) into three photons is still a controversial issue.
NTIS
Positronium ; Quantum Electrodynamics ; Particle Decay ; Alpha Decay

20020012321 Stanford Linear Accelerator Center , Menlo Park, CA USA
Matter effects in the D0-D0-bar system
Silva, J. P. ; Jul. 25, 2001 ; 6p ; In English
Report No.(s): DE2001-784953 ; SLAC-PUB-8519 ; No Copyright ; Avail: Department of Energy Information Bridge

We discuss the impact of matter effects in the D0-D0 system. We show that such effects could, in principle, be measured, but that they cannot be used to probe the mass difference ID or the lifetime different YD. This occurs because the mixing effects and he matter effects decouple at short times. We also comment briefly on the B systems.
NTIS
Mesons ; Kaons ; Elementary Particle Interactions

20020012322 Stanford Linear Accelerator Center , Menlo Park, CA USA
Use of the Reciprocal Basis in Neutral Meson Mixing
Silva, J. P. ; Jul. 25, 2001 ; 15p ; In English
Report No.(s): DE2001-784952 ; SLAC-PUB-8499 ; No Copyright ; Avail: Department of Energy Information Bridge
In the presence of CP violation, the effective Hamiltonian matrix describing a neutral meson anti-meson system does not commute with its hermitian conjugate. As a result, this matrix cannot be diagonalized by a unitary transformation and one needs to introduce a reciprocal basis. Although known, this fact is seldom discussed and almost never used. Here, we use this concept to highlight a parametrization of the Hamiltonian matrix in terms of physical observables, and we show that using it reduces a number of long and tedious derivations into simple matrix multiplications. These results have a straightforward application for propagation in matter. We comment on the (mathematical) relation with neutrino oscillations.
NTIS
Mesons ; Mixing ; Hamiltonian Functions

20020012324 Stanford Linear Accelerator Center , Menlo Park, CA USA
QCD Aspects of Exclusive B Decays
Brodsky, S. J. ; Apr. 04, 2001 ; 15p ; In English
Report No.(s): DE2001-784903 ; SLAC-PUB-8809 ; No Copyright ; Avail: Department of Energy Information Bridge
Remarkable progress has recently been made applying perturbative QCD methods to the exclusive two-body hadronic decays of B mesons. Two groups, Beneke, Buchalla, Neubert, and Sachrajda, and Keum, Li, and Sanda have proven factorization theorems which allow the rigorous computation of certain types of exclusive B decay amplitudes in terms of the distribution amplitudes of the initial-state B meson and the final-state hadrons. These new analyses allow one to understand the hadronic physics of heavy hadron decays from a fundamental perspective. There have been many applications of the PQCD formalism, including many new results presented at this conference.
NTIS
Quantum Chromodynamics ; Mesons ; Particle Decay

20020012327 Stanford Linear Accelerator Center , Menlo Park, CA USA
Hadronic B Decays to Charmless Final States and to J/psi K*
Hoecker, A. ; Apr. 13, 2001 ; 13p ; In English
Report No.(s): DE2001-784900 ; SLAC-PUB-8802 ; No Copyright ; Avail: Department of Energy Information Bridge
Preliminary results from the BABAR experiment on charmless B decays to charged pions or kaons, and the measurement of the B to J/psi K*decay amplitudes are presented.
NTIS
Particle Decay ; Hadrons

20020012334 Stanford Linear Accelerator Center , Menlo Park, CA USA
Studies of CP Violation at BABAR
Ryd, A. ; Mar. 22, 2001 ; 17p ; In English
Report No.(s): DE2001-784887 ; SLAC-PUB-8780 ; No Copyright ; Avail: Department of Energy Information Bridge
One of the main goals of the BABAR experiment is to study CP Violation in neutral B-mesons. The neutral B meson system is similar to the neutral Kaon system in that we have two flavor eigenstates that mix. However, the phenomenology is rather different. In the Kaon system the physics is driven by a large difference in the decay widths, such that there are two states, the K-L and the K0S, that have substantially different lifetimes.
NTIS
Invariance ; Mesons ; Phenomenology

20020012342 Stanford Linear Accelerator Center , Menlo Park, CA USA
Measurement of CP-Violating Asymmetries in B0 Decays to CP Eigenstates
MacFarlane, D. B. ; Feb. 26, 2001 ; 10p ; In English
Report No.(s): DE2001-784878 ; SLAC-PUB-8777 ; No Copyright ; Avail: Department of Energy Information Bridge
No abstract available.
NTIS
Mesons ; Storage Rings (Particle Accelerators)

20020012344 Stanford Linear Accelerator Center , Menlo Park, CA USA
Study of Top-quark Production and Decay Vertices with LCD Fast Simulation
Iwasaki, M. ; Feb. 08, 2001 ; 5p ; In English
Report No.(s): DE2001-784875 ; SLAC-PUB-8773 ; No Copyright ; Avail: Department of Energy Information Bridge
The top quark plays a special role in particle physics, due to its uniquely large mass. It decays immediately, before forming a hadron. Therefore its spin information is expected to be directly transferred to its daughters. This feature provides us opportunities of probing the top couplings using the information of its daughters. The high energy future e+ e- linear collider would be an ideal tool for such studies, because of its clean event environment and the possibility of initial-state polarization.
NTIS
Quarks ; Hadrons ; Simulation

20020012345 Stanford Linear Accelerator Center , Menlo Park, CA USA
Search for Stable, Massive, Elementary Particles
Kim, P. C. ; Feb. 14, 2001 ; 34p ; In English
Report No.(s): DE2001-784874 ; SLAC-PUB-8772 ; No Copyright ; Avail: Department of Energy Information Bridge
In this paper we review the experimental and observational searches for stable, massive, elementary particles other than the electron and proton. The particles may be neutral, may have unit charge or may have fractional charge. They may interact through the strong, electromagnetic, weak or gravitational forces or through some unknown force. The purpose of this review is to provide a guide for future searches-what is known, what is not known, and what appear to be the most fruitful areas for new searches. A variety of experimental and observational methods such as accelerator experiments, cosmic ray studies, searches for exotic particles in bulk matter and searches using astrophysical observations is included in this review.
NTIS
Elementary Particles ; Gravitational Fields ; Cosmic Rays

20020012347 Stanford Linear Accelerator Center , Menlo Park, CA USA
Hadronic Light-Front Wavefunctions and QCD Phenomenology
Brodsky, S. J. ; Feb. 02, 2001 ; 43p ; In English
Report No.(s): DE2001-784872 ; SLAC-PUB-8770 ; No Copyright ; Avail: Department of Energy Information Bridge
A fundamental goal in QCD is to understand the non-perturbative structure of hadrons at the amplitude level-not just the single-particle flavor, momentum, and helicity distributions of the quark constituents, but also the multi-quark, gluonic, and hidden-color correlations intrinsic to hadronic and nuclear wavefunctions. A natural calculus for describing the bound-state structure of relativistic composite systems in quantum field theory is the light-front Fock expansion which encodes the properties of a hadron in terms of a set of frame-independent n-particle wavefunctions.
NTIS
Hadrons ; Quantum Chromodynamics ; Quantum Theory ; Correlation

20020012538 Stanford Linear Accelerator Center , Menlo Park, CA USA
Study of Topological Vertexing for Heavy Quark Tagging
Abe, T. ; Feb. 13, 2001 ; 5p ; In English
Report No.(s): DE2001-784877 ; SLAC-PUB-8775 ; No Copyright ; Avail: Department of Energy Information Bridge
We compare heavy quark tagging and anti-tagging efficiencies for vertex detectors with different inner radii using the topological vertex technique developed at the SLC/SLD experiment. Charm tagging benefits by going to very small inner radii.
NTIS
Detectors ; Topology ; Quarks

20020012546 Stanford Linear Accelerator Center , Menlo Park, CA USA

O(alpha(sup 3) ln alpha) Corrections to Muonium and Positronium Hyperfine Splitting

Melnikov, K. ; Jul. 25, 2001 ; 4p ; In English

Report No.(s): DE2001-784957 ; SLAC-PUB-8652 ; No Copyright ; Avail: Department of Energy Information Bridge

The perturbative series for binding energies of a QED bound state are non-analytic in the fine structure constant and the expansion contains powers of alpha(sup n1) ln(sup n2) alpha, where n1 and n2 are some integer numbers. The appearance of logarithms of a is best explained by the fact that different scales, such as the mass m, the momentum ma and the typical energy m(alpha(sup 2)) control dynamics of the bound state.

NTIS

Quantum Electrodynamics ; Muonium ; Positronium ; Hyperfine Structure ; Particle Decay

20020012547 Stanford Linear Accelerator Center , Menlo Park, CA USA

Closed String Tachyons, AdS/CFT, and QCD

Silverstein, E. M. ; Jul. 25, 2001 ; 29p ; In English

Report No.(s): DE2001-784968 ; SLAC-PUB-8797 ; No Copyright ; Avail: Department of Energy Information Bridge

We find that tachyonic orbifold examples of AdS/CFT have corresponding instabilities at small radius, and can decay to more generic gauge theories. We do this by computing a destabilizing Coleman-Weinberg effective potential for twisted operators of the corresponding quiver gauge theories, generalizing calculations of Tseytlin and Zarembo and interpreting them in terms of the large-N behavior of twisted-sector modes. The dynamically generated potential involves double-trace operators, which affect large-N correlators involving twisted fields but not those involving only untwisted fields, in line with large-N inheritance arguments. We point out a simple reason that no such small radius instability exists in gauge theories arising from freely acting orbifolds, which are tachyon-free at large radius. When an instability is present, twisted gauge theory operators with the quantum numbers of the large-radius tachyons aquire VEVs, leaving a gauge theory with fewer degrees of freedom in the infrared, analogous to but less extreme than 'decays to nothing' studied in other systems with broken supersymmetry. In some cases one is left with pure glue QCD plus decoupled matter and U (1) factors in the IR, which we thus conjecture is described by the corresponding (possibly strongly coupled) endpoint of tachyon condensation in the M/String-theory dual.

NTIS

Gauge Theory ; Quantum Chromodynamics ; Tachyons ; Supersymmetry ; String Theory

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NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20020006071 Brookhaven National Lab. , Upton, NY USA

Alternative approach to low frequency RF accelerators and power sources

Zhao, ; Jun. 18, 2001 ; 4p ; In English

Report No.(s): DE2001-785366 ; BNL-68558 ; No Copyright ; Avail: Department of Energy Information Bridge

The Muon Collider and Neutrino Factory projects require low frequency rf cavities because the size and emittance of the muon beam is much larger than is usual for electron or proton beams. The range of 30 MHz to 200 MHz is of special interest. However, the size of an accelerator with low frequency will be impractically large if it is simply scaled up from usual designs. In addition, to get very high peak power in this range is difficult. Presented in this paper is an alternative structure that employs a quasi-lumped inductance that can significantly reduce the transverse size while keeping high gradient. Also addressed is a power compression scheme with a thyratron. This gives a possible solution to provide very high peak power.

NTIS

Neutrinos ; Muons ; Electron Beams

20020006073 Brookhaven National Lab. , Upton, NY USA

High energy muon colliders

King, ; Jun. 18, 2001 ; 4p ; In English

Report No.(s): DE2001-785363 ; BNL-68555 ; No Copyright ; Avail: Department of Energy Information Bridge

A plausible straw-man scenario and collider ring parameter sets are presented for future energy frontier muon colliders in symbiotec facilities with e+e- and hadron colliders: 1.6-10 TeV mu-linear colliders (mu-LC) where the muons are accelerated in the linacs of a TeV-scale linear e+e- collider, and a 100 TeV Very Large Muon Collider (VLMC) that shares a facility with a 200 TeV Very Large Hardon collider (VLHC) and a 140 TeV muon-proton collider.
NTIS
Accelerators ; Muons ; Storage Rings (Particle Accelerators)

20020006077 Los Alamos National Lab. , NM USA
Procedure to set phase and amplitude of the rf in the sns linac's superconducting cavities
Young, L. M. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783293 ; LA-UR-01-3142 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper describes a procedure to set a phase and amplitude of the RF fields in the Spallation Neutron Source (SNS) linac's superconducting cavities. The linac uses superconducting cavities to accelerate the H(sup -) ion beam from the normal conducting linac at 185 MeV to a final energy of approximately GeV. There are two types of cavities in the linac, 33 cavities with a geometric beta of 0.61 and 48 cavities with a geometric beta of 0.81. The correct phase setting of any single superconducting cavity depends on the RF phase and amplitude of all the preceding superconducting cavities.
NTIS
Linear Accelerators ; Ion Beams ; Spallation ; Cavities

20020006083 Los Alamos National Lab. , NM USA
Progress on the new high power 200 mhz rf system for the lansce dtl
Lyles, J. T. ; Clark, D. C. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783276 ; LA-UR-01-3152 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Los Alamos Neutron Science Center (LANSCE) linac accelerates up to 1 mA average of proton current for various applications, including the short pulse spallation neutron source, proton radiography, isotope production and neutron research. Long beam pulse at high current put extreme demands on the drift tube linac (DTL) RF power amplifiers, which were originally installed in 1972. A new RF power system is being developed for increased peak power with higher duty factor. The final power amplifiers use a THALES TH628 Diacrode and will not require the large anode modulators used in the present system. The RF amplitude control will be introduced at a low level in the power chain. When completed, the new system will reduce the number of electron power tubes from twenty-four to seven in the RF plant for the 100 MeV DTL. Details of the EM field models, the mechanical layout, prototype construction techniques, RF tests, and system considerations will be discussed.
NTIS
Linear Accelerators ; Beam Currents ; Neutron Sources ; Electron Tubes

20020006085 Los Alamos National Lab. , NM USA
1 Megawatt Polyphase Boost Converter-Modulator for Klystron Pulse Application
Reass, W. A. ; Doss, J. D. ; Gribble, R. F. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783260 ; LA-UR-01-3229 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper describes electrical design criteria and first operational results a 140 kV, q MW average, 11 MW peak, zero-voltage-switching 20 kHz polyphase bridge, boost converter/modulator for klystron pulse application. The DC-DC converter derives the buss voltages from a standard 13.8 kV to 2300 Y substation cast-core transformer. Energy storage and filtering is provided by self-clearing metallized hazy polypropylene traction capacitors. (IGBT) switching networks are used to generate the polyphase 20 kHz transformer primary drive waveforms.
NTIS
Klystrons ; Design Analysis ; Electric Potential ; Energy Storage

20020006087 Los Alamos National Lab. , NM USA
System identification of the linac rf system using a wavelet method and its applications in the sns llrf control system
Wang, Y. ; Kwon, S. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783253 ; LA-UR-01-3223 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
For a pulsed LINAC such as the SNS, an adaptive feed-forward algorithm plays an important role in reducing the repetitive disturbance caused by the pulsed operation conditions. In most modern feed-forward control algorithms, accurate real time system identification is required to make the algorithm more effective. In this paper, an efficient wavelet method is applied to the system identification in which the Haar function is used as the base wavelet. The advantage of this method is that the Fourier transform

of the Haar function in the time domain is a sinc function in the frequency domain. Thus we can directly obtain the system transfer function in the frequency domain from the coefficients of the time domain system response.
NTIS
Linear Accelerators ; Wavelet Analysis ; Transfer Functions ; Algorithms

20020006088 Los Alamos National Lab. , NM USA
Conventional facilities requirements for the sns linac
Tallerico, P. ; Crow, M. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783252 ; LA-UR-01-3222 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Spallation Neutron Source (SNS) linac has a hgh gradient and 2 MW of beam power, and it therefore requires substantial RF power and cooling. There are 94 klystrons in its RF system, a large number for a proton linac. The optimization process and logic that lead to the klystron, transmitter, and power supply sizes is discussed. We also describe the requirements for building and tunnel area, electrical power, and water for this system. The trade-off decisions between low capital cost, low operating cost, and good maintainability are described.
NTIS
Linear Accelerators ; Neutron Sources ; Spallation

20020006089 Los Alamos National Lab. , NM USA
Upgrade to initial bpm electronics module and beamline components for calibration of the leda beam position measurements
Barr, D. S. ; Gilpatrick, J. D. ; Shurter, R. B. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783247 ; LA-UR-01-3216 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Low-Energy Demonstration Accelerator (LEDA), designed and built at the Los Alamos National Laboratory, is part of the Accelerator Production of Tritium (APT) program and provides a platform for measuring high-power proton beam-halo formation. Beam Position Monitors (BPMs) are placed along the FODO lattice and the HEBT. The BPM systems employing log-ratio processor electronics have recently been upgraded for all fifteen BPMs along the accelerator. Two types of calibration are now used. The first corrects for errors within the electronics module and the log-amp transfer function non-conformity. The second is a single-point routine used to correct for cable plant attenuation differences. This paper will also cover the new switching systems used for various system calibration modes as well as various results from LEDA beam runs. New switching algorithms were implemented in order to remove sensitive electronic switches from within the beam tunnel radiation environment. Attention will be paid to the calibration algorithms and switching system interactions, and how well they work in practice.
NTIS
Accelerators ; Beams (Radiation) ; Monitors ; Transfer Functions

20020006166 Department of Energy , Washington, DC USA
Report of research activities and continuation request for the High Energy Physics Group at Southern Methodist University *Final Report*
Stroynowski, R. ; Coan, T. E. ; Mar. 12, 1999 ; 88p ; In English
Report No.(s): DE2001-6636 ; No Copyright ; Avail: Department of Energy Information Bridge
The main effort of the Southern Methodist University (SMU) group is devoted to the CLEO experiment at CESR (Cornell Electron Storage Ring) concentrating on studies of the properties of the tau lepton and of the bottom and charm quarks. In addition to the data analysis they have initiated a major effort in the construction of the particle identification device (RICH) for the CLEO III upgrade. At SMU in Dallas, Thomas Coan, with the help of Jingbo Ye and five graduate students, is leading the construction of the RICH inner radiator. This task includes design and assembly of RICH mechanical structure and tests of the LiF crystals used to generate Cerenkov light. This second independent construction effort is still in its early stage. The initial project is to develop inter-chip connectors for the RICH front-end readout boards. In parallel, they work with a Cornell engineer on the design of a VME (Versa Module Eurocard) based interface board between the front-end data board and DAQ (data acquisition) electronics. They expect this project to expand and to include the fabrication of the data interface board for the RICH readout starting in the spring of 1996.
NTIS
Quarks ; High Energy Interactions ; Storage Rings (Particle Accelerators)

20020006239 Los Alamos National Lab. , NM USA
Mbx challenge competition: a neutron matter model
Baker, G. ; Nov. 01, 1999 ; 12p ; In English
Report No.(s): DE2001-772943 ; LA-UR-99-5759 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Bertsch, non-parametric model of neutron matter is analyzed and strong indications are found that, in the infinite system limit, the ground state is a Fermi liquid with an effective mass, except for a set of measure zero.
NTIS
Neutrons ; Fermi Liquids

20020006315 Los Alamos National Lab. , NM USA
Analog front-end electronics for beam position measurement on the beam halo measurement
Shurter, R. B. ; Cote, T. J. ; Gilpatrick, J. D. ; Jun. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-783248 ; LA-UR-01-3217 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Enhancements have been made to the log-ratio analog front-end electronics based on the Analog Devices 8307 logarithmic amplifier as used on the LEDA accelerator. The dynamic range of greater than 85 dB, has been extended to nearly the full capability of the AD8307 from the previous design of approximately 65 dB through the addition of a 350 MHz band-pass filter, careful use of ground and power plane placement, signal routing and power supply bypassing. Additionally, selection of high-isolation RF switches (55dB) has been an integral part of a new calibration technique, which is fully described in another paper submitted to this conference. Provision has also been made for insertion of a first-stage low-noise amplifier for using the circuit under low-signal conditions.
NTIS
Proton Beams ; Calibrating ; Beams (Radiation) ; Radio Frequencies ; Bandpass Filters

20020006524 Chicago Univ. , Chicago, IL USA
Development of a Fast X-ray Shutter System ***Final Report***
Schildkamp, W. ; Feb. 28, 2000 ; 5p ; In English
Report No.(s): DE2001-772663 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The objective of the project was to develop a fast shutter mechanism to allow separation of a single pulse of x-rays out of the given time structure of the APS. Technological challenges in developing this device range from engineering of ultra high strength alloys, mechanical shape development for optimal strength, coupling such materials to motorized shafts, magnetic suspension of high velocity rotors in combination with phase pick up and excursion monitoring, resonance control and jitter-free electronics. The pulse selector was delivered, integrated into the x-ray diffraction environment and tested. The researchers developed an acoustic delay line as protection against air inrushes and associated failure of the rotor and thin diamond windows for maximum x-ray transparency. Design goals were reached or exceeded and practical experience with the device began in March 2000.
NTIS
X Ray Diffraction ; Photons

20020006536 Los Alamos National Lab. , NM USA
Model to estimate volume change due to radiolytic gas bubbles and thermal expansion in solution reactors
Souto, F. ; Heger, A. ; Feb. 01, 2001 ; 13p ; In English
Report No.(s): DE2001-774453 ; LA-UR-01-673 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Aqueous homogeneous solution reactors have been proposed for the production of medical isotopes. However, the reactivity effects of fuel solution volume change, due to formation of radiolytic gas bubbles and thermal expansion, have to be mitigated to allow steady state operation of solution reactors. The results of the free run experiments analyzed indicate that the proposed model to estimate the void volume due to radiolytic gas bubbles and thermal expansion in solution reactors can accurately describe the observed behavior during the experiments. This void volume due to radiolytic gas bubbles and fuel solution thermal expansion can then be used in the investigation of reactivity effects in fissile solutions. In addition, these experiments confirm that the radiolytic gas bubbles are formed at a higher temperature than the fuel solution temperature. These experiments also indicate that the mole-weighted average for the radiolytic gas bubbles in uranyl fluoride solutions is about 1 (micro)m. Finally, it should be noted that another model, currently under development, would simulate the power behavior during the transient given the initial fuel solution level and density. The model is based on Monte Carlo simulation with the MCNP (Monte Carlo N-Particle) computer

code to obtain the reactor reactivity as a function of the fuel solution density, which, in turn, changes due to thermal expansion and radiolytic gas bubble formation.
NTIS
Chemical Reactors ; Bubbles ; Fuels ; Thermal Expansion ; Aqueous Solutions

20020006808 Florida Univ. , Dept. of Nuclear and Radiological Engineering , Gainesville, FL USA
Lateral Migration Radiography Image Signatures for the Detection and Identification of Buried Land Mines ***Final Report , 1 Jul. 1998-30 Jun. 2001***
Dugan, Edward T. ; Jacobs, Alan M. ; Aug. 2001 ; 152p ; In English ; Original contains color images
Contract(s)/Grant(s): DAAG55-98-1-0400
Report No.(s): AD-A395436 ; ARO-33830.6-CI-LMD ; No Copyright ; Avail: CASI ; A08 , Hardcopy ; A02 , Microfiche
Lateral migration radiography (LMR), a new form of Compton backscatter x-ray imaging, is applied to the detection and identification of buried land mines. Uncollimated detectors provide images that are due primarily to single-scatter photons from the soil surface or near-surface. Collimated detectors provide images that are due primarily to multiple-scatter photons from the near-surface or sub-surface. Noise removal and image enhancement techniques including simple weighted filters, Weiner filters, optimal filters and neural networks have been successfully employed on LMR images. Information from both the uncollimated and collimated detector images is used to effectively remove surface clutter and enhance mine detection and identification. An innovative rotating collimator for the x-ray source has been developed to provide rapid side-to-side scanning of the source beam without having to move the x-ray generator in this direction. Acquisition of detailed images of a 40 cm by 40 cm area takes under 30 seconds. The construction and testing of a portable LMR system for out door mine detection was completed. This system includes the x-ray generator; rotating source collimator; large area scintillator detectors; system frame assembly; motors and sensors for side-to- side and front-to-rear scanning; x-ray generator scan and data acquisition and processing systems; a standoff-to-vehicle IR modem communication system; and a portable electric generator power system. System weight (not including the vehicle) is about 160 kg, but this initial portable system has been significantly over-designed; system weight for a prototype should be in the range of 80 kg. Power requirement for this system can be as low as 150 watts and will not exceed 800 watts. This portable system successfully acquired images of mines buried in an indoor soil box and then in out-of-door tests conducted near the University of Florida campus.
DTIC
Radiography ; Mine Detectors ; X Ray Imagery ; Compton Effect

20020006827 Oak Ridge National Lab. , TN USA
Phenomena and Parameters Important to Burnup Credit
Parks, C. V. ; Jan. 10, 2001 ; 16p ; In English
Report No.(s): DE2001-775416 ; P00-109216 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Since the mid-1980s, a significant number of studies have been directed at understanding the phenomena and parameters important to implementation of burnup credit in out-of-reactor applications involving pressurized-water-reactor (PWR) spent fuel. The efforts directed at burnup credit involving boiling-water-reactor (BWR) spent fuel have been more limited. This paper reviews the knowledge and experience gained from work performed in the US and other countries in the study of burnup credit. Relevant physics and analysis phenomenon are identified, and an assessment of their importance to burnup credit implementation for transport and dry cask storage is given.
NTIS
Spent Fuels ; Boiling Water Reactors ; Nuclear Fuels ; Pressurized Water Reactors

20020006835 Argonne National Lab. , IL USA
Cost estimate report for the long-term management of depleted uranium hexafluoride: storage of depleted uranium metal
Folga, S. M. ; Kier, P. H. ; Thimmapuram, P. R. ; Jan. 24, 2001 ; 90p ; In English
Report No.(s): DE2001-775269 ; ANL/EAD/TM-99 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This report contains a cost analysis of the long-term storage of depleted uranium in the form of uranium metal. Three options are considered for storage of the depleted uranium. These options are aboveground buildings, partly underground vaults, and mined cavities. Three cases are presented. In the first case, all the depleted uranium metal that would be produced from the conversion of depleted uranium hexafluoride (UF(sub 6)) generated by the US Department of Energy (DOE) prior to July 1993 would be stored at the storage facility (100% Case). In the second case, half the depleted uranium metal would be stored at this storage facility (50% Case). In the third case, one-quarter of the depleted uranium metal would be stored at the storage facility

(25% Case). The technical basis for the cost analysis presented in this report is principally found in the companion report, ANL/EAD/TM-100, 'Engineering Analysis Report for the Long-Term Management of Depleted Uranium Hexafluoride: Storage of Depleted Uranium Metal', prepared by Argonne National Laboratory.
NTIS
Uranium Fluorides ; Waste Disposal ; Cost Analysis ; Spent Fuels

20020006836 Argonne National Lab. , IL USA
Review of oxidation rates of DOE spent nuclear fuel , Part 1 , Nuclear fuel
Hilton, B. A. ; Dec. 08, 2000 ; 100p ; In English
Report No.(s): DE2001-775264 ; ANL-00/24-Pt-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The long-term performance of Department of Energy (DOE) spent nuclear fuel (SNF) in a mined geologic disposal system depends highly on fuel oxidation and subsequent radionuclide release. The oxidation rates of nuclear fuels are reviewed in this two-volume report to provide a baseline for comparison with release rate data and technical rationale for predicting general corrosion behavior of DOE SNF. The oxidation rates of nuclear fuels in the DOE SNF inventory were organized according to metallic, Part 1, and non-metallic, Part 2, spent nuclear fuels. This Part 1 of the report reviews the oxidation behavior of three fuel types prototypic of metallic fuel in the DOE SNF inventory: uranium metal, uranium alloys and aluminum-based dispersion fuels. The oxidation rates of these fuels were evaluated in oxygen, water vapor, and water. The water data were limited to pure water corrosion as this represents baseline corrosion kinetics. Since the oxidation processes and kinetics discussed in this report are limited to pure water, they are not directly applicable to corrosion rates of SNF in water chemistry that is significantly different (such as may occur in the repository). Linear kinetics adequately described the oxidation rates of metallic fuels in long-term corrosion. Temperature dependent oxidation rates were determined by linear regression analysis of the literature data. As expected the reaction rates of metallic fuels dramatically increase with temperature. The uranium metal and metal alloys have stronger temperature dependence than the aluminum dispersion fuels. The uranium metal/water reaction exhibited the highest oxidation rate of the metallic fuel types and environments that were reviewed. Consequently, the corrosion properties of all DOE SNF may be conservatively modeled as uranium metal, which is representative of spent N-Reactor fuel. The reaction rate in anoxic, saturated water vapor was essentially the same as the water reaction rate. The long-term intrinsic reaction rates of irradiated and unirradiated fuel were determined to be similar. The apparent reaction rate of irradiated metallic fuel increases as a function of swelling due to the increased surface area.
NTIS
Spent Fuels ; Radioactive Wastes ; Oxidation ; Waste Disposal

20020006842 Oak Ridge National Lab. , TN USA
HILO2k: A Coupled Neutron-Photon Transport Cross-Section Library for Neutron Energies up to 2000 MeV
Lillie, R. A. ; Jan. 10, 2001 ; 8p ; In English ; ANS AccApp 2000 Meeting
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774654 ; P00-109213 ; No Copyright ; Avail: Department of Energy Information Bridge
HILO2k is a new high-energy neutron and photon transport cross-section library containing neutron cross sections to 2 GeV and photon cross sections to 20 MeV. This library is the culmination of work directed at producing a high-energy multigroup transport library suitable for use in multidimensional deterministic transport codes. Its development was funded by neutronics R&D funds from the planned Spallation Neutron Source (SNS) project. It is also a modified extension of the preliminary HILO library (HILOlk) presented at the AccApp'99 meeting.
NTIS
Libraries ; Neutron Cross Sections ; Transport Theory

20020007930 Central Potato Research Inst. , Simla, India
Nuclear reaction modeling for ria isol target design
Mashnik, S. ; Mar. 01, 2001 ; 6p ; In English
Report No.(s): DE2001-776132 ; LA-UR-01-1494 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Los Alamos scientists are collaborating with researchers at Argonne and Oak Ridge on the development of improved nuclear reaction physics for modeling radionuclide production in ISOL targets. This is being done in the context of the MCNPX simulation code, which is a merger of MCNP and the LAHET intranuclear cascade code, and simulates both nuclear reaction cross sections and radiation transport in the target. The CINDER code is also used to calculate the time-dependent nuclear decays for estimating induced radioactivities. They give an overview of the reaction physics improvements they are addressing, including intranuclear cascade (INC) physics, where recent high-quality inverse-kinematics residue data from GSI have led to INC spallation and fission

model improvements; and preequilibrium reactions important in modeling (p,xn) and (p,xnyp) cross sections for the production of nuclides far from stability.
NTIS
Particle Production ; Computerized Simulation ; Inverse Kinematics ; Radioactive Isotopes

20020007935 Lawrence Livermore National Lab. , Livermore, CA USA
Beam-beam simulations for separated beams
Furman, M. A. ; Apr. 10, 2000 ; 7p ; In English
Report No.(s): DE2001-776571 ; LBNL-45363 ; CBP-NOTE-333 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We present beam-beam simulation results from a strong-strong gaussian code for separated beams for the LHC and RHIC. The frequency spectrum produced by the beam-beam collisions is readily obtained and offers a good opportunity for experimental comparisons. Although our results for the emittance blowup are preliminary, we conclude that, for nominal parameter values, there is no significant difference between separated beams and center-on-center collisions.
NTIS
Beams (Radiation) ; Computerized Simulation ; Frequency Distribution

20020008083 Argonne National Lab. , IL USA
GAMMAS-PHERE + FMA: A Journey Beyond the Proton Drip-Line
Seweryniak, D. ; Woods, P. J. ; Ressler, J. J. ; Davids, C. N. ; Heinz, A. ; Nov. 30, 2000 ; 13p ; In English
Report No.(s): DE2001-772113 ; ANL/PHY/CP-103549 ; No Copyright ; Avail: Department of Energy Information Bridge
The majority of experiments performed during the two-year long stay of GAMMAS-PHERE at the Argonne National Laboratory aimed to study proton-rich nuclei far from the line of stability at and beyond the proton drip-line. A high reaction channel selectivity was required to assign in-beam gamma-ray transitions to weakly populated exotic nuclei in the presence of background from strong reaction channels. In many of the experiments this was achieved by using the Argonne fragment mass analyzer to separate heavy-ion fusion-evaporation reaction products from scattered beam and disperse them according to their mass-over-charge-state ratio. For medium mass and heavy alpha and proton emitters the Recoil-Decay Tagging method was implemented. In-beam gamma-ray transitions were observed in several proton emitters between Z=50 and Z=82. Among others, rotational bands were assigned to Ho-141 and Eu-131. A quadruple deformation of beta = 0.25(4) was deduced for the ground state in Ho-141 from the extracted dynamic moment of inertia. Based on observed band crossings and signature splittings the 7/2(-)(523) and 1/2(+)(411) configurations were proposed for the ground state and the isomeric state, respectively. Comparison with particle-rotor calculations indicates, however, that Ho-141 may have significant hexadecapole deformation and could be triaxial.
NTIS
Gamma Rays ; Protons ; Nuclear Structure

20020008086 Argonne National Lab. , IL USA
Temperature Calculations of Heat Loads in Rotating Target Wheels Exposed to High Beam Currents
Greene, J. P. ; Gabor, R. ; Neubauer, J. ; Nov. 29, 2000 ; 6p ; In English
Report No.(s): DE2001-772105 ; ANL/PHY/CP-103047 ; No Copyright ; Avail: Department of Energy Information Bridge
In heavy-ion physics, high beam currents can eventually melt or destroy the target. Tightly focused beams on stationary targets of modest melting point will exhibit short lifetimes. Defocused or wobbled beams are employed to enhance target survival. Rotating targets using large diameter wheels can help overcome target melting and allow for higher beam currents to be used in experiments. The purpose of the calculations in this work is to try and predict the safe maximum beam currents which produce heat loads below the melting point of the target material.
NTIS
Beam Currents ; Ion Beams ; Melting ; Melting Points

20020008118 Oak Ridge National Lab. , TN USA
Benchmark Analysis of the MIX-COMP-THERM-O02 Experiments Using the SCALE/CENTRM Sequence
Hollenbach, D. F. ; Jan. 19, 2001 ; 6p ; In English
Report No.(s): DE2001-774928 ; P01-109576 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper examines a set of lattice problems to evaluate the differences between the NITAWL resonance processor and the CENTRM/PMC resonance processor. NITAWL uses the Nordheim Integral Treatment to process resolved resonances while CENTRM/PMC produces point-wise fluxes, which are then used to collapse point cross-sections. The purpose of this report is

to determine the effect of resonance overlap on Mixed-Oxide systems. NITAWL processes resonances individually, not taking into account the change in the background cross-section. CENTRM/PMC does not contain this potential problem since it calculates a point-flux using all resonances from all materials simultaneously.
NTIS
Oxides ; Resonance

20020008130 Oak Ridge National Lab. , TN USA
Nuclear Data Evaluation for Reactor Applications
Leal, L. C. ; Jan. 19, 2001 ; 5p ; In English
Report No.(s): DE2001-774674 ; P01-109685 ; No Copyright ; Avail: Department of Energy Information Bridge

In past years, nuclear analysts had to rely on a limited amount of nuclear data for reactor design. In that time, the need for nuclear data was driven by the thermal and fast reactor programs. In a thermal reactor, the fissions of importance all take place below 4 eV. Because of this, evaluations for thermal applications emphasized this region. In a typical fast reactor, however, the most important fission range shifts upwards to the 10's to 100's of keV region, and this led to evaluations that emphasized this range. Nuclear criticality situations involve an energy spectrum that peaks in the 10's to 100's eV range, and need critical attention to the cross sections in this range. Since all of these systems produce fission neutrons at high energies - 500 keV to a few MeV - attention has been given to this energy range. As noted, the region most neglected is the epithermal region; however, calculational experiences suggest many nuclides need improvements in all energy regions.
NTIS
Fission ; Reactor Design

20020008155 Lawrence Livermore National Lab. , Livermore, CA USA
Experiments at The Virtual National Laboratory for Heavy Ion Fusion
Seidl, P. A. ; Bieniosek, F. M. ; Celata, C. M. ; Faltens, A. ; Kwan, J. W. ; Jul. 24, 2000 ; 17p ; In English
Report No.(s): DE2001-775118 ; LBNL-45675 ; HIFAN 1030 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An overview of experiments is presented, in which the physical dimensions, emittance and perveance are scaled to explore driver-relevant beam dynamics. Among these are beam merging, focusing to a small spot, and bending and recirculating beams. The Virtual National Laboratory for Heavy Ion Fusion (VNL) is also developing two driver-scale beam experiments involving heavy-ion beams with I(sub beam) about 1 Ampere to provide guidance for the design of an Integrated Research Experiment (IRE) for driver system studies within the next five years. Multiple-beam sources and injectors are being designed and a one-beam module will be built and tested. Another experimental effort will be the transport of such a beam through about 100 magnetic quadrupoles. The experiment will determine transport limits at high aperture fill factors, beam halo formation, and the influence on beam properties of secondary electron. Research into driver technology will be briefly presented, including the development of ferromagnetic core materials, induction core pulsers, multiple-beam quadrupole arrays and plasma channel formation experiments for pinched transport in reactor chambers.
NTIS
High Energy Interactions ; Ion Beams ; Heavy Ions ; Nuclear Fusion

20020008877 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
G(sup E)(P)/G(sup M)(P) for Bound Protons: First Results for O-16 with the Recoil Polarization Technique
Glashausser, C. ; May 01, 1999 ; 10p ; In English
Report No.(s): DE2001-777759 ; JLAB-PHY-99-30 ; DOE/ER/40150-1832 ; No Copyright ; Avail: Department of Energy Information Bridge

The first (e, e(prime)p) polarization transfer measurements on a heavy nucleus have been made at TJNAF (Thomas Jefferson National Accelerator Facility). The reaction (sup 16)O(e, e(prime)p) was used to study the transfer of polarization to the recoil proton in quasielastic kinematics. The preliminary data are in good agreement with standard calculations which assume no modification of the nucleon form factors in the nuclear medium.
NTIS
Polarization (Charge Separation) ; Recoil Protons ; Electron Transfer

20020008888 Los Alamos National Lab. , NM USA

US/Russian Collaboration: Experiments with Explosive Pulsed Power

Goforth, J. ; Lindemuth, I. ; Apr. 01, 2001 ; 5p ; In English

Report No.(s): DE2001-777455 ; LA-UR-01-1917 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Through conferences and technical publications, personnel at Los Alamos National Laboratory (LANL) and the All-Russian Institute of Experimental Physics (VNIIEF) learned of each other's interests in both high explosive pulsed power (HEPP) systems and their applications to fusion and high magnetic field research. The principle forum for contact was the Megagauss (MG) Conference series, becoming visible in 1979 at the MG-II Conference in Washington DC and culminating in Novosibirsk at MG-V in 1989. Conversations at MG-V led to a proposal, advanced by VNIIEF in 1991, to form a collaborative research agreement. After further preliminary conversations, a contingent from VNIIEF arrived at the MG-VI conference in Albuquerque in 1992 with plans to visit Los Alamos after the conference and finalize an agreement. The two laboratories signed a Memorandum of Understanding (MOU) at this time, November of 1992, agreeing to conduct joint experiments using at least two HEPP systems developed by VNIIEF. Since that time, joint experiments have been conducted both at LANL and VNIIEF facilities using a variety of HEPP systems. On a few occasions, the effort has focused on the HEPP system itself, but more often it has focused on scientific applications of mutual interest.

NTIS

Research Management ; Explosives ; International Cooperation

20020009576 Brookhaven National Lab. , Upton, NY USA

Event data storage and management in star

Perevoztchikov, ; Feb. 07, 2000 ; 4p ; In English

Report No.(s): DE2001-780778 ; BNL-68201 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Solenoidal Tracker At RHIC (STAR) is a large acceptance collider detector, commissioned for operation at Brookhaven National Laboratory in 1999. STAR is designed to measure the momentum and identify several thousands of particles per event. About 300 Terabytes of data will be generated each year. To handle such a huge amount of data, sophisticated data structures and associated tools were developed. The main features of these data structures are: Data structure is a complicated but flexible set of C++ objects; All data objects are persistent, we do not maintain separate transient and persistent data structures; Persistence of data structure is based on ROOT I/O implementation; Part of ROOT I/O was modified to meet STAR requirements; and The modification of ROOT I/O allows to support automatic schema evolution of STAR data structures. Automatic tools allow reading of old data into new environments. In this paper we present our experience with maintenance of big and complicated OO data structures, especially concerning schema evolution.

NTIS

C++ (Programming Language) ; Data Storage ; Data Structures ; Star Trackers

20020009577 Brookhaven National Lab. , Upton, NY USA

OO model of star detector for simulation, visualization and reconstruction

Fine, ; Nevski, ; Feb. 07, 2000 ; 4p ; In English

Report No.(s): DE2001-780777 ; BNL-68202 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Solenoidal Tracker At RHIC (STAR) is a large acceptance collider detector, at Brookhaven National Laboratory. Most of the detailed knowledge on the STAR detector is implemented into a GEANT3 based simulation model. This knowledge certainly is valuable for the new STAR OO software. STAR ROOT-based framework was upgraded to provide tools to access this model via a set of TVolume classes. In this paper we present our experience with migration of the GEANT3 based detector simulation for STAR to an OO model.

NTIS

Stellar Models ; Migration

20020009579 Brookhaven National Lab. , Upton, NY USA

Star offline framework

Fine, ; Fisyak, ; Perevoztchikov, ; Wenaus, ; Feb. 07, 2000 ; 6p ; In English

Report No.(s): DE2001-780775 ; BNL-68207 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Solenoidal Tracker At RHIC (STAR) is a large acceptance collider detector, commissioned at Brookhaven National Laboratory in 1999. STAR has developed a software framework supporting simulation, reconstruction and analysis in offline production, interactive physics analysis and online monitoring environments that is well matched both to STAR's present status of transition between FORTRAN and C++ based software and to STAR's evolution to a fully OO software base. This paper

presents the results of two years effort developing a modular C++ framework based on the ROOT package that encompasses both wrapped FORTRAN components (legacy simulation and reconstruction code) served by IDL-defined data structures, and fully OO components (all physics analysis code) served by a recently developed object model for event data. The framework supports chained components, which can themselves be composite subchains, with components (”makers”) managing ”data sets” they have created and are responsible for. An St-DataSet class from which data sets and makers inherit allows the construction of hierarchical organizations of components and data, and centralizes almost all system tasks such as data set navigation, I/O, database access, and inter-component communication. This paper will present an overview of this system, now deployed and well exercised in production environments with real and simulated data, and in an active physics analysis development program.
NTIS
On-Line Systems ; Particle Collisions

20020009616 Oak Ridge National Lab. , TN USA
Quality Assurance Calculations to Support Use of HELIOS Version 1.6 for Plutonium Disposition Studies
Sanders, C. E. ; Apr. 09, 2001 ; 62p ; In English
Report No.(s): DE2001-779691 ; ORNL/TM-2001/50 ; No Copyright ; Avail: Department of Energy Information Bridge
In mid-2000, the Reactor Physics Group at Oak Ridge National Laboratory (ORNL) purchased a new version of the HELIOS, assembly-level reactor physics computer program (version 1.6). While the authors of the HELIOS program had performed validation and verification studies and compared results to versions 1.4 and 1.5, geometries and materials similar to those expected for mixed oxide fuel (MOX) in Russian water-water energetic reactors (VVER) had not been investigated. The studies reported in this document are a program-specific supplement to the work performed by the computer program authors and are performed to comply with quality assurance procedures of the Reactor Physics Group of ORNL. There were two goals for these studies. First, quantify the differences in nuclide inventories or other physics parameters, such as multiplication factors, due to the use of version 1.6 instead of 1.4. Second, determine if results from the version 1.6 design library (a 45 energy group library) differed significantly (meaning absolute value of the difference greater than or equal to 1%) from values obtained with the 190 group master library. Changes in nuclide inventories and multiplication factors are dependent on the system studied (whether U.S. or Russian reactors) and the type of fuel (whether low-enriched or mixed oxide). For selected actinides, the differences between the design library for version 1.4 and the master library for version 1.6 can be as high as 15%.
NTIS
Plutonium Recycle Test Reactor ; Quality Control ; Reactor Physics

20020009620 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Energy Recovery Electron Linac-on-Proton Ring Collider
Merminga, L. ; Krafft, G. ; Lebedev, V. ; Mar. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-779409 ; JLAB-ACP-01-01 ; DOE/ER/40150-1839 ; No Copyright ; Avail: Department of Energy Information Bridge
Electron-proton colliders with center of mass energies between 14 GeV and 30 GeV and luminosities at the 10(exp 33) level have been proposed recently as a means for studying hadronic structure. Electron beam polarization appears to be crucial for the majority of experiments. Two accelerator design scenarios have been examined in detail: colliding rings and recirculating linac-on-ring. Although the linac-on-ring scenario is not as well understood as the ring-ring scenario, comparable luminosities appear feasible, while the linac-on-ring option presents a significant advantage with spin manipulations. Rf power and beam dump requirements make the linac-on-ring option viable only if the electron linac recovers the beam energy, a technology demonstrated at Jefferson Lab’s IR FEL, with cw current up to 5 mA and beam energy up to 50 MeV. We begin with a brief overview of the Jefferson Lab energy recovery FEL and summarize the benefits of energy recovery. The feasibility of an energy recovery linac-ring collider is investigated and two conceptual point designs are shown. Luminosity projections for the linac-ring scenario based on fundamental limitations are presented. Accelerator physics issues are discussed and we conclude with a list of required R and D for the realization of such a design.
NTIS
Electron Beams ; Hadrons

20020009632 Oak Ridge National Lab. , TN USA
Isotopic Cross Sections for Production of Gamma Rays Created by Neutron Interactions with B-11 for En Between 2 and 22 MeV: Tabulated Data
Larson, D. C. ; Feb. 15, 2001 ; 13p ; In English
Report No.(s): DE2001-777775 ; ORNL/TM-13490 ; No Copyright ; Avail: Department of Energy Information Bridge

Inelastic and nonelastic neutron interactions with (sup 11)B have been studied for incident neutron energies between 2 and 22 MeV. Neutrons from the Oak Ridge Electron Linear Accelerator (ORELA) impinged a sample of natural boron. Gamma rays resulting from neutron interactions were detected using a well calibrated intrinsic Ge detection system. Data reduction included compensation for Doppler broadening of the observed peaks and corrections due to incident neutron attenuation, effects due to multiple scattering of neutrons, and sample attenuation of the outgoing gamma rays. Cross sections for gamma rays having energies (in keV) of 2124, 4445, 4741, 5020, 6434, 6743+6793 (combined), and 7286 following inelastic scattering, of 478 keV from the (sup 11)B(n,n(alpha)(gamma))(sup 7)Li reaction, and of 718 keV from the (sup 11)B(n,2n(gamma))(sup 10)B reaction as functions of incident neutron energy are presented in tabular form.
NTIS
Neutrons ; Scattering Cross Sections ; Linear Accelerators ; Gamma Rays

20020010129 Oak Ridge National Lab. , TN USA
Nuclear Collective Motion
Nazarewicz, W. , Oak Ridge National Lab. , USA ; Mar. 20, 2001 ; 40p ; In English ; VII Hispalensis International Summer School on Nuclear Physics 2000: Master's Lessons
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-777627 ; P01-110290 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Current developments in nuclear structure are discussed from a theoretical perspective. First, the progress in theoretical modeling of nuclei is reviewed. This is followed by the discussion of nuclear time scales, nuclear collective modes, and nuclear deformations. Some perspectives on nuclear structure research far from stability are given. Finally, interdisciplinary aspects of the nuclear many-body problem are outlined.
NTIS
Nuclear Models ; Nuclear Structure ; Mathematical Models ; Atomic Excitations

20020010183 Lawrence Livermore National Lab. , Livermore, CA USA
Preliminary Results from a Scaled Final Focus Experiment for Heavy Ion Inertial Fusion
MacLaren, S. ; Faltens, A. ; Henestroza, E. ; Ritchie, G. ; Seidl, P. ; Mar. 29, 1999 ; 3p ; In English
Report No.(s): DE2001-779710 ; LBNL-42460 ; No Copyright ; Avail: Department of Energy Information Bridge
Vacuum ballistic focusing may be a straightforward method to obtain the heavy ion beam spot size necessary to drive an inertial confinement fusion target. Proper scaling of particle energy, mass, beam current, beam emittance, and magnetic field replicates the dynamics of a full driver beam in a small laboratory experiment. by expanding the beam and then focusing to a very small spot, the effects of aberrations and space charge on this method of final focus can be studied. to date, 200 microAngstroms of 120keV K(sup +) has been focused to test the matching and focusing elements. A recently designed high brightness contact ionization source is being tested for upcoming focusing measurements with an 87 microAngstroms Cs beam that will duplicate the dynamics of a proposed driver design at one-tenth scale. Transverse phase space and beam current density at various stages of the focus will be presented. Follow-on measurements studying electron neutralization of space charge and its effect on the focus will be explored.
NTIS
Current Density ; Inertial Confinement Fusion ; Heavy Ions

20020010213 Fermi National Accelerator Lab. , Batavia, IL USA
Adjustable permanent quadrupoles for the next linear collider
Volk, J. T. ; Jun. 22, 2001 ; 3p ; In English
Report No.(s): DE2001-781956 ; FERMILAB-CONF-01-093 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The proposed Next Linear Collider (NLC) will require over 1400 adjustable quadrupoles between the main linacs' accelerator structures. These 12.7 mm bore quadrupoles will have a range of integrated strength from 0.6 to 138 Tesla, with a maximum gradient of 141 Tesla per meter, an adjustment range of +0 to -20% and effective lengths from 324 mm to 972 mm. The magnetic center must remain stable to within 1 micron during the 20% adjustment. In an effort to reduce costs and increase reliability, several designs using hybrid permanent magnets have been developed. Four different prototypes have been built. All magnets have iron poles and use Samarium Cobalt to provide the magnetic fields. Two use rotating permanent magnetic material to vary the gradient, one uses a sliding shunt to vary the gradient and the fourth uses counter rotating magnets. Preliminary data on gradient strength,

temperature stability, and magnetic center position stability are presented. These data are compared to an equivalent electromagnetic prototype.
NTIS
Linear Accelerators ; Particle Collisions ; Magnetic Materials

20020010216 Fermi National Accelerator Lab. , Batavia, IL USA
Beam-induced energy deposition issues in the Very Large Hadron Collider
Mokhov, N. V. ; Drozhdin, A. I. ; Foster, G. W. ; Jun. 26, 2001 ; 3p ; In English
Report No.(s): DE2001-782000 ; FERMILAB-CONF-01/135 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Energy deposition issues are extremely important in the Very Large Hadron Collider (VLHC) with huge energy stored in its 20 TeV (Stage-1) and 87.5 TeV (Stage-2) beams. The status of the VLHC design on these topics, and possible solutions of the problems are discussed. Protective measures are determined based on the operational and accidental beam loss limits for the prompt radiation dose at the surface, residual radiation dose, ground water activation, accelerator components radiation damage and quench stability. The beam abort and beam collimation systems are designed to protect accelerator from accidental and operational beam losses, IP region quadrupoles from irradiation by the products of beam-beam collisions, and to reduce the accelerator-induced backgrounds in the detectors.
NTIS
Hadrons ; Radiation Damage ; Collimation ; Energy Transfer

20020010217 Fermi National Accelerator Lab. , Batavia, IL USA
Degradation of multibunch luminosity in a linear collider due to cumulative beam breakup
Bohn, C. L. ; Syphers, M. J. ; Schulte, D. ; Jun. 26, 2001 ; 3p ; In English
Report No.(s): DE2001-782001 ; FERMILAB-CONF-01/138-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Beam-excited transverse wakes in accelerating radiofrequency structures will influence the transverse offsets of each bunch in a multibunch train, causing the projected emittance of the bunch train to grow. An analytic theory of this phenomenon that includes the mitigating influence of a correlated energy spread across the bunch train was recently devised and applied to electron-positron linear colliders. We use the results of this theory to estimate analytically the associated degradation of multibunch luminosity in terms of top-level parameters for the two beams, the two accelerators, and the final-focus system. Then we compare the estimates with results from GUINEA-PIG, a code that includes the detailed physics of beam-beam interactions.
NTIS
Beam Interactions ; Luminosity

20020010218 Fermi National Accelerator Lab. , Batavia, IL USA
Physics goals for the planned next linear collider engineering test facility
Bohn, C. L. ; Jun. 26, 2001 ; 3p ; In English
Report No.(s): DE2001-782006 ; FERMILAB-CONF-01/139-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Next Linear Collider (NLC) Collaboration is planning to construct an Engineering Test Facility (ETF) at Fermilab. As presently envisioned, the ETF would comprise a fundamental unit of the NLC main linac to include X-band klystrons and modulators, a delay-line power-distribution system (DLDS), and NLC accelerating structures that serve as loads. The principal purpose of the ETF is to validate stable operation of the power-distribution system, first without beam, then with a beam having the NLC pulse structure. This paper concerns the possibility of configuring and using the ETF to accelerate beam with an NLC pulse structure, as well as of doing experiments to measure beam-induced wakefields in the rf structures and their influence back on the beam.
NTIS
Test Facilities ; Superhigh Frequencies ; Modulators ; Collisions

20020010226 Lawrence Livermore National Lab. , Livermore, CA USA
FXR fast beam imaging diagnostics
Ferriera, T. ; Gilliam, R. ; Ong, M. ; Wargo, P. ; Zentler, J. ; Jun. 01, 1999 ; 7p ; In English
Report No.(s): DE2001-9371 ; UCRL-JC-134615 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Lawrence Livermore National Laboratory Flash X-ray (FXR) machine is being upgraded to produce two pulses. A very fast imaging system has been developed to characterize the electron beam diameter and shape. The system consists of a kapton target insertion mechanism and a framing camera. It has a fast gated imaging tube (500 ps) and CCD subsystem to capture and send the image to the control room. The beam diameter data provides insight on mechanisms that effect the x-ray spot size. These colorful beam measurements will be compared with our other diagnostics to form a more complete picture of beam behavior. A demonstration will be described where the image data was used to design a collimator to improve x-ray beam performance.
NTIS
Electron Beams ; Charge Coupled Devices ; Ground Based Control ; Imaging Techniques ; Integrated Mission Control Center

20020010370 Stanford Linear Accelerator Center , Menlo Park, CA USA
Switched Matrix Accelerator
Whittum, D. H. ; Oct. 04, 2000 ; 79p ; In English
Report No.(s): DE2001-784858 ; SLAC-PUB-7848 ; No Copyright ; Avail: Department of Energy Information Bridge
We describe a new concept for a microwave circuit functioning as a charged-particle accelerator at mm-wavelengths, permitting an accelerating gradient higher than conventional passive circuits can withstand consistent with cyclic fatigue. The device provides acceleration for multiple bunches in parallel channels, and permits a short exposure time for the conducting surface of the accelerating cavities. Our analysis includes scalings based on a smooth transmission line model and a complementary treatment with a coupled-cavity simulation. We provide also an electromagnetic design for the accelerating structure, arriving at rough dimensions for a seven-cell accelerator matched to standard waveguide and suitable for bench tests at low power in air at 91.392 GHz. A critical element in the concept is a fast mm-wave switch suitable for operation at high-power, and we present the considerations for implementation in an H-plane tee. We discuss the use of diamond as the photoconductor switch medium.
NTIS
Charged Particles ; Microwave Circuits ; Photoconductors ; Accelerators ; Switches ; Mathematical Models

20020010382 Stanford Linear Accelerator Center , Menlo Park, CA USA
Beam Instability and Microbunching Due to Coherent Synchrotron Radiation
Stupakov, G. ; Jan. 30, 2001 ; 10p ; In English
Report No.(s): DE2001-784869 ; SLAC-PUB-8761 ; No Copyright ; Avail: Department of Energy Information Bridge
A relativistic electron beam moving on a circular orbit in free space can radiate coherently if the wavelength of the synchrotron radiation exceeds the length of the bunch. In accelerators coherent synchrotron radiation (CSR) of the bunch is usually suppressed by the shielding effect of the conducting walls of the vacuum chamber. However an initial density fluctuation with a characteristic length much shorter than the bunch length can radiation coherently. If the radiation results in the growth of the initial fluctuation, one can expect an instability which leads to micro-bunching of the beam and increased coherent radiation at short wavelengths. Such an instability is studied theoretically in this paper. The effect of the beam energy spread and the shielding due to the conducting walls is included into consideration. The condition for the instability is evaluated for several existing accelerators.
NTIS
Coherent Radiation ; Relativistic Electron Beams ; Synchrotron Radiation ; Electron Bunching ; Beams (Radiation) ; Stability

20020010626 Lawrence Livermore National Lab. , Livermore, CA USA
Directions for advanced use of nuclear power in century XXI
Walter, C. E. ; May 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9355 ; UCRL-JC-132968-REV-1 ; DP0101018 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Nuclear power can provide a significant contribution to electricity generation and meet other needs of the world and the US during the next century provided that certain directions are taken to achieve its public acceptance. These directions include formulation of projections of population, energy consumption, and energy resources over a responsible period of time. These projections will allow assessment of cumulative effects on the environment and on fixed resources. Use of fossil energy resources in a century of growing demand for energy must be considered in the context of long-term environmental damage and resource depletion. Although some question the validity of these consequences, they can be mitigated by use of advanced fast reactor technology. It must be demonstrated that nuclear power technology is safe, resistant to material diversion for weapon use, and

economical. An unbiased examination of all the issues related to energy use, especially of electricity, is an essential direction to take.
NTIS
Fast Nuclear Reactors ; Reactor Technology ; Nuclear Electric Power Generation

20020010884 Stanford Linear Accelerator Center , Menlo Park, CA USA
Experimental Studies of W-Band Accelerator Structures at High Field
Hill, M. E. ; Feb. 09, 2001 ; 114p ; In English
Report No.(s): DE2001-784855 ; SLAC-R-560 ; No Copyright ; Avail: Department of Energy Information Bridge
A high-gradient electron accelerator is desired for high-energy physics research, where frequency scalings of breakdown and trapping of itinerant beamline particles dictates operation of the accelerator at short wavelengths. The first results of design and test of a high gradient mm-wave linac with an operating frequency at 91.392 GHz (W-band) are presented. A novel approach to particle acceleration is presented employing a planar, dielectric accelerator (PDA) are analyzed for an idealized structure, along with a circuit equivalent model used for understanding the structure as a microwave circuit. Along with the W-band accelerator structures, other components designed and tested are high power rf windows, high power attenuators, and a high power squeeze-type phase shifter.
NTIS
Electron Accelerators ; Millimeter Waves ; Linear Accelerators ; Attenuators

20020010885 Stanford Linear Accelerator Center , Menlo Park, CA USA
Observation of the Askaryan Effect: Coherent Microwave Cherenkov Emission From Charge Asymmetry in High-Energy Particle Cascades
Field, C. ; Jan. 24, 2001 ; 11p ; In English
Report No.(s): DE2001-784853 ; SLAC-PUB-8768 ; No Copyright ; Avail: Department of Energy Information Bridge
We present the first direct experimental evidence for the charge excess in high energy particle showers predicted nearly 40 years ago by Askaryan. We directed bremsstrahlung photons from picosecond pulses of 28.5 GeV electrons at the SLAC Final Focus Test Beam facility into a 3.5. ton silica sand target, producing electromagnetic showers several meters long. A series of antennas spanning 0.3. to 6 GHz were used to detect strong, sub-nanosecond radio frequency pulses produced whenever a shower was present. The measured electric field strengths are consistent with a completely coherent radiation process. The pulses show 100% linear polarization, consistent with the expectations of Cherenkov radiation. The field strength versus depth closely follows the expected particle number density profile of the cascade, consistent with emission from excess charge distributed along the shower. These measurements therefore provide strong support for experiments designed to detect high energy cosmic rays and neutrinos via coherent radio emission from their cascades.
NTIS
Asymmetry ; Cerenkov Radiation ; Coherent Radiation ; Cosmic Rays ; Microwave Emission ; Electromagnetic Pulses ; Photons

20020010941 Brookhaven National Lab. , Upton, NY USA
Carbon wire heating due to scattering in the SNS
Liaw, C. J. ; Cameron, P. R. ; Jun. 18, 2001 ; 3p ; In English
Report No.(s): DE2001-782065 ; BNL-67999 ; No Copyright ; Avail: Department of Energy Information Bridge
In the SNS, the 2.5 MeV H(sup (minus)) beam from the RFQ will be accelerated in the Linac to 1 GeV, and then injected into the High Energy Beam Transport (HEBT). After passing through HEBT, the electrons are stripped during injection into the Accumulator Ring. The proton beam will be accumulated in the Ring for around 1000 turns before ejecting to the Ring to Target Beam Transport (RTBT). The filling time of the Ring will be 1 ms and the extraction pulse length from the ring will be 695 ns, with a repetition rate of 60 Hz. The baseline power per pulse of the proton beam is 1 MW, with the possibility of a 2 MW upgrade. Carbon wires will be used to measure beam profiles throughout the facility. Wire heating due to beam scattering by the carbon wires has been analyzed from the RFQ through to the RTBT. We present results from this analysis.
NTIS
Carbon ; Electrons ; Linear Accelerators ; Scattering ; Wire ; Heating

20020010942 Brookhaven National Lab. , Upton, NY USA
Excitation of resonances due to the space charge and magnet errors in the SNS ring
Fedotov, A. V. ; Malitsky, N. ; Papaphilippou, Y. ; Wei, J. ; Jun. 18, 2001 ; 3p ; In English
Report No.(s): DE2001-782064 ; BNL-68044 ; No Copyright ; Avail: Department of Energy Information Bridge

The latest designs of high-intensity proton rings require minimal beam loss. The major cause of losses in a circular machine is the interplay of excited resonances, leading to particle diffusion. Such resonances could be driven by the space charge itself, magnet errors or a combined effect of the above. As a result, the goal of achieving low-level beam loss becomes especially challenging in the presence of both space charge and magnet imperfections. In this paper, we investigate the resonance excitation and their impact on the beam dynamics of the Spallation Neutron Source (SNS) ring, for various possible working points of the lattice.
NTIS
Excitation ; Neutron Sources ; Space Charge ; Spallation ; Storage Rings (Particle Accelerators) ; Magnets

20020010943 Brookhaven National Lab. , Upton, NY USA
Effect of space charge on stability of beam distribution in the SNS ring
Fedotov, A. V. ; Wei, J. ; Gluckstern, R. L. ; Jun. 18, 2001 ; 3p ; In English
Report No.(s): DE2001-782063 ; BNL-68045 ; No Copyright ; Avail: Department of Energy Information Bridge
In the Spallation Neutron Source (SNS) ring, multi-turn injection is employed to obtain a large transverse beam size which significantly reduces the space-charge tune shift of the accumulated beam. Careful choice of the painting scheme and bump function is required to obtain the desired beam profile together with low beam loss. In this paper we examine, both analytically and numerically, the effect of the space charge on the beam profile during multi-turn injection painting.
NTIS
Space Charge ; Spallation ; Stability ; Storage Rings (Particle Accelerators) ; Neutron Sources

20020010944 Brookhaven National Lab. , Upton, NY USA
Parallel extension of the UAL environment
Malitsky, N. ; Shishlo, A. ; Jun. 18, 2001 ; 3p ; In English
Report No.(s): DE2001-782061 ; BNL-68368 ; No Copyright ; Avail: Department of Energy Information Bridge
The deployment of the Unified Accelerator Library (UAL) environment on the parallel cluster is presented. The approach is based on the Message-Passing Interface (MPI) library and the Perl adapter that allows one to control and mix together the existing conventional UAL components with the new MPI-based parallel extensions. In the paper, we provide timing results and describe the application of the new environment to the SNS Ring complex beam dynamics studies, particularly, simulations of several physical effects, such as space charge, field errors, fringe fields, and others.
NTIS
Deployment ; Parallel Processing (Computers) ; Astrodynamics ; Computerized Simulation

20020010946 Fermi National Accelerator Lab. , Batavia, IL USA
Protecting LHC Components Against Radiation Resulting from an Unsynchronized Beam Abort
Mokhov, N. V. ; Jun. 26, 2001 ; 3p ; In English
Report No.(s): DE2001-781999 ; FERMILAB-CONF-01/133 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The effect of possible accidental beam loss in the LHC on the IP5 and IP6 insertion elements is studied via realistic Monte Carlo simulations. The scenario studied is beam loss due to unsynchronized abort at an accidental prefire of one of the abort kicker modules. Simulations show that this beam loss would result in severe heating of the IP5 and IP6 superconducting (SC) quadrupoles. Contrary to the previous considerations with a stationary set of collimators in IP5, collimators in IP6 close to the cause are proposed: a movable collimator upstream of the Q4 quadrupole and a stationary one upstream of the extraction septumMSD. The calculated temperature rise in the optimal set of collimators is quite acceptable. All SC magnets are protected by these collimators against damage.
NTIS
Collimators ; Losses ; Quadrupoles ; Computerized Simulation

20020010947 Fermi National Accelerator Lab. , Batavia, IL USA
Protecting LHC Components Against Radiation Resulting from Colliding Beam Interactions
Rakhno, I. L. ; Mokhov, N. V. ; Jun. 26, 2001 ; 3p ; In English
Report No.(s): DE2001-781996 ; FERMILAB-CONF-01/131 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Beam-induced energy deposition in the LHC high luminosity interaction region (IR) components due to both pp collisions and beam loss in the IR vicinity is a significant challenge for the design of the high luminosity insertions. It was shown in our

previous studies that a set of collimators in the machine and absorbers within the low-beta quadrupoles would reduce both the peak power density and total heat load to tolerable levels with a reasonable safety margin. In this paper the results of further optimization and comprehensive MARS calculations are briefly described for the updated IP1 and IP5 layouts and a baseline pp-collision source term. Power density, power dissipation, accumulated dose and residual dose rates are studied in the components of the inner triplets including their TAS absorbers, the TAN neutral beam absorbers, separation dipoles, and quadrupoles of the outer triplets and possible collimators there. It is shown that the optimized absorbers and collimators provide adequate protection of all the critical components.
NTIS
Beam Interactions ; Collimators ; Energy Transfer ; Particle Collisions

20020011132 Stanford Linear Accelerator Center , Menlo Park, CA USA
Photonic Band Gap Fiber Accelerator
Oct. 02, 2000 ; 6p ; In English
Report No.(s): DE2001-784860 ; SLAC-PUB-8633 ; No Copyright ; Avail: Department of Energy Information Bridge
We present and analyze a conceptually new kind of charged particle accelerator, making use of a photonic band gap lattice for field confinement near the beam axis, and employing a dielectric material to produce a synchronous longitudinal electric field. An example design is presented, and we also discuss the absence of higher order dipole modes and ease of fabrication.
NTIS
Fabrication ; Particle Accelerators ; Photonics ; Dielectrics ; Energy Gaps (Solid State)

20020011133 Stanford Linear Accelerator Center , Menlo Park, CA USA
Planar Accelerator Structures for Millimeter Wavelengths
Palmer, D. ; Oct. 18, 2000 ; 4p ; In English
Report No.(s): DE2001-784861 ; SLAC-PUB-8665 ; No Copyright ; Avail: Department of Energy Information Bridge
The fabrication of a muffin-tin planar accelerator structure for operation in the 90 GHz range is discussed in Reference. Fabrication problems subsequently encountered led us to consider an alternative structure, a structure which can be though of as a muffin-tin with the side removed and replaced by a pair of side chambers which act as side terminations. With the side chambers removed, the structure when viewed from the side presents two periodic arrays of vanes facing one another from above and below the beam plane and which extend towards the beam plane from upper and lower plane metallic surfaces. The vane pairs are the analogs of the beam iris in cylindrical structures, and the space between the irises and terminated by the upper and lower plane metallic surfaces correspond to the cavities. Because the general appearance of the view is zipper-like, we will refer to the structure as the 'zipper' structure. The side chambers are envisaged as extending with uniform cross section from the input to the output cavities.
NTIS
Fabrication ; Millimeter Waves ; Accelerators ; Planar Structures ; Metal Surfaces

20020011134 Stanford Linear Accelerator Center , Menlo Park, CA USA
Planar Dielectric Accelerator Structures at W-band
Hill, M. E. ; Oct. 16, 2000 ; 7p ; In English
Report No.(s): DE2001-784862 ; SLAC-PUB-8666 ; No Copyright ; Avail: Department of Energy Information Bridge
We describe the operating principles, design, fabrication, assembly, and bench-test of a miniature planar dielectric traveling-wave accelerator structure made from dielectric brazed to oxygen-free electronic grade (OFE) copper. This work focuses on alumina ceramic (AL995) and diamond as dielectrics. This two-port device is matched to WR10 at input and output, and designed for charged particle acceleration at 91.392 GHz (W-band).
NTIS
Dielectrics ; Fabrication ; Particle Acceleration ; Planar Structures ; Miniaturization ; Charged Particles

20020011135 Stanford Linear Accelerator Center , Menlo Park, CA USA
High-gradient Millimeter-wave Accelerator on a Planar Dielectric Substrate/011
Hill, M. E. ; Oct. 27, 2000 ; 6p ; In English
Report No.(s): DE2001-784863 ; SLAC-PUB-8680 ; No Copyright ; Avail: Department of Energy Information Bridge
We report the first high gradient studies of a millimeter-wave accelerator, employing for the first time a planar dielectric accelerator, powered by means of a 0.5-A, 300-MeV, 11.424-GHz drive electron beam, synchronous at the 8th harmonic, 91.392 GHz. Embedded in a ring-resonator circuit within the electron beamline vacuum, this structure was operated at 20 MeV/m, with

a circulating power of 200 kW, for 2 x 10(exp-5) pulses, with no sign of breakdown, dielectric charging or other deleterious high-gradient phenomena. We also present the first measurement of the quadrupolar content of an accelerating mode.
NTIS
Circuits ; Dielectrics ; Millimeter Waves ; Substrates ; Accelerators

20020011136 Stanford Linear Accelerator Center , Menlo Park, CA USA
Out-of-Plane Deflections as a Diagnostic Tool and Application to PEP-II
Venturini, M. ; Feb. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-784864 ; SLAC-PUB-8700 ; No Copyright ; Avail: Department of Energy Information Bridge
We derive simplified formulae that relate the 'out-of-phase' beam-beam deflections of colliding e+ and e- beams, to the off-diagonal entry of the sigma-matrix expressing the convoluted beam sizes. These formalae can be used to fit measured deflection curves and extract information about the relative tilt angle of two colliding bunches in the transverse plane.
NTIS
Electron Beams ; Deflection ; Electron Scattering ; Particle Theory

20020011137 Stanford Linear Accelerator Center , Menlo Park, CA USA
Development of High Power X-Band Semiconductor RF Switch for Pulse Compression Systems of Future Linear Colliders
Tantawi, S. ; Nov. 06, 2000 ; 4p ; In English
Report No.(s): DE2001-784865 ; SLAC-PUB-8702 ; No Copyright ; Avail: Department of Energy Information Bridge
We describe development of semiconductor X-band high-power RF switches. The target applications are high-power RF pulse compression systems for future linear colliders. We describe the design methodology of the architecture of the whole switch systems. We designed and built several active waveguide windows for the active element. The waveguide window is a silicon wafer with an array of four hundred PIN/NIP diodes covering the surface of the window. This waveguide window is located in an over-moded TE01 circular waveguide. The results of high power RF measurements of the active waveguide window are presented. The experiment is performed at power levels of a few megawatts at X-band.
NTIS
Radio Frequencies ; Semiconductors (Materials) ; Waveguide Windows ; Linearity ; Pulse Compression ; Superhigh Frequencies ; Collisions

20020011140 Stanford Linear Accelerator Center , Menlo Park, CA USA
Quantum Ground State and Minimum Emittance of a Fermionic Particle Beam in a Circular Accelerator
Kabel, A. C. ; Feb. 05, 2001 ; 9p ; In English
Report No.(s): DE2001-784868 ; SLAC-PUB-8759 ; No Copyright ; Avail: Department of Energy Information Bridge
In the usual parameter regime of accelerator physics, particle ensembles can be treated as classical. In particular, we have to consider the Pauli exclusion principle, which will limit the minimum achievable emittance for a beam of fermions. We calculate these lowest emittances for the cases of bunched and coasting beams at zero temperature and their first-order change rate at finite temperature.
NTIS
Fermions ; Ground State ; Particle Beams ; Quantum Mechanics ; Emittance

20020011211 Lawrence Livermore National Lab. , Livermore, CA USA
Acceleration Schedules for a Recirculating Heavy-Ion Accelerator
Grote, D. P. ; Sharp, W. ; Jun. 01, 1999 ; 5p ; In English
Report No.(s): DE2001-9651 ; UCRL-JC-134013 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The recent development of miniature inductive adders has made it feasible to design programmable, high-repetition-rate pulsers with a substantially higher voltage than is possible using a conventional field-effect transistor architecture. Prototype pulsers using the new technology are being developed as part of a series of experiments at Lawrence Livermore National Laboratory (LLNL) to test the concept of a recirculating induction accelerator. Preliminary numerical work is reported here to determine what effects the higher-voltage pulsers would have on the beam quality of the LLNL small recirculator.
NTIS
Mathematical Models ; Pulse Generators

20020011220 Sandia National Labs. , Albuquerque, NM USA

Quantitative Analysis with Heavy Ion E-TOF ERD

Banks, J. C. ; Doyle, B. L. ; Font, A. C. ; Jul. 23, 1999 ; 9p ; In English

Report No.(s): DE2001-9667 ; SAND99-1909C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Heavy ion TOF ERD combined with energy detection (E-TOF-ERD) is a powerful analytical technique taking advantage of the following facts: the scattering cross section is usually very high (approximately 10(exp -21) square cm/sr) compared to regular He RBS (approximately 10(exp -25) square cm/sr), contrary to what happens with the energy resolution in ordinary surface solid barrier detectors, time resolution is almost independent of the atomic mass of the detected element, and the detection in coincidence of time and energy signals allows for the mass separation of overlapping signals with the same energy (or time of flight). Measurements on several oxides have been performed with the E-TOF-ERD set up at Sandia National Laboratories using an incident beam of 10-15 MeV Au. The information on the composition of the sample is obtained from the time domain spectrum, which is converted to energy domain, and then, using existing software codes, the analysis is performed. During the quantification of the results, they have found problems related to the interaction of the beam with the sample and to the tabulated values of the stopping powers for heavy ions.

NTIS

Heavy Ions ; Ion Beams ; Oxides

20020011222 Sandia National Labs. , Albuquerque, NM USA

Thin Foil Acceleration Method for Measuring the Unloading Isentropes of Shock-Compressed Matter

Asay, J. R. ; Chhabildas, L. C. ; Fortov, V. E. ; Kanel, G. I. ; Khishchenko, K. V. ; Jul. 21, 1999 ; 6p ; In English

Report No.(s): DE2001-9670 ; SAND99-1943C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This work has been performed as part of the search for possible ways to utilize the capabilities of laser and particle beams techniques in shock wave and equation of state physics. The peculiarity of these techniques is that we have to deal with micron-thick targets and not well reproducible incident shock wave parameters, so all measurements should be of a high resolution and be done in one shot. Besides the Hugoniots, the experimental basis for creating the equations of state includes isentropes corresponding to unloading of shock-compressed matter. Experimental isentrope data are most important in the region of vaporization. With guns or explosive facilities, the unloading isentrope is recovered from a series of experiments where the shock wave parameters in plates of standard low-impedance materials placed behind the sample are measured. The specific internal energy and specific volume are calculated from the measured p(u) release curve which corresponds to the Riemann integral. This way is not quite suitable for experiments with beam techniques where the incident shock waves are not well reproducible. The thick foil method provides a few experimental points on the isentrope in one shot. When a higher shock impedance foil is placed on the surface of the material studied, the release phase occurs by steps, whose durations correspond to that for the shock wave to go back and forth in the foil. The velocity during the different steps, connected with the knowledge of the Hugoniot of the foil, allows us to determine a few points on the isentropic unloading curve. However, the method becomes insensitive when the low pressure range of vaporization is reached in the course of the unloading. The isentrope in this region can be measured by recording the smooth acceleration of a thin witness plate foil. With the mass of the foil known, measurements of the foil acceleration will give us the vapor pressure.

NTIS

Foils (Materials) ; Isentropic Processes ; Isentrope

20020011227 Lawrence Livermore National Lab. , Livermore, CA USA

Beam coupling impedance of fast stripline beam kickers

Caporaso, G. ; Chen, Y. J. ; Nelson, A. D. ; Poole, B. R. ; Mar. 01, 1999 ; 5p ; In English

Report No.(s): DE2001-9761 ; UCRL-JC-131947 ; REPT-39DP01000 ; No Copyright ; Avail: Department of Energy Information Bridge

A fast stripline beam kicker is used to dynamically switch a high current electron beam between two beamlines. The transverse dipole impedance of a stripline beam kicker has been previously determined from a simple transmission line model of the structure. This model did not include effects due to the long axial slots along the structure as well as the cavities and coaxial feed transition sections at the ends of the structure. 3-D (three-dimensional) time domain simulations show that the simple transmission line model underestimates the low frequency dipole beam coupling impedance by about 20% for our structure. In addition, the end cavities and transition sections can exhibit dipole impedances not included in the transmission line model. For

high current beams, these additional dipole coupling terms can provide additional beam-induced steering effects not included in the transmission line model of the structure.
NTIS
Electron Beams ; Beam Switching

20020011367 Stanford Linear Accelerator Center , Menlo Park, CA USA
Effect of Numerical Noise on Beam Emittance Growth in PIC Code
Batygin, Y. K. ; Jun. 26, 2001 ; 4p ; In English
Report No.(s): DE2001-784946 ; SLAC-PUB-8881 ; No Copyright ; Avail: Department of Energy Information Bridge
In particle-in-cell (PIC) simulation, errors in space charge forces are of random character. It results in an unphysical increase of effective beam emittance, even while symplectic integrator is used. to establish quantitative measure of this effect on beam dynamics, an analytical model of equilibrium beam affected by random errors in space charge field calculations is considered. An explicit expression connecting beam emittance growth with beam brightness, integration step and the value of random error in space charge field is discussed.
NTIS
Linear Accelerators ; Emittance ; Simulation ; Space Charge ; Beam Injection

20020011707 Research Inst. of National Defence , Div. of Systems and Underwater Technology , Stockholm, Sweden
Least Mean Square Method for PDEs Applied to the Neutron Diffusion Approximation
Widlund, L. , Research Inst. of National Defence , Sweden ; Dec. 2000 ; 16p ; In English
Report No.(s): PB2001-108434 ; FOA-R-00-01724-861-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The method of variable separation is often a powerful tool to solve PDEs. However, it is not always possible. Studying the neutron diffusion equation as an example, there are solutions separated in the time variable and the space co-ordinates if the parameters are independent of time. A method is suggested how this type of solution could best be fit to the case where variable separation is not possible.
NTIS
Least Squares Method ; Partial Differential Equations ; Method of Characteristics

20020011724 Stanford Linear Accelerator Center , Menlo Park, CA USA
Impedance of Small-Angle Collimators in High-Frequency Limit
Stupakov, G. ; Jun. 07, 2001 ; 22p ; In English
Report No.(s): DE2001-784937 ; SLAC-PUB-8857 ; No Copyright ; Avail: Department of Energy Information Bridge
We consider round a rectangular-aperture tapered collimators with a small taper angle a. Depending on the angle, aperture, and the frequency different parameter regimes are found with specific scalings of the impedance. The physical mechanism involved in formation of the beam wake field is discussed. Analytical formulas are derived for the limiting case of the diffraction regime for round collimators. For rectangular geometry with a large width to height ratio, two new regimes-diffraction and intermediate-are found and the impedance is calculated for each regime. In addition to consideration based on solution of Maxwell's equations, a simple recipe is given for calculation of the impedance in the diffraction regime for both round and rectangular geometries.
NTIS
Impedance Measurement ; Collimators ; Maxwell Equation

20020011725 Stanford Linear Accelerator Center , Menlo Park, CA USA
Transverse RF Deflecting Structure for Bunch Length and Phase Space Diagnostics
Emma, P. J. ; Jun. 25, 2001 ; 4p ; In English
Report No.(s): DE2001-784939 ; SLAC-PUB-8864 ; No Copyright ; Avail: Department of Energy Information Bridge
A traveling wave transverse rf deflecting structure is discussed as a tool for bunch length measurement and as an aid to detailed phase space diagnostics in future FEL projects. The high frequency time variation of the deflecting fields is used to 'pitch' or 'yaw' the electron bunch where the resulting transverse beam width measured on a simple profile monitor represents a reliable, single-shot measure of the absolute bunch length.
NTIS
Diagnosis ; Electron Bunching ; Free Electron Lasers ; Radio Frequencies

20020011728 Stanford Linear Accelerator Center , Menlo Park, CA USA
Study of Beam Energy Spectrum Measurement in the NLC Extraction Line
Nosochkov, Y. ; Jun. 19, 2001 ; 4p ; In English
Report No.(s): DE2001-784942 ; SLAC-PUB-8871 ; No Copyright ; Avail: Department of Energy Information Bridge
The NLC extraction line provides a secondary focal point with a low B function and 2 cm dispersion which can be used for measurement of the beam energy spectrum. In this study, tracking simulations were performed to transport the 0.5 TeV electron beam from the Interaction Point (IP) to the secondary focus (SF), measure the resultant transverse beam profile and reconstruct the disrupted IP energy spread. In the simulation, the obtained energy spectrum reproduced the initial IP spread reasonably well, especially with the vertical dispersion at SF which provides larger ration of dispersion to the betatron beam size.
NTIS
Beam Interactions ; Betatrons ; Electron Beams ; Energy Spectra

20020011729 Stanford Linear Accelerator Center , Menlo Park, CA USA
NLC Beam Properties and Extraction Line Performance with Beam Offset at IP
Nosochkov, Y. ; Jun. 19, 2001 ; 4p ; In English
Report No.(s): DE2001-784943 ; SLAC-PUB-8872 ; No Copyright ; Avail: Department of Energy Information Bridge
Properties of the disrupted NLC beam at the Interaction Point (IP) and particle loss in the extraction line are analyzed as a function of beam-to-beam position and angular offset at IP. The simulations show that disruption and beam loss maximize when the vertical beam separation at IP is about 20 times the rms vertical beam size. The horizontal offset does not increase the disruption and the beam loss. The angular offsets cause particle loss in the extraction line mainly because of the beam orbit oscillations.
NTIS
Beam Interactions ; Beams (Radiation) ; Simulation ; Linear Accelerators

20020011730 Stanford Linear Accelerator Center , Menlo Park, CA USA
Stationary Relativistic Bunch in Space-Charge-Dominated Regime
Batygin, Y. K. ; Jun. 26, 2001 ; 4p ; In English
Report No.(s): DE2001-784944 ; SLAC-PUB-8879 ; No Copyright ; Avail: Department of Energy Information Bridge
Self-consistent treatment of a space-charge-dominated beam is generalized for the case of relativistic bunch. Analytical derivations are performed in the limit of a high brightness beam. Shape of the stationary bunch profile as well as expression for space charge limited beam current are derived. Applicability of well-known ellipsoidal model to bunched beam in RF field is discussed.
NTIS
Space Charge ; Electron Bunching ; Relativistic Particles

20020011732 Stanford Linear Accelerator Center , Menlo Park, CA USA
Design Studies of Positron Collection for the NLC
Batygin, Y. K. ; Jun. 26, 2001 ; 4p ; In English
Report No.(s): DE2001-784947 ; SLAC-PUB-8882 ; No Copyright ; Avail: Department of Energy Information Bridge
The positron source for the NLC project utilizes a 6.2 GeV electron beam interacting in a high-Z positron production target. The electromagnetic shower in the target results in large energy deposition which can cause damage to the target. Optimization of the collection system is required to insure long-term operation of the target with needed high positron yield into the 6-dimensional acceptance of the subsequent predamping ring. Positron tracking through the accelerating system indicates a dilution of the initial positron phase space density. Results of the studies on the development of the collector systems design are presented.
NTIS
Linear Accelerators ; Electron Beams ; Systems Engineering ; Positrons

20020011734 Stanford Linear Accelerator Center , Menlo Park, CA USA
Frequency Resolved Measurement of Longitudinal Impedances Using Transient Beam Diagnostics
Teytelman, D. ; Jun. 26, 2001 ; 4p ; In English
Report No.(s): DE2001-784949 ; SLAC-PUB-8884 ; No Copyright ; Avail: Department of Energy Information Bridge
In this paper we present several techniques for characterizing longitudinal impedances based on transient measurements of the growth rates and tune shifts of unstable coupled-bunch modes. These techniques are applicable to measurement of both fundamental and higher-order mode impedances and allow characterization of shunt impedances and quality factors of the HOMs.

Methods presented here are complementary to lab bench measurements of RF cavities, in that the beam based measurements directly sense the physical impedance in the installed configuration. In contrast to a single-bunch integrated impedance measurement these techniques resolve the impedances in the frequency domain. These methods allow determination of the impedance's unaliased frequency by analyzing synchronous phase transients. Experimental results from ALS and BESSY-II are presented showing the use of these techniques to measure complex impedances.
NTIS
Impedance Measurement ; Linear Accelerators ; Coupled Modes ; Diagnosis

20020011880 Stanford Linear Accelerator Center , Menlo Park, CA USA
Femtosecond Electron Bunch Lengths in the SLAC FFTB Beamline
Emma, P. J. ; Jun. 25, 2001 ; 4p ; In English
Report No.(s): DE2001-784932 ; SLAC-PUB-8850 ; No Copyright ; Avail: Department of Energy Information Bridge
We describe a new proposal to generate bunches as short as 35 fsec rms with the existing SLAC linac and damping ring. The bunch is compressed in three stages, starting with the existing ring-to-linac compressor. A second stage of compression is added in the form of a simple magnetic chicane installed at the 9-GeV location in the linac. The short bunch after the chicane generates a strong wakefield in the linac which provides a large correlated energy spread allowing a third compression stage in the existing Final Focus Test Beam (FFTB) beamline. Peak currents as high as 30 kA are possible and when passed through a new undulator in the FFTB, can generate hard x-rays of very high peak brightness and pulse duration of 80 fsec FWHM. The short bunch is ideal for plasma and wakefield studies as well as providing abundant R&D for verifying micro-bunch behavior in the future Linac Coherent Light Source (LCLS).
NTIS
Linear Accelerators ; Plasmas (Physics) ; Pulse Duration ; Coherent Light ; Electron Bunching ; Light Sources

20020012290 Stanford Linear Accelerator Center , Menlo Park, CA USA
Cryogenic System for the SLAC E158 Experiment
Weisend, J. G. ; Jul. 12, 2001 ; 9p ; In English
Report No.(s): DE2001-784992 ; SLAC-PUB-8917 ; No Copyright ; Avail: Department of Energy Information Bridge
E158 is a fixed target experiment at SLAC in which high energy (up to 48 GeV) polarized electrons are scattered off the unpolarized electrons in a 1.5.m long liquid hydrogen target. The total volume of liquid hydrogen in the system is 55 1. The beam can deposit as much as 700 W into the liquid hydrogen. Among the requirements for the system are: that density fluctuations in the liquid hydrogen be kept to a minimum, that the target can be moved out of the beam line while cold and replaced to within 2 mm and that the target survive lifetime radiation doses of up to 1 x 10(exp 6) GY. The cryogenic system for the experiment consists of the target itself, the cryostat containing the target, a refurbished CTI 4000 refrigerator providing more than 1 kW of cooling at 20 K and associated transfer lines and valve boxes. This paper discusses the requirements, design, construction, testing and operation of the cryogenic system. The unique features of the design associated with hydrogen safety and the high radiation field in which the target resides are also covered.
NTIS
Cryogenics ; Linear Accelerators ; Liquid Hydrogen ; Polarized Radiation

20020012291 Stanford Linear Accelerator Center , Menlo Park, CA USA
Interactive Orbit Control in MATLAB
Corbett, W. ; Jul. 06, 2001 ; 3p ; In English
Report No.(s): DE2001-784990 ; SLAC-PUB-8906 ; No Copyright ; Avail: Department of Energy Information Bridge
Recent advances in steering algorithms have made it possible to accurately control electron beam position in storage rings, implement fast and slow feedback systems, and in some cases detect hardware errors. In practice, however, the program operator would like to reduce the overhead of selecting variables and constraints and to easily view the data. to simplify the process, we constructed an interactive orbit control program in MATLAB. The program modules are easily adapted to new algorithms or beam lines. This paper describes the program functionality and architecture.
NTIS
Algorithms ; Electron Beams ; Storage Rings (Particle Accelerators) ; Interactive Control

20020012292 Stanford Linear Accelerator Center , Menlo Park, CA USA

Tunability of the NLC Final Focus System

Seryi, A. ; Jul. 23, 2001 ; 4p ; In English

Report No.(s): DE2001-784986 ; SLAC-PUB-8895 ; No Copyright ; Avail: Department of Energy Information Bridge

The performance of the new NLC Final Focus system has been investigated as a function of the incoming beam characteristics, such as energy, emittances, and energy spread. A preliminary study of the tolerances and the tunability of the system is presented in this paper.

NTIS

Tuning ; Linear Accelerators ; Emittance

20020012293 Stanford Linear Accelerator Center , Menlo Park, CA USA

Dipole Wakefield Suppression In High Phase Advance Detuned Linear Accelerators for the JLC/NLC Designed to Minimise Electrical Breakdown and Cumulative BBU

Jones, R. M. ; Jul. 02, 2001 ; 4p ; In English

Report No.(s): DE2001-784983 ; SLAC-PUB-8887 ; No Copyright ; Avail: Department of Energy Information Bridge

Recent experiments at SLAC and CERN have revealed evidence of significant deformation in the form of 'pitting' of the cells of the 1.8m series of structures DDS/RDDS (Damped Detuned Structure/Rounded Damped Detuned Structure). This pitting occurs in the high group velocity (vg/c=0.012) end of the accelerating structure and little evidence of breakdown has been found in the lower group velocity end of the structure. Additional albeit preliminary experimental evidence, suggests that shorter and lower group velocity structures have reduced breakdown events with increasing accelerating field strengths.

NTIS

Linear Accelerators ; Electrical Faults

20020012294 Stanford Linear Accelerator Center , Menlo Park, CA USA

Manifold Damping of Transverse Wakefields In High Phase Advance Traveling Wave Structures and Local Damping of Dipole Wakefields In Standing Wave Accelerators

Jones, R. M. ; Jul. 02, 2001 ; 4p ; In English

Report No.(s): DE2001-784982 ; SLAC-PUB-8886 ; No Copyright ; Avail: Department of Energy Information Bridge

Operating the SLAC/KEK DDS (Damped Detuned Structure) X-band linacs at high gradients (in excess of 70MV/m) has recently been found to be limited by the accelerator structures breaking down and as a consequence severe damage occurs to the cells which makes the structures inoperable. A series of recent experiments at SLAC indicates that arcing in the structures is significantly reduced if the group velocity of the accelerating model is reduced and additionally it has been discovered that reducing the length of the accelerating structure also limits the number and intensity of breakdown events. However, in designing new accelerating structures care must be taken to ensure that the beam-induced transverse wakefields do not cause the beam to become unstable. Here, we report on damping transverse wakefields in two different short structures: a 90cm traveling wave structure in which the wakefield is coupled out to four attached manifolds and secondly, in a standing wave structure in which a limited number of cells heavily damp down the wakefield.

NTIS

Standing Waves ; Accelerators ; Traveling Waves ; Damping

20020012296 Stanford Linear Accelerator Center , Menlo Park, CA USA

Probes of Universal Extra Dimensions at Colliders

Rizzo, T. G. ; Jun. 28, 2001 ; 27p ; In English

Report No.(s): DE2001-784980 ; SLAC-PUB-8863 ; No Copyright ; Avail: Department of Energy Information Bridge

In the Universal Extra Dimensions model of Appelquist, Cheng and Dobrescu, all of the Standard Model fields are placed in the bulk and thus have Kaluza-Klein (KK) excitations. These KK states can only be pair produced at colliders due to the tree-level conservation of KK number, with the lightest of them being stable and possibly having a mass as low as i9s almost equal to 350-400 GeV. After calculating the contribution to g-2 in this model we investigate the production cross sections and signatures for these particles at both hadron and lepton colliders. We demonstrate that these signatures critically depend upon whether the lightest KK states remain stable or are allowed to decay by any of a number of new physics mechanisms. These mechanisms which induce KK decays are studied in detail.

NTIS

Linear Accelerators ; Standard Model (Particle Physics) ; Particle Decay ; Hadrons ; Leptons

20020012297 Stanford Linear Accelerator Center , Menlo Park, CA USA

Impedance Analysis of Bunch Length Measurements at the ATF Damping Ring

Bane, K. L. ; Jul. 25, 2001 ; 9p ; In English

Report No.(s): DE2001-784979 ; SLAC-PUB-8846 ; No Copyright ; Avail: Department of Energy Information Bridge

We present energy spread and bunch length measurements at the Accelerator Test Facility (ATF) at KEK, as functions of current, for different ring rf voltages, and with the beam both on and off the coupling resonance. We fit the on-coupling bunch shapes to those of an impedance model consisting of a resistor and an inductor connected in series. We find that the fits are reasonably good, but that the resulting impedance is unexpectedly large.

NTIS

Impedance ; Electron Bunching

20020012318 Stanford Linear Accelerator Center , Menlo Park, CA USA

Low-Scale and Gauge-Mediated Supersymmetry Breaking at the FermilabTevatron Run II

Peskin, M. E. ; Jul. 25, 2001 ; 98p ; In English

Report No.(s): DE2001-784956 ; SLAC-PUB-8643 ; No Copyright ; Avail: Department of Energy Information Bridge

The prospects for discovering and studying signals of low-scale supersymmetry breaking models at the Tevatron Run II and beyond are explored. These model include gauge-mediated supersymmetry breaking as the most compelling and concrete realization, but more generally are distinguished by the presence of a nearly massless Goldstino as the lightest supersymmetric particle. The next-lightest supersymmetric particle(s) (NLSP) decays to its partner and the Goldstino. Depending on the supersymmetry breaking scale, these decays can occur promptly or on a scale comparable to or larger than the size of a detector. A systematic analysis based on a classification in terms of the identity of the NLSP and its decay length is presented.

NTIS

Design Analysis ; Particle Accelerators ; Supersymmetry

20020012319 Stanford Linear Accelerator Center , Menlo Park, CA USA

Signals for Non-Cummutative Interactions at Linear Colliders

Rizzo, T. G. ; Jul. 23, 2001 ; 52p ; In English

Report No.(s): DE2001-784955 ; SLAC-PUB-8635 ; No Copyright ; Avail: Department of Energy Information Bridge

Recent theoretical results have demonstrated that non-commutative geometries naturally appear within the context of string/M-theory. One consequence of this possibility is that QED takes on a non-abelian nature due to the introduction of 3- and 4-point functions.

NTIS

Quantum Electrodynamics ; String Theory ; Linear Accelerators ; High Energy Interactions

20020012323 Stanford Linear Accelerator Center , Menlo Park, CA USA

Simulation of Beam-Beam Effects in e(sup +)e(sub -) Storage Rings

Cai, Y. ; Apr. 05, 2001 ; 6p ; In English

Report No.(s): DE2001-784905 ; SLAC-PUB-8811 ; No Copyright ; Avail: Department of Energy Information Bridge

The beam-beam effects of the PEP-II as an asymmetric collider are studied with strong-strong simulations using a newly develop particle-in-cell (PIC) code. The simulated luminosity agrees with the measured one within 10% in a large range of the beam currents. The spectra of coherent dipole oscillation are simulated with and without the transparency symmetry. The simulated tune shift of the coherent mode agrees with the linearized Vlasov theory even at large beam-beam parameters. The Poicare map pf coherent dipole is used to identify the beam-beam resonances.

NTIS

Simulation ; Beam Interactions ; Oscillations

20020012325 Stanford Linear Accelerator Center , Menlo Park, CA USA

Parameters for a 30 GeV Undulator Test Facility in the FFTB/LCLS

Krejcik, P. ; Apr. 12, 2001 ; 18p ; In English

Report No.(s): DE2001-784902 ; SLAC-PUB-8806 ; No Copyright ; Avail: Department of Energy Information Bridge

The parameters for a 30 GeV test beam are outlined for use with an undulator in the FFTB tunnel where the LCLS will eventually be housed. It is proposed to use the SLAC linac and damping rings in their present mode of operation for PEP II injection, where 30 GeV beams are also delivered at 10 Hz to the FFTB. High peak currents are obtained within the addition of a second bunch compressor in the linac. In order to minimize the synchrotron radiation induced emittance growth in the bunch

compressor it is necessary to locate the new bunch compressor at the low-energy end of the linac, just after the damping rings. The bunch compressor is a duplicate of the LCLS chicane-style bunch compressor. This test beam would provide an exciting possibility to test LCLS undulator sections and provided a unique high-brightness source of incoherent X-rays and begin developing the LCLS experimental station. The facility will also as a much needed accelerator test bed for the production, diagnostics and tuning of very short bunches in preparation for the LCLS after the photo injector commissioned.
NTIS
Linear Accelerators ; Polarization (Charge Separation) ; Beams (Radiation)

20020012326 Stanford Linear Accelerator Center , Menlo Park, CA USA
Derivation of Microwave Instability Dispersion Relation with Account of Synchrotron Damping and Quantum Fluctuations
Stupakov, G. ; Apr. 02, 2001 ; 8p ; In English
Report No.(s): DE2001-784901 ; SLAC-PUB-8803 ; No Copyright ; Avail: Department of Energy Information Bridge
A dispersion relation for a microwave instability of a coasting beam is derived from the Vlasov-Fokker-Plank equation which takes into account the effects of synchrotron damping and quantum fluctuations. This derivation generalizes the standard analysis of the beam stability in which the diffusion and damping are usually neglected. Our results are also applicable for a bunched beam when the wavelength of the instability is much smaller than the bunch length.
NTIS
Microwaves ; Synchrotron Radiation ; Beam Steering ; Vlasov Equations

20020012328 Stanford Linear Accelerator Center , Menlo Park, CA USA
Very Large Hadron Collider Instability Workshop Summary Report
Chao, A. ; Apr. 18, 2001 ; 24p ; In English
Report No.(s): DE2001-784899 ; SLAC-PUB-8800 ; No Copyright ; Avail: Department of Energy Information Bridge
The VLHC Instability Workshop was held at SLAC, March 21-23, 2001. The purpose is to review the instability issues facing VLHC, both for the high-field and the low-field stages. The review is considered a snapshot survey of these issues as presently conceived, and serves as input to its current Feasibility Study.
NTIS
Hadrons ; Linear Accelerators

20020012340 Stanford Linear Accelerator Center , Menlo Park, CA USA
Recent Results from SLD
Convery, M. R. ; Feb. 27, 2001 ; 33p ; In English
Report No.(s): DE2001-784880 ; SLAC-PUB-8781 ; No Copyright ; Avail: Department of Energy Information Bridge
The SLD experiment, located at the interaction point of the Stanford Linear Collider (SLC), finished taking data at the Z0 resonance in June of 1998. The total data sample taken in the years 1993 to 1998 consists of 550,000 Z decays. In this paper I will describe a number of analyses that have been performed using the SLD data. These analyses cover topics in the fields of Electroweak, QCD and Heavy Flavor physics. Many of them benefit from the unique beam conditions available at the SLC.
NTIS
Quantum Chromodynamics ; Electroweak Interactions (Field Theory) ; Analyzers

20020012341 Stanford Linear Accelerator Center , Menlo Park, CA USA
Existence and Properties of an Collisions
Warnock, R. L. ; Feb. 15, 2001 ; 12p ; In English
Report No.(s): DE2001-784879 ; SLAC-PUB-8778 ; No Copyright ; Avail: Department of Energy Information Bridge
The equilibrium phase distribution of stored colliding electron beams is studied from the viewpoint of Vlasov-Fokker-Planck (VFP) theory. Numerical integration of the VFP system in one degree of freedom revealed a nearly Gaussian equilibrium with non-diagonal covariance matrix. This result is reproduced approximately in an analytic theory based on linearization of the beam-beam force. Analysis of an integral equation for the equilibrium distribution, without linearization, establishes the existence of a unique equilibrium at sufficiently small current. The role of damping and quantum noise is clarified through a new representation of the propagator of the linear Fokker-Plank equation with harmonic force.
NTIS
Electron Beams ; Collisions ; Beam Interactions ; Phase Diagrams

20020012550 Stanford Linear Accelerator Center , Menlo Park, CA USA
Halo Reduction by Means of Non Linear Optical Elements in the NLC Final Focus System
Seryi, A. ; Jul. 23, 2001 ; 4p ; In English
Report No.(s): DE2001-784987 ; SLAC-PUB-8896 ; No Copyright ; Avail: Department of Energy Information Bridge

In the Beam Delivery Systems (BDS) for linear colliders that have been designed or built, collimators (or scrapers) are used to suppress backgrounds due to the beam halo. Off-energy and off-axis particles are stopped on the collimator jaws, physically limiting the acceptance of the system. This concept does not scale well to higher beam energy, higher intensity or lower emittance. The increased beam density requires longer and more demanding collimator regions. In contrast, this paper studies the possibility of inserting non-linear optical elements into the Final Focus in order to effectively increase the acceptance of the system. This technique could make the traditional collimation scheme obsolete so that only protection collimators would be needed.
NTIS
Halos ; Linear Accelerators ; Optical Equipment ; Collimators

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20020006043 Johns Hopkins Univ. , Applied Physics Lab. , Laurel, MD USA
Optical Approach to Quantum Computing ***Final Report , 1 Jun. 1998-31 May 2001***
Franson, James D. ; Aug. 29, 2001 ; 19p ; In English
Contract(s)/Grant(s): DAAG55-98-1-0368
Report No.(s): AD-A395330 ; AROJDF3 ; ARO-38792.16-PH-QC ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The primary goal of this project was to investigate the possible use of photon-exchange interactions to implement quantum logic gates. The nonlinear phase shifts produced by photon-exchange interactions were investigated theoretically using several different methods, including Dicke-state expansions of the excited atoms in a medium and density-matrix calculations to include the effects of collisions and spontaneous emission. An experimental investigation was performed in which two single photons were propagated through a sodium vapor cell with a laser pulse applied at the same time. The experimental results demonstrated a small nonlinear phase shift, as expected from the theoretical calculations. Errors in which the laser pulses do not return the atoms to their initial state may limit the practical applications of this approach.
DTIC
Photons ; Nonlinear Optics ; Quantum Electronics ; Quantum Computation

20020006086 Los Alamos National Lab. , NM USA
Non-Contact Optical Three Dimensional Liner Metrology
Sebring, R. ; Anderson, W. ; Jun. 01, 2001 ; 6p ; In English
Report No.(s): DE2001-783258 ; LA-UR-01-3227 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We optically captured the as-built liner geometry of NTLX (near term liner experiments) for Shiva Star using ultra-precision ranging lasers. We subsequently verified the resulting digitized geometry against the 3D CAD model of the part. The results confirmed that the Liner contours are within designed tolerances but revealed subtle fabrication artifacts that would typically go undetected.
NTIS
Rangefinding ; Linings ; Computer Aided Design

20020006116 Sandia National Labs. , Albuquerque, NM USA
MTI Focal Plane Assembly Design and Performance
Ballard, M. ; Rienstra, J. L. ; Jun. 17, 1999 ; 13p ; In English
Report No.(s): DE2001-7872 ; SAND98-2802C ; No Copyright ; Avail: Department of Energy Information Bridge

The focal plane assembly for the Multispectral Thermal Imager (MTI) consists of sensor chip assemblies, optical filters, and a vacuum enclosure. Sensor chip assemblies, composed of linear detector arrays and readout integrated circuits, provide spatial resolution in the cross-track direction for the pushbroom imager. Optical filters define 15 spectral bands in a range from 0.45 micro-m to 10.7 micro-m. All the detector arrays are mounted on a single focal plane and are designed to operate at 75 K. Three pairs of sensor chip assemblies (SCAs) are required to provide cross-track coverage in all 15 spectral bands. Each pair of SCAs

includes detector arrays made from silicon, iridium antimonide, and mercury cadmium telluride. Read out integrated circuits multiplex the signals from the detectors to 18 separate video channels. Optical filter assemblies defining the spectral bands are mounted over the linear detector arrays. Each filter assembly consists of several filter strips bonded together side-by-side. The MTI focal plane assembly has been integrated with the rest of the payload and has undergone detailed testing and calibration. This paper includes representative test data for the various spectral bands and the overall performance of the focal plane assembly.
NTIS
Multispectral Photography ; Optical Filters ; Calibrating ; Performance Tests

20020006130 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Control and Diagnostics System for the CEBAF Injector
Adderley, P. ; Barry, W. ; Bork, R. ; Cucinotta, R. ; Grubb, C. ; Oct. 01, 1988 ; 3p ; In English
Report No.(s): DE2001-775708 ; CEBAF-PR-88-026 ; DOE/ER/4015-1817 ; No Copyright ; Avail: Department of Energy Information Bridge

We present the first experience with the CEBAF injector control and diagnostics system. The computer architecture of the control system has been described elsewhere. The injector system is a model for the CEBAF controls. A computer system controls the gun, the steering magnets, and the focusing elements, and in the near future also the injector rf system. The beam parameters such as current, position, and emittance are measured by various monitors and are automatically analyzed by the computer.
NTIS
Injectors ; Linear Accelerators ; Beam Injection ; Control ; Diagnosis

20020006131 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Betatron Function Parameterization of Beam Optics including Acceleration
Douglas, D. R. ; Kewisch, J. ; York, R. C. ; Oct. 01, 1988 ; 4p ; In English
Report No.(s): DE2001-775707 ; CEBAF-PR-88-025 ; DOE/ER/4015-1816 ; No Copyright ; Avail: Department of Energy Information Bridge

Betatron function parameterization of symplectic matrices is of recognized utility in beam optical computations. The traditional 'beta functions' beta, alpha, gamma,(=(1+alpha(exp 2))/beta) and psi (the betratron phase advance) provide an emittance-independent representation of the properties of a beam transport system. They thereby decouple the problem of 'matching' injected beam envelope properties to the acceptance of a particular transport system from the details of producing a beam of a specific emittance. The definition and interpretation of these parameters becomes, however, more subtle when acceleration effects, especially adiabatic damping (with associated nonsymplecticity of the transfer matrix), are included. We present algorithms relating symplectic representations of beam optics to the more commonly encountered nonsymplectic (x, x', y, y') representation which exhibits adiabatic damping. Betatron function parameterizations are made in both representations. Self-consistent physical interpretations of the betatron functions are given and applications to a standard beam transport program are made.
NTIS
Algorithms ; Betatrons ; Matrices (Mathematics) ; Particle Beams

20020006202 Rutgers - The State Univ. , Office of Research and Sponsored Programs , Piscataway, NJ USA
A Proposal to Acquire a Variable Temperature Scanning Tunneling Microscope System ***Final Report , 31 Mar. 2000-30 Mar 2001***
Madey, Theodore E. ; Jul. 31, 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0051
Report No.(s): AD-A395493 ; AROD-40777.1-PH-R ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

The purpose of the project was to acquire a variable temperature scanning tunneling microscope (STM) to be used for atomic level imaging of surfaces. After considering many possible instruments, we ordered an instrument from Omicron Corporation, a customized VT STM 25RH Special Instrument. This provides sample heating and cooling during STM operation. The instrument was finally delivered on July 20, 2001. The instrument is being set up and is undergoing tests at present.
DTIC
Scanning Tunneling Microscopy ; Temperature Control ; Measuring Instruments ; Imaging Techniques

20020006245 Federal Energy Technology Center , Morgantown, WV USA
Hemispheric center for environmental technology. News Highlights, July 1999
Ebadian, M. A. ; Jul. 31, 1999 ; 87p ; In English
Report No.(s): DE2001-772523 ; DE-FG01-95EW55094-71 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

FIU-HCET personnel visited the Special Technologies Laboratory (STL) for discussions with the Principal Investigator (PI) of Laser Induced Fluorescence Imaging (LIFI) and for training in LIFI. Mr. Peter Gibbons, Tanks Retrieval Technology Integration Manager, visited FIU-HCET on July 20, 1999. Mr. Gibbons inspected the pipeline unplugging experimental facility at the HCET testing field. The detailed test bed construction, testing plan, and plugging material specifications were discussed. NTIS
Imaging Techniques ; Laser Induced Fluorescence

20020006316 NASA Ames Research Center , Moffett Field, CA USA
Nonlinear Optical Image Processing with Bacteriorhodopsin Films
Downie, John D. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Spatial Light Modulators and Applications Topical Meeting , 12-17 Mar. 1995 , Salt Lake City, UT , USA
Contract(s)/Grant(s): RTOP 506-59-21 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The transmission properties of some bacteriorhodopsin film spatial light modulators are uniquely suited to allow nonlinear optical image processing operations to be applied to images with multiplicative noise characteristics. A logarithmic amplitude transmission feature of the film permits the conversion of multiplicative noise to additive noise, which may then be linearly filtered out in the Fourier plane of the transformed image. The bacteriorhodopsin film displays the logarithmic amplitude response for write beam intensities spanning a dynamic range greater than 2.0 orders of magnitude. We present experimental results demonstrating the principle and capability for several different image and noise situations, including deterministic noise and speckle. Using the bacteriorhodopsin film, we successfully filter out image noise from the transformed image that cannot be removed from the original image.
Author
Bacteria ; Image Processing ; Nonlinearity ; Proteins ; Photoreceptors

20020006846 Kansas City Plant , Kansas City, MO USA
Development of a Single-Axis Edge Detection System
Hanshaw, R. A. ; Feb. 18, 2000 ; 40p ; In English
Report No.(s): DE2001-751343 ; KCP-613-6290 ; No Copyright ; Avail: Department of Energy Information Bridge

A SIP (Societe Genevoise Instruments de Physique) Trioptic coordinate measuring machine was modified for calibration of high quality single-axis glass standards to an uncertainty of +/- 0.000020 inch. The modification was accomplished through the addition of a frame grabber board, vision software, a high-resolution camera, stepper motors, a two-axis motor controller, and an HP-IB interface card. An existing temperature system (hygrometer, barometer, laser interferometer system, and optics) was retained as part of the system. An existing Hewlett Packard computer was replaced with a personal computer to accommodate the frame grabber board. Each component was integrated into the existing system using Visual Basic. The system was automated for unattended measurements by creating a machine programming language, which is recognized within the main program. NTIS
Edge Detection ; Interferometers ; Calibrating ; Machine Oriented Languages

20020006901 Miami Univ. , Dept. of Chemistry , Coral Gables, FL USA
Acquisition of Epifluorescence Film Balancing System ***Final Report , 01 Apr. 2000-31 Mar. 2001***
Leblanc, Roger M. ; Mar. 2001 ; 10p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0023
Report No.(s): AD-A395584 ; ARO-40855.1-CH-RIP ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Funding was given to purchase a new epifluorescence film balancing system. Request for this grant was made justifying its need tor the ongoing research projects. Different components of the system were acquired from different sources and were assembled into the system that can record fluorescence images at the air-water interface. The system was tested for its performance on the monolayers of a new amphiphilic coumarin dye. Excellent fluorescent images were recorded on the Langmuir films of a new amphiphilic coumarin dye. These images recorded at different surface pressures are presented in this report. Further, this

system is being applied to characterize the monolayers of different enzymes that interact with organophosphorus compounds at the air/water interface.
DTIC
Optical Equipment ; Microscopy ; Organic Phosphorus Compounds ; Air Water Interactions

20020008870 Swedish Defence Research Establishment , Sensor Technology , Linkoeping, Sweden
Evaporation of Thin Metal Films by Laser Radiation ***Foeranging av Tunna Metallfilmer med Laserstralning. En Studie av Laempliga Metaller och Filmtojocklekar i Optiska Sekringar***
Senneryd, P. , Swedish Defence Research Establishment , Sweden ; Mar. 2001 ; 94p ; In Swedish
Report No.(s): PB2001-107750 ; FOI-R-0068-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
An optical fuse contains a thin metal film that reflects ordinary light, but is damaged when the light intensity becomes too high, so that the light no longer reflects. Optical fuses can be used to protect eyes or sensors against dangerous laser radiation. In order to be suitable for use in an optical fuse, a metal film should have high reflectance when exposed to ordinary light intensities, but very quickly get damaged, so that the reflectance becomes low when exposed to dangerous light levels. In this diploma work, different metals and film thicknesses have been investigated, to find suitable films for this purpose.
NTIS
Eye (Anatomy) ; Metal Films ; Laser Beams ; Laser Ablation ; Eye Protection

20020008901 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Use of Jefferson Lab's High Average Power FEL as a Thomson Backscatter X-ray Source
Krafft, G. A. ; May 01, 1997 ; 3p ; In English
Report No.(s): DE2001-776936 ; JLAB-ACC-97-44 ; DOE/ER/40150-1823 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Recently, workers from Berkeley have measured Thomson forward scattered X-rays at the ALS injector. The average power of their device was limited by, among other things, the repetition rate of the high power laser. In order to achieve high average power, it is natural to investigate the possibility of backscatter from the recirculating optical pulses in Jefferson Lab CW IRFEL, now under construction. Photon brightnesses of order 10(exp 7) photons/(sec sq mm sq mrad) will be produced at this facility, with a spectrum extending up to 7 keV in energy, in the present operating mode. A near-term upgrade to 75 MeV yields about 30 keV photons with similar brightness. In the longer term, the UV upgrade of our device could potentially produce 4 MeV photons with substantially higher brightness. Scaling laws for such configurations are given and these three cases are presented in detail.
NTIS
Beam Injection ; X Ray Sources ; High Power Lasers ; Continuous Radiation

20020009031 Sandia National Labs. , Albuquerque, NM USA
Near Infrared (NIR) Imaging Techniques Using Lasers and Nonlinear Crystal Optical Parametric Oscillator/Amplifier (OPO/OPA) Imaging and Transferred Electron (TE) Photocathode Image Intensifiers
Yates, ; McDonald, ; Bliss, ; Cameron, ; Greives, ; Dec. 20, 2000 ; 11p ; In English
Report No.(s): DE2001-772161 ; SAND2000-3202C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Laboratory experiments utilizing different near-infrared (NIR) sensitive imaging techniques for LADAR range gated imaging at eye-safe wavelengths are presented. An OPO/OPA configuration incorporating a nonlinear crystal for wavelength conversion of 1.56 micron probe or broadcast laser light to 807 nm light by utilizing a second pump laser at 532 nm for gating and gain, was evaluated for sensitivity, resolution, and general image quality. These data are presented with similar test results obtained from an image intensifier based upon a transferred electron (TE) photocathode with high quantum efficiency (QE) in the 1-2 micron range, with a P-20 phosphor output screen. Data presented include range-gated imaging performance in a cloud chamber with varying optical attenuation of laser reflectance images.
NTIS
Image Intensifiers ; Photocathodes ; Near Infrared Radiation ; Experimentation ; Imaging Techniques

20020009123 Lawrence Livermore National Lab. , Livermore, CA USA
Optimum Cs condition for high-resolution transmission electron microscopy
OKeefe, M. A. ; Feb. 14, 2000 ; 3p ; In English
Report No.(s): DE2001-775171 ; LBNL-47219 ; No Copyright ; Avail: Department of Energy Information Bridge

With the advent of electron-optical systems able to generate negative spherical aberration (usually called 'Cs correctors'), it has now become feasible to zero-out objective lens Cs in the high-resolution transmission electron microscope. However, I show that - instead of tuning out spherical aberration completely - there is an optimum value for the residual Cs that maximizes information transfer to the best possible resolution and depends only on the information limit of the microscope.
NTIS
Aberration ; High Resolution ; Transmission Electron Microscopy ; Optimal Control ; Imaging Techniques

20020009532 Communications Research Lab. , Tokyo, Japan
Structure Model Analysis of the Kashima 34m Telescope
Nakajima, Junichi , Communications Research Lab. , Japan ; Saita, Takeshi , Seikei Univ. , Japan ; Horiguchi, Junji , Seikei Univ. , Japan ; Yuge, Kouhei , Seikei Univ. , Japan ; Nakamura, Toshio , Seikei Univ. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 83-89 ; In English ; Copyright ; Avail: Issuing Activity
Deformation analysis of the Kashima 34-m radio telescope is performed. Although the telescope has a large aperture and accurate reflector panels, the dish support structures determine the high frequency performance. Especially in millimeter wavelengths, deformations above 1 mm greatly affect telescope efficiency. We have modeled the 34-m telescope into elements and used the Finite Element Method (FEM) to simulate accurate telescope deformations. The results of our analysis were found to agree well with realistic deformation. Future analysis and telescope evaluations based on computer are possible with this FEM model.
Author
Structural Analysis ; Radio Telescopes ; Parabolic Reflectors

20020009548 NASA Ames Research Center , Moffett Field, CA USA
Eye-Movement Tracking Using Compressed Video Images
Mulligan, Jeffrey B. , NASA Ames Research Center , USA ; Beutter, Brent R. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Vision Science and its Applications Topical Meeting , 2-7 Feb. 1995 , Santa Fe, NM , USA
Contract(s)/Grant(s): RTOP 505-64-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Infrared video cameras offer a simple noninvasive way to measure the position of the eyes using relatively inexpensive equipment. Several commercial systems are available which use special hardware to localize features in the image in real time, but the constraint of realtime performance limits the complexity of the applicable algorithms. In order to get better resolution and accuracy, we have used off-line processing to apply more sophisticated algorithms to the images. In this case, a major technical challenge is the real-time acquisition and storage of the video images. This has been solved using a strictly digital approach, exploiting the burgeoning field of hardware video compression. In this paper we describe the algorithms we have developed for tracking the movements of the eyes in video images, and present experimental results showing how the accuracy is affected by the degree of video compression.
Author
Eye Movements ; Algorithms ; Tracking (Position)

20020009553 NASA Ames Research Center , Moffett Field, CA USA
Attentional Capture Can Depend on Search Mode
Remington, Roger W. , NASA Ames Research Center , USA ; Folk, Charles L. , Villanova Univ. , USA ; [1994] ; 1p ; In English ; 35th Psychonomic Society and Meeting , 11-13 Nov. 1994 , Saint Louis, MO , USA ; Sponsored by Psychonomic Society , USA
Contract(s)/Grant(s): RTOP 505-64-13 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
We have previously reported that an irrelevant singleton in one color does not capture attention when the target is defined by a singleton in a different color. Here, we show that when subjects are uncertain of the target color, capture occurs even when distractors and targets differ in color. The effects of target certainty on capture are explained in terms of the contingent involuntary orienting hypothesis of Folk, Remington, and Johnston (1992).
Author
Color ; Tracking (Position) ; Targets

20020009587 Brookhaven National Lab. , Upton, NY USA
Photoacoustic spectroscopy using a synchrotron light source
Jackson, R. S. ; Michaelian, K. H. ; Homes, C. C. ; Feb. 05, 2001 ; 3p ; In English
Report No.(s): DE2001-780633 ; BNL-68197 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We have investigated the use of a synchrotron as a source for infrared photoacoustic spectroscopy. A synchrotron has an intrinsically high radiance, which is beneficial when photoacoustic spectroscopy is applied to small samples, especially at long wavelengths.
NTIS
Light Sources ; Photoacoustic Spectroscopy

20020009604 Sandia National Labs. , Albuquerque, NM USA
Photonics Integration Devices and Technologies
Vawter, G. A. ; Lin, S. Y. ; Sullivan, C. T. ; Zubrzycki, W. J. ; Chow, W. W. ; Apr. 01, 2001 ; 35p ; In English
Report No.(s): DE2001-780313 ; SAND2001-0897 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We have used selective AlGaAs oxidation, dry-etching, and high-gain semiconductor laser simulation to create new in-plane lasers with interconnecting passive waveguides for use in high-density photonic circuits and future integration of photonics with electronics. Selective oxidation and doping of semiconductor heterostructures have made vertical cavity surface emitting lasers (VCSELs) into the world's most efficient low-power lasers. We apply oxidation technology to improve edge-emitting lasers and photonic-crystal waveguides, making them suitable for monolithic integrated microsystems. Two types of lasers are investigated: (1) a ridge laser with resonant coupling to an output waveguide; (2) a selectively oxidized laser with a low active volume and potentially sub-milliAmp threshold current. Emphasis is on development of high performance lasers suited for monolithic integration with photonic circuit elements.
NTIS
Etching ; Oxidation ; Semiconductor Lasers ; Aluminum Gallium Arsenides

20020009692 Fermi National Accelerator Lab. , Batavia, IL USA
Busch's theorem for mappings
Burov, A. ; May 29, 2001 ; 3p ; In English
Report No.(s): DE2001-781160 ; FERMILAB-CONF-01-074-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

For rotation-invariant Hamiltonian systems, canonical angular momentum is conserved. In beam optics, this statement is known as Busch's theorem. This theorem can be generalized to symplectic mappings; two generalizations are presented in this paper. The first one states that a group of rotation-invariant mappings is identical to a group of the angular-momentum preserving mappings, assuming both of them symplectic and linear. The second generalization of Busch's theorem claims that for any beam which rotation symmetry happened to be preserved, an absolute value of the angular momentum of any particle from this beam is preserved as well; the linear symplectic mapping does not have to be rotation-invariant here.
NTIS
Hamiltonian Functions ; Angular Momentum ; Particle Beams

20020009693 Brookhaven National Lab. , Upton, NY USA
Practical approach to monochromatic lwfa
Pogorelsky, ; Jul. 06, 2000 ; 11p ; In English
Report No.(s): DE2001-781136 ; BNL-68272 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Dependence of the LWFA performance upon the laser wavelength is applied to optimization of the plasma-channeled standard LWFA operating in a linear regime. Electron beam energy spread, emittance and luminosity depend upon the proportion of the electron bunch size to the plasma wavelength. This proportion tends to improve with the laser wavelength increase. We propose the two-stage (approximately)1 GeV LWFA with the controlled energy spread and emittance based on realistic capabilities of the BNL ATF that features: picosecond terawatt CO2 and a high-brightness electron gun.
NTIS
Electron Guns ; Brightness ; Luminosity ; Carbon Dioxide

20020009694 Brookhaven National Lab. , Upton, NY USA
Laser profile measurements of an h beam
Connolly, ; Cameron, ; Cupolo, ; Grau, ; Kesselman, ; May 12, 2001 ; 3p ; In English
Report No.(s): DE2001-781135 ; BNL-68274 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A non-intercepting beam profile monitor for H(sup (minus)) beams is being developed at Brookhaven National Lab. An H(sup (minus)) ion has a first ionization potential of 0.75eV. Electrons can be removed from an H(sup (minus)) beam by passing

light from a near-infrared laser through it. Experiments have been performed on the BNL linac to measure the transverse profile of a 750keV beam by using a Nd:YAG laser to photoneutralize narrow slices of the beam. The laser beam is scanned across the ion beam neutralizing the portion of the beam struck by the laser. The electrons are removed from the ion beam and the beam current notch is measured.
NTIS
Linear Accelerators ; YAG Lasers ; Beam Currents ; Laser Applications ; Laser Beams ; Neodymium Lasers

20020010205 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Scanning Nearfield Infrared Microscopy
Gillman, E. ; Mar. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-781121 ; JLAB-ACC-00-12 ; DOE/ER/40150-1846 ; No Copyright ; Avail: Department of Energy Information Bridge
Commonly, location specific chemical identification by means of vibrational spectroscopy in the infrared region is largely restricted to samples of macroscopic dimensions, on the order of one to several microns; the scale of the examined area is completely determined by the diffraction limit of the incident radiation. However, chemical identification at length scales less than the diffraction limit is possible using a scanned probe technique, the Scanning Near-Field Infrared Microscope (SNFIM). Using a scanned probe technique in the near-field, resolution of chemical features on the order of h/20 or (approximately) 100 nm can be achieved. An overview of previous experimental results using a free electron laser (FEL) and more conventional infrared sources will be discussed. Recent results from the SNFIM experiment at Jefferson Lab will also be presented.
NTIS
Free Electron Lasers ; Infrared Radiation ; Near Fields

20020010257 Army Communications-Electronics Command , Fort Monmouth, NJ USA
Proceedings of the International Wire and Cable Symposium (49th)
Nov. 16, 2000 ; 704p ; In English
Report No.(s): AD-A393963 ; No Copyright ; Avail: CASI ; A99 , Hardcopy ; A06 , Microfiche
The International Wire and Cable Symposium provides a forum for the exchange of technical information amongst suppliers, manufacturers, and users on technological advancements in materials, processes, and products used for voice, data, and video signal transmission systems.
Author
Conferences ; Data Transmission ; Signal Transmission ; Video Signals ; Wire

20020010369 Lawrence Livermore National Lab. , Livermore, CA USA
Observation of ionization instability of intense laser pulses
Alexeev, I. ; Antonsen, T. M. ; Li, Y. ; Milchberg, H. M. ; Nikitin, S. ; Jun. 25, 1999 ; 9p ; In English
Report No.(s): DE2001-9347 ; UCRL-JC-134715 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Theoretical analysis and preliminary experiment on ionization instability of intense laser pulses in ionizing plasmas are presented. The ionization instability is due to the dependence of the ionization rate on the laser intensity and scatters the laser energy off the original propagation direction.
NTIS
Ionization ; Pulsed Lasers ; Stability

20020010590 Lawrence Livermore National Lab. , Livermore, CA USA
Subsurface damage assessment with atomic force microscopy
Carr, J. W. ; Fearon, E. ; Hutcheon, I. D. ; Summers, L. J. ; Apr. 16, 1999 ; 6p ; In English
Report No.(s): DE2001-9746 ; UCRL-JC-132385 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The performance of transparent optics in high fluence applications is often dominated by inhomogeneities in the first few hundred nanometers of material. Defects undetectable with optical methods can cause catastrophic failures when used in critical applications where high strength, chemical or mechanical resistance or extreme smoothness is required. Not only are these defects substantially smaller than the wavelength of visible light, they are often concealed below a layer of glass-like material deposited during the polishing process. In high quality glass, the chemical and material properties of the outermost layer are modified by the grinding, lapping and polishing processes used in fabrication. Each succeeding step in a process is designed to remote damage

from the previous operation. However, any force against the surface, no matter how slight will leave evidence of this damage. These processes invariably create dislocations, cracks and plastic deformation in the subsurface region.
NTIS
Atomic Force Microscopy ; Defects ; Damage Assessment

20020010591 Lawrence Livermore National Lab. , Livermore, CA USA
Machining parameter study to select best conditions for SPDT of large single-crystal silicon optics
Carr, J. W. ; Davis, P. J. ; Haack, J. K. ; Krulewich, D. A. ; McClellan, M. R. ; Mar. 18, 1999 ; 6p ; In English
Report No.(s): DE2001-9744 ; UCRL-JC-132720 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The interdependence of process parameters on diamond turning of single-crystal silicon is poorly understood. An experimental design technique based on methods of statistical analysis permits the determination of a specific parameters influence and its co-dependence on other factors. This design technique enables the creation of an experimental matrix, considering all input parameters (surface velocity; feed rate; depth of cut; tool radius; tool rake/skew angle; cutting fluid), while substantially decreasing the overall number of experiments. After an initial survey the significant parameters for a subsequent response surface methodology (RSM) study can be selected. From measurements of tool wear, surface finish and sub-surface damage (SSD) the optimum parameter settings for the diamond turning process can then be determined.
NTIS
Optics ; Silicon ; Statistical Analysis ; Single Crystals

20020010601 Lawrence Livermore National Lab. , Livermore, CA USA
NIF small optics laser damage test specifications
Sheehan, L. ; Apr. 20, 1999 ; 6p ; In English
Report No.(s): DE2001-9631 ; UCRL-ID-133979 ; No Copyright ; Avail: Department of Energy Information Bridge
The Laser Damage Group is currently conducting tests on small optics samples supplied for initial evaluation of potential NIF suppliers. This document is meant to define the specification of laser-induced damage for small optics and the test methods used to collect the data. A rating system which will be applied for vendor selection is presented.
NTIS
Laser Damage ; Specifications

20020010625 Lawrence Livermore National Lab. , Livermore, CA USA
Modeling short-pulse-driven collisional x-ray lasers and other new schemes
Dunn, J. ; Li, Y. ; Nilsen, J. ; Osterheld, A. L. ; Jul. 01, 1999 ; 12p ; In English
Report No.(s): DE2001-9356 ; UCRL-JC-132649 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Recently, the technique of using a nsec pulse to preform and ionize the plasma followed by a psec pulse to heat the plasma has enabled low-Z neon-like and nickel-like ions to laser driven by small lasers with only ten joules of energy. In this work we model recent experiments done using the COMET laser at LLNL to illuminate 1 cm long slab targets of Ti with a 4.8 J, 800 ps prepulse followed 1.6 nsec later by a 6 J, 1 psec drive pulse. The LASNEX code is used to calculate the hydrodynamic evolution of the plasma and provide the temperatures and densities to the XRASER code, which then does the kinetics calculations to determine the gain. The temporal and spatial evolution of the plasma is studied both with and without radiation transport included for the 3d and 3s (-) 2p Ne-like Ti resonance lines. Large regions with gains greater than 80 cm(sup (minus)1) are predicted for the 3p (sup 1)S(sub 0) (-) 3s (sup 1)P(sub 1) Ne-like Ti laser line at 326 (angstrom). Given the large gain and large gradients in these plasmas, we do propagation calculations including refraction to understand which regions have the right combination of high gain and low gradients to contribute to the X-ray laser output. Calculations are also presented using different delays between the long and short pulse and different widths for the short pulse to provide better insight for optimizing the laser output. In addition to the standard 326 (angstrom) laser line, high gain is also predicted and observed for the 3d (sup 1)P(sub 1) (-) 3p (sup 1)P(sub 1) laser line at 301 (angstrom) in Ne-like Ti. We present calculations with and without radiation transport included on the strong 3d (sup 1)P(sub 1) (-) 2p (sup 1)S(sub 0) resonance line to better understand this self photopumping effect. We also look at the analog transition in Ni-like ions to understand if self photopumping may also play a role in Ni-like ions. High gain is predicted on the 3d(sup 9) 4f (sup 1)P(sub 1) (-) 3d(sup 9) 4d (sup 1)P(sub 1) Ni-like transition and this line has recently been observed at 226 (angstrom) in Ni-like Mo. Gain of 13 cm(sup (minus)1) has been measured for this line.
NTIS
X Ray Lasers ; Pulsed Lasers ; Laser Outputs

20020010894 National Inst. of Standards and Technology , National Voluntary Lab. Accreditation Program , Gaithersburg, MD USA

Calibration Laboratories: Technical Guide for Optical Radiation Measurements

Faison, C. D. ; Brickenkamp, C. S. ; Aug. 2000 ; 44p ; In English

Report No.(s): PB2001-104045 ; NIST/NB-150-2E ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Handbook 150-2E is one of a series of technical guides for the accreditation of calibration laboratories; each handbook corresponds to one of eight fields of physical metrology calibration: (1) electromagnetic dc/low frequency; (2) microwave frequency; (3) time and frequency; (4) ionizing radiation; (5) optical radiation; (6) dimensional; (7) mechanical; and (8) thermodynamics. The handbooks are intended for use by the National Voluntary Laboratory Accreditation Program (NVLAP) technical experts when assessing laboratories, staff of calibration laboratories, those operating under other laboratory accreditation systems, users of laboratory calibration services, and others wanting information on NVLAP accreditation guidelines and requirements. As tools for the NVLAP technical expert (assessor), this guide accompanies NIST Handbook 150, NVLAP Procedures and General Requirements, the NVLAP General Operations Checklist, and the NVLAP Fields of Calibration and Parameters Selection List (the latter lists are available on the NVLAP website). The assessor may witness a calibration, have an item recalibrated, examine the results of interlaboratory comparisons, inspect facilities, documents, equipment, and personnel to validate that a laboratory is capable of performing calibration within their stated uncertainties.

NTIS

Optical Measurement ; Optical Properties ; Ionizing Radiation

20020010918 Oregon Univ. , Dept. of Physics , Eugene, OR USA

Atmospheric and Spectroscopic Research in the Far Infrared ***Final Report , 22 Feb. 1998 - 21 Feb. 2002***

Park, Kwangjai , Oregon Univ. , USA ; [2001] ; 6p ; In English

Contract(s)/Grant(s): NAG1-2010 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The University of Oregon (UO) was a participant in a number of far infrared spectroscopic projects over the past three decades. These include Sub-millimeter Infrared Balloon Experiment (SIBEX), the Balloon Intercomparison Campaign (BIC), and the Infrared Balloon Experiment (IBEX). In addition to these field studies, the UO program contained a detector research component and a laboratory spectroscopy element. Through a productive collaboration with Dr. Carli's group in Italy, with Prof. Ade's group in England and with Dr. Chance of Harvard-Smithsonian, we have made substantial contributions to the development of far infrared spectroscopy as a mature measurement technology for the atmospheric science. This report summarizes the activities during the latest grant period, covering the span from February 22, 1998 to February 21, 2002.

Author

Far Infrared Radiation ; Infrared Radiation ; Infrared Spectroscopy ; Atmospheric Radiation ; Radiation Measurement

20020010945 Brookhaven National Lab. , Upton, NY USA

Inelastic x-ray scattering at ultrahigh pressures

Mao, H. K. ; Hemley, J. ; Kao, C. C. ; Aug. 28, 2000 ; 18p ; In English

Report No.(s): DE2001-782060 ; BNL-68351 ; No Copyright ; Avail: Department of Energy Information Bridge

Inelastic x-ray scattering (IXS) provides high-pressure research with an arsenal of analytical capabilities for key measurements that were previously unattainable, and high pressure research provides IXS with numerous applications where the technique has unique advantages over other methods. High-pressure investigations can now be conducted using non-resonant IXS, resonant IXS, nuclear resonant IXS, and x-ray emission spectroscopy with energy resolutions of 100 meV to 1 eV for electronic transitions and 1 to 10 meV for phonon studies. By pressure-tuning materials over a wide range, we are able to investigate fundamental physics of electron gases, strongly correlated electron systems, high-energy electronic excitations, and phonons in energy and momentum space. The results will have a profound influence on materials applications as well as providing basic information for understanding the deep interior of the Earth and other planets.

NTIS

High Pressure ; Inelastic Scattering ; Synchrotron Radiation ; X Ray Scattering ; Spectroscopy

20020011150 Lawrence Livermore National Lab. , Livermore, CA USA

Simulation of material removal efficiency with ultrashort laser pulses

Banks, P. S. ; Feit, M. D. ; Komashko, A. M. ; Perry, M. D. ; Rubenchik, A. M. ; Jul. 01, 1999 ; 12p ; In English

Report No.(s): DE2001-9853 ; UCRL-JC-133744 ; No Copyright ; Avail: Department of Energy Information Bridge

Understanding physical processes accompanying ablation is necessary for optimal use of ultrashort laser pulse (USLP) material processing. We describe the implementation of self-consistent electromagnetic propagation-energy absorption in our numerical models and estimate effect on material removal of energy, pulse length and prepulses.
NTIS
Electromagnetic Wave Transmission ; Ablation ; Pulsed Lasers

20020011152 Lawrence Livermore National Lab. , Livermore, CA USA
Smoothing of mirror substrates by thin-film deposition
Baker, S. ; Parra, E. ; Spiller, E. ; Tarrio, C. ; Aug. 03, 1999 ; 13p ; In English
Report No.(s): DE2001-9864 ; UCRL-JC-135146 ; No Copyright ; Avail: Department of Energy Information Bridge
Superpolished optical flats with high spatial frequency roughness below 0.1 nm have been commercially available for years. However, it is much more difficult to obtain figured optics of similar quality. We have obtained and tested the finish of figured optics from different vendors by atomic force microscopy and optical profilometry and have investigated how the substrate quality can be improved by the deposition of thin films. We have determined the growth parameters of several thin-film structures. From these parameters we can determine how the surface topography of a coated mirror differs from that of the substrate, select the best thin-film structure, and predict the possible improvement.
NTIS
Mirrors ; Thin Films ; Deposition

20020011160 Lawrence Livermore National Lab. , Livermore, CA USA
Surface figure and roughness tolerances for NIF optics and the interpretation of the gradient, P-V wavefront and RMS specifications
Aikens, D. M. ; English, R. E. ; House, W. ; Lawson, J. K. ; Nichols, M. A. ; Jul. 01, 1999 ; 10p ; In English
Report No.(s): DE20019-8166 ; UCRL-JC-134534 ; No Copyright ; Avail: Department of Energy Information Bridge
In a high energy laser system such as the National Ignition Facility (NIF), the ability to focus light into as small a spot as possible at the highest possible fluence is highly dependent on the quality of the optics used in the system. Typically, surface form errors and transmitted and reflected wavefront errors are specified in terms of a peak-to-valley wavefront error (P-V), or occasionally in terms of an RMS wavefront error (RMS) 1 . It has been shown, however, that the parameter that most closely correlates with beam focusability is neither of these, but the RMS of the gradients of the wavefront error (RMS Gradient). Further, the spatial frequency of the wavefront error plays a significant role in the way that a given error effects the performance of the laser system, so careful attention must be paid to how the spatial filtering is both specified and accomplished. Since ISO 10110 has no specific provisions for a gradient specification, LLNL has developed its own notation and procedures for these critical specifications. In evaluating surface figure errors as specified by the NIF drawings, modern phase modulating interferometers (PMI) will be used. In addition to performing QA testing of the optics, LLNL intends to utilize the software capabilities of the instruments to obtain the information to model the wavefront of the 131 passes through various optical elements comprising the NIF front end. Tests will be performed and documented after coating and as installed in the specified mechanical mounts. This paper describes the evaluation of the wavefront error for NIF small optics including specifications over a given spatial period callout, the proper low pass filtering of the data and the allowable filtering and settings that can be applied to obtain proper wavefront data. This paper also describes the origin and evolution of other NIF wavefront and roughness specifications, and gives examples. Since the wavefront requirements and hence the specifications vary for the different systems in the NIF, we will focus on one system, the injection laser system (ILS) or ”front end”. Also discussed will be the metrology and data manipulation requirements for the large aperture optics. Finally, clarification will be given to the differences between various versions of the RMS wavefront and roughness specifications allowed in ISO 10110, and how they contrast to the RMS roughness specifications used in ANSI-Y14.5.
NTIS
Wave Fronts ; Surface Roughness ; Root-Mean-Square Errors

20020011167 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
Implemented 2-D Local Feature Extraction Framework. Methodology Report
Olsson, H. ; June 2000 ; 32p ; In English
Report No.(s): PB2001-108212 ; FOA-R-00-1553-408-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report serves as documentation of developed MATLAB programs, produced during the work presented in ’2-D (two-dimensional) Automatic Image Analysis and Image Enhancement for Gated Viewing Imagery,’ published by FOA Laser Systems. Mainly, the programs are an implementation of a general computer vision scheme developed by the Computer Vision

Laboratory at Linkoping University. A system overview is presented. Specific instructions on the use of a few main programs are given in a user's guide. A complete list of implemented programs is given in a chapter of its own, together with short purpose introductions.
NTIS
Computer Vision ; Image Analysis ; Image Enhancement ; User Manuals (Computer Programs)

20020011223 Sandia National Labs. , Albuquerque, NM USA
Highly-Efficient Laser with Self-Aligned Waveguide and Current Confinement by Selective Oxidation
Allerman, A. ; Blum, O. ; Gao, Y. ; Vawter, G. A. ; Jul. 27, 1999 ; 4p ; In English
Report No.(s): DE2001-9673 ; SAND99-1967C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We report highly efficient, low-threshold-current edge-emitting lasers where both the optical waveguide and lateral current confinement are achieved by lateral selective oxidation of AlGaAs. External differential quantum efficiency in excess of 95% and 40% wall-plug efficiency are demonstrated in 600 (micro)m-long devices without facet coatings. Shorter, 300-micrometer-long, uncoated devices have 6 mA threshold currents. This high-performance is a combined result of placement of the oxide layers so as to achieve the minimum optical mode volume and bi-parabolic grading of the Al(sub x)Ga(sub 1 - x)As heteroepitaxy for minimum height/potential barriers, less than 15 meV, created by the wide-energy-gap layers required for selective wet oxidation. Since the initial development of wet AlGaAs oxidation methods, a number of oxidized edge-emitting laser concepts have been tried. The most successful of these have used lateral selective oxidation of AlGaAs layers between 100 and 300 nm thickness. These layers have been used as current restricting apertures or for both current restriction and lateral waveguiding. Use of an oxide layer above and below the laser active region offers the ability to create a self-aligned waveguide with current apertures on both sides of the pn-junction in a process requiring only one epitaxial growth step. Previous use apertures for these dual purposes resulted multi-moded lasers with reduced efficiency and elevated threshold current density due to non-ideal formation of the waveguide and possibly excess stress caused by the thick (300 nm) oxide layer.
NTIS
Waveguides ; Lasers ; Aluminum Gallium Arsenides ; Oxidation

20020011224 Bechtel Nevada Corp. , Las Vegas, NV USA
Fiber Optic High Voltage Probe
Heino, M. J. ; Aug. 01, 1999 ; 3p ; In English
Report No.(s): DE2001-9754 ; DOE/NV/11718-333 ; No Copyright ; Avail: Department of Energy Information Bridge
We developed a fiber coupled sensor to measure High Voltage directly using only light as the probe. We use the Pockles effect in lithium niobate crystal which will induce a phase shift in a laser beam that varies according to applied voltage. This can then be transformed into a modulation of beam intensity by polarizers, interferometry, or waveguide coupling. No voltage dividers are necessary, nor is any physical connection. This is accompanied by taking advantage of the structure of the power system itself, using voltage planes and dielectric insulation already present as the capacitive voltage divider. We hypothesize a bandwidth from GHz to DC (direct current). Such a system could be used in any application that calls for isolated and unobtrusive voltage sensing.
NTIS
Fiber Optics ; Electrical Measurement ; High Voltages

20020011232 Lawrence Livermore National Lab. , Livermore, CA USA
High-resolution wavefront control of high-power laser systems
Brase, J. ; Brown, C. ; Carrano, C. ; Kartz, M. ; Olivier, S. ; Jul. 08, 1999 ; 9p ; In English
Report No.(s): DE2001-9797 ; UCRL-JC-134822 ; REPT-98-ERD-061 ; No Copyright ; Avail: Department of Energy Information Bridge
Nearly every new large-scale laser system application at LLNL (Lawrence Livermore National Laboratory) has requirements for beam control which exceed the current level of available technology. For applications such as inertial confinement fusion, laser isotope separation, and laser machining the ability to transport significant power to a target while maintaining good beam quality is critical. There are many ways that laser wavefront quality can be degraded. Thermal effects due to the interaction of high-power laser or pump light with the internal optical components or with the ambient gas are common causes of wavefront degradation. For many years, adaptive optics based on thin deformable glass mirrors with piezoelectric or electrostrictive actuators have been used to remove the low-order wavefront errors from high-power laser systems. These adaptive optics systems have successfully improved laser beam quality, but have also generally revealed additional high-spatial-frequency errors, both because the low-order errors have been reduced and because deformable mirrors have often introduced some high-spatial-frequency components due to manufacturing errors. Many current and emerging laser applications fall into the high-resolution category

where there is an increased need for the correction of high spatial frequency aberrations which requires correctors with thousands of degrees of freedom. The largest Deformable Mirrors currently available have less than one thousand degrees of freedom at a cost of approximately $1M. A deformable mirror capable of meeting these high spatial resolution requirements would be cost prohibitive. Therefore a new approach using a different wavefront control technology is needed. One new wavefront control approach is the use of liquid-crystal (LC) spatial light modulator (SLM) technology for controlling the phase of linearly polarized light. Current LC SLM technology provides high-spatial-resolution wavefront control, with hundreds of thousands of degrees of freedom, more than two orders of magnitude greater than the best Deformable Mirrors currently made. Even with the increased spatial resolution, the cost of these devices is nearly two orders of magnitude less than the cost of the largest deformable mirror. NTIS

Isotope Separation ; Inertial Confinement Fusion ; Liquid Crystals ; Light Modulators ; Optical Equipment ; Laser Beams

20020011233 Lawrence Livermore National Lab. , Livermore, CA USA

Advanced conceptual design report for the Z-Beamlet laser backlighter

Caird, J. ; May 31, 1999 ; 84p ; In English

Report No.(s): DE2001-9798 ; UCRL-ID-134409 ; No Copyright ; Avail: Department of Energy Information Bridge

The Z-accelerator facility at Sandia National Laboratories (SNL) in Albuquerque, New Mexico, performs critical experiments on the physics of matter at extremely high energy density as part of the Department of Energy's nuclear weapons Stockpile Stewardship Program. In order to augment and enhance the value of experiments performed at this facility, the construction of a new x-ray backlighting diagnostic system is required. New information would be obtained by recording images and/or spectra of x-ray radiation transmitted through target materials as they evolve during Z-accelerator-driven experiments (or 'shots'). In this application, we generally think of the diagnostic x-rays as illumination produced behind the target materials and detected after passing through the Z-target. Hence the x-ray source is commonly called a 'backlighter' The methodology is a specific implementation of the general science known as x-ray radiography and/or x-ray spectroscopy. X-ray backlighter experiments have been performed in inertial confinement fusion (ICF) facilities in many countries. On Nova, experience with backlighters has been obtained since about 1986. An intense source of x-rays is produced by focusing one of its beams on a backlighter target nearby, while the other beams are used to create the high-energy-density conditions to be studied in the experiment. This conceptual design report describes how a laser-backlighter similar to one beam of Nova could be constructed for use at Sandias Z-accelerator facility. The development of such a facility at Sandia is timely for two major reasons. First, at LLNL the Beamlet laser was decommissioned in FY98, and the Nova laser will be decommissioned in FY99, in preparation for activation of the National Ignition Facility (NIF). This will provide several million dollars worth of subsystems and components from which to construct other lasers, such as the Z-backlighter. Second, the new diagnostic capability at Sandia will provide a national resource for experimentation that would otherwise not exist to complement Nova, and future NIF experiments. In this report, the primary criteria and functional requirements for an x-ray backlighter diagnostic at the Z-accelerator facility are discussed at the beginning of Chapter 2 (Section 2.1). This is followed by a detailed discussion of subsystem design requirements (SSDRs) for a laser-backlighter that can meet these requirements (Section 2.2). Chapter 3 describes a conceptual design for a laser system that meets these requirements. Chapter 4 provides schedule information for the proposed project. A summary of overall project costs (in FY99 dollars) is shown in Table 1-1. NTIS

Radiography ; X Ray Spectroscopy ; Nuclear Weapons ; Laser Beams ; Accelerators

20020011369 Lawrence Livermore National Lab. , Livermore, CA USA

Thermally induced distortion of high average power laser system by an optical transport system

Ault, L. ; Chow, R. ; Taylor, J. R. ; Jedlovec, D. ; Mar. 31, 1999 ; 11p ; In English

Report No.(s): DE2001-9802 ; UCRL-JC-133728 ; No Copyright ; Avail: Department of Energy Information Bridge

The atomic vapor laser isotope separation process uses high-average power lasers that have the commercial potential to enrich uranium for the electric power utilities. The transport of the laser beam through the laser system to the separation chambers requires high performance optical components, most of which have either fused silica or Zerodur as the substrate material. One of the requirements of the optical components is to preserve the wavefront quality of the laser beam that propagate over long distances. Full aperture tests with the high power process lasers and finite element analysis (FEA) have been performed on the transport optics. The wavefront distortions of the various sections of the transport path were measured with diagnostic Hartmann sensor packages. The FEA results were derived from an in-house thermal-structural-optical code which is linked to the commercially available CodeV program. In comparing the measured and predicted results, the bulk absorptance of fused silica

was estimated to about 50 ppm/cm in the visible wavelength regime. Wavefront distortions are reported on optics made from fused silica and Zerodur substrate materials.
NTIS
Apertures ; Distortion ; High Power Lasers ; Laser Beams ; Temperature Effects ; Optics

20020011713 Sandia National Labs. , Albuquerque, NM USA
Development of a Compact Optical-MEMS Scanner with Integrated VCSEL Light Source and Diffractive Optics
Krygowski, T. W. ; Reyes, D. ; Rodgers, M. S. ; Smith, J. H. ; Warren, M. ; Jun. 30, 1999 ; 11p ; In English
Report No.(s): DE2001-9507 ; SAND99-0498C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In this work the design and initial fabrication results are reported for the components of a compact optical-MEMS laser scanning system. This system integrates a silicon MEMS laser scanner, a Vertical Cavity Surface Emitting Laser (VCSEL) and passive optical components. The MEMS scanner and VCSEL are mounted onto a fused silica substrate which serves as an optical interconnect between the devices. Two Diffractive Optical Elements (DOEs) are etched into the fused silica substrate to focus the VCSEL beam and increase the scan range. The silicon MEMS scanner consists of an actuator that continuously scans the position of a large polysilicon gold-coated shuttle containing a third DOE. Interferometric measurements show that the residual stress in the 500 (micro)m x 1000 (micro)m shuttle is extremely low, with a maximum deflection of only 0.18(micro)m over an 800 (micro)m span for an unmetallized case and a deflection of 0.56(micro)m for the metallized case. A conservative estimate for the scan range is (approximately)(+-)4(degree), with a spot size of about 0.5 mm, producing 50 resolvable spots. The basic system architecture, optical and MEMS design is reported in this paper, with an emphasis on the design and fabrication of the silicon MEMS scanner portion of the system.
NTIS
Lasers ; Light Sources ; Fabrication ; Diffractive Optics ; Optical Equipment ; Optical Scanners

20020011718 Oak Ridge National Lab. , TN USA
Detection of Infrared Photons Using the Electronic Stress in Metal-Semiconductor Interfaces
Datskos, P. G. ; Datskou, I. ; Egert, C. M. ; Rjic, S. ; Apr. 05, 1999 ; 10p ; In English
Report No.(s): DE2001-9535 ; ORNL/CP-102573 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
It is well known that the work function of metals decreases when they are placed in a nonpolar liquid. A similar decrease occurs when the metal is placed into contact with a semiconductor forming a Schottky barrier. We report on a new method for detecting photons using the stress caused by photo-electrons emitted from a metal film surface in contact with a semiconductor microstructure. The photoelectrons diffuse into the microstructure and produce an electronic stress. The photon detection results from the measurement of the photo-induced bending of the microstructure. Internal photoemission has been used in the past to detect photons, however, in those cases the detection was accomplished by measuring the current due to photoelectrons and not due to electronic stress. Small changes in position (displacement) of microstructures are routinely measured in atomic force microscopy (AFM) where atomic imaging of surfaces relies on the measurement of small changes (< l0(sup -9) m) in the bending of microcantilevers. In the present work we studied the photon response of Si microcantilevers coated with a thin film of Pt. The Si microcantilevers were 500 nm thick and had a 30 nm layer of Pt. Photons with sufficient energies produce electrons from the platinum-silicon interface which diffuse into the Si and produce an electronic stress. Since the excess charge carriers cause the Si microcantilever to contract in length but not the Pt layer, the bimaterial microcantilever bends. In our present studies we used the optical detection technique to measure the photometric response of Pt-Si microcantilevers as a function of photon energy. The charge carriers responsible for the photo-induced stress in Si, were produced via internal photoemission using a diode laser with wavelength (lambda) = 1550 nm.
NTIS
Binary Systems (Materials) ; Imaging Techniques ; Infrared Detectors

20020011726 Stanford Linear Accelerator Center , Menlo Park, CA USA
Optics Simulations for the NLC Main Linac
Woodley, M. D. ; Jun. 15, 2001 ; 4p ; In English
Report No.(s): DE2001-784940 ; SLAC-PUB-8865 ; No Copyright ; Avail: Department of Energy Information Bridge
Focusing in the NLC main linac will be provided mainly by hybrid permanent magnet quadrupoles which have limited variability in strength. When the energy profile of the linac changes, due to normal cycling of rf sources, mismatches in the beam optics can be generated if the quadrupole strengths are not rescaled to the new energy profile. These mismatches can lead to emittance dilution. In addition, betatron phase advance changes caused by the mismatch can adversely affect the beam trajectory,

leading to emittance dilution from dispersion and wakefields. This paper describes the results of simulations of these processes, undertaken in an attempt to determine whether or not rescaling of the quadrupoles will be necessary in the NLC main linac.
NTIS
Linear Accelerators ; Optics ; Simulation ; Beams (Radiation)

20020011727 Stanford Linear Accelerator Center , Menlo Park, CA USA
Study of Low beta(sub y) Straight Section in SPEAR 3
Nosochkov, Y. ; Jun. 19, 2001 ; 4p ; In English
Report No.(s): DE2001-784941 ; SLAC-PUB-8870 ; No Copyright ; Avail: Department of Energy Information Bridge
The SPEAR 3 light source has two 7.6 m straight sections one of which is available for new insertion devices (ID). by reducing the vertical Beta(sub y) function at the center of the straight from 9.8 m to 1.5 m, the beam size can be decreased from 44 mu to 17 mu to reduce the ID gap, the the ID length may be limited by the increased Beta(sub y) variation in the ID. Alternatively, a double waist optics with two symmetric low Beta(sub y) locations and a chicane may be considered to implement two Ids. In this paper, we discuss the low Beta(sub y) optics, effects on the beam dynamic aperture, and the ID parameters needed to maximize photon flux density and brightness while maintaining electron beam lifetime.
NTIS
Electron Beams ; Light Sources ; Linear Accelerators

20020011745 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
Optical R and D in Finland ***Optisk FoU i Finland***
Svensson, S. ; Oedman, S. ; August 2000 ; 22p ; In Swedish ; Original contains color illustrations
Report No.(s): PB2002-100456 ; FOA-R-00-01574-612-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
The visited organizations are active in research, manufacturing, maintenance and calibration of optical range finders, optical components and equipment, diffractive/nano-structured optics, spectrometers, laser protection, laser warning receivers and low observables at optical wavelengths. One of the main reasons for the visits was to enhance and stabilize the possibilities of co-operation between FOA and Finnish research organizations.
NTIS
Finland ; Laser Applications ; Optical Equipment ; Diffractive Optics

20020011856 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
A Method for Correction of an Optical Calibration Signal ***Metod foer Korrigering av en Optisk Kalibreringssignal***
Boman, T. ; Oennegren, J. ; Dec. 1999 ; 48p ; In Swedish ; Original contains color illustrations
Report No.(s): PB2001-108169 ; FOA-R-01361-408-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)
This report treats a fiber-optic link intended to be used in calibration of a digital beamforming antenna. The temperature and polarization dependency has been examined for a few of the components such as the fiber-optic coupler, the fiber, and the PIN-diodes. Measurements on an experimental antennas are also reported. The study shows that the optical calibration network in the present configuration does not satisfy the specifications concerning the amplitude stability. If the method of measuring the DC-currents at the PIN-diodes to give correction for the calibration signal is used, the amplitude stability can be improved considerably. The phase stability has been shown to be satisfactory at temperatures above 28 degrees C. mathematical models that explain the measured data are described, and deviations between the models and the reality are discussed. The measurement system that has been designed in order to make the measurements is also reported.
NTIS
P-I-N Junctions ; Fiber Optics ; Calibrating ; Junction Diodes ; Couplers

20020011879 Stanford Linear Accelerator Center , Menlo Park, CA USA
Issues and R&D Critical to the LCLS
Emma, P. J. ; Jun. 25, 2001 ; 6p ; In English
Report No.(s): DE2001-784931 ; SLAC-PUB-8849 ; No Copyright ; Avail: Department of Energy Information Bridge
The Linac Coherent Light Source (LCLS) is a high brightness x-ray free-electron laser project based on the SLAC linac. A new photocathode rf gun serves as injector for the last kilometer of the linac, which is fitted with two stages of bunch compression. Acceleration to 15-GeV produces intense 1.5-A coherent radiation by self-amplified spontaneous emission in a long undulator.
NTIS
Linear Accelerators ; Coherent Light ; Light Sources ; Free Electron Lasers

20020012224 Lawrence Livermore National Lab. , Livermore, CA USA

Adaptive optics high resolution spectroscopy: Present status and future direction

Alcock, C. ; Angel, R. ; Ciarlo, D. ; Fugate, R. O. ; Ge, J. ; Jul. 27, 1999 ; 12p ; In English

Report No.(s): DE2001-13799 ; UCRL-JC-132672 ; REPT-99-FS-004 ; No Copyright ; Avail: Department of Energy Information Bridge

High resolution spectroscopy experiments with visible adaptive optics (AO) telescopes at Starfire Optical Range and Mt. Wilson have demonstrated that spectral resolution can be routinely improved by a factor of- 10 over the seeing-limited case with no extra light losses at visible wavelengths. With large CCDs now available, a very wide wavelength range can be covered in a single exposure.In the near future, most large ground-based telescopes will be equipped with powerful AO systems. Most of these systems are aimed primarily at diffraction-limited operation in the near IR. An exciting new opportunity will thus open up for high resolution IR spectroscopy. Immersion echelle gratings with much coarser grooves being developed by us at LLNL will play a critical role in achieving high spectral resolution with a compact and low cost IR cryogenically cooled spectrograph and simultaneous large wavelength coverage on relatively small IR detectors. We have constructed a new AO optimized spectrograph at Steward Observatory to provide R = 200,000 in the optical, which is being commissioned at the Starfire Optical Range 3.5m telescope. We have completed the optical design of the LLNL IR Immersion Spectrograph (LISPEC) to take advantage of improved silicon etching technology.

NTIS

Adaptive Optics ; High Resolution ; Infrared Spectroscopy ; Design Analysis ; Optical Equipment ; Telescopes ; Spectrographs

20020012231 Lawrence Livermore National Lab. , Livermore, CA USA

Large aperture diffractive optics for space based lasers

Hyde, R. ; Sep. 01, 1999 ; 44p ; In English

Report No.(s): DE2001-13757 ; UCRL-ID-135649 ; REPT-97-ERD-002 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

While space based laser systems would be a valuable tool in defending against ballistic missile attacks, they will be extremely expensive to field; quite probably too expensive. The purpose of this report is to examine one powerful approach, the use of very large aperture diffractive optics, for greatly reducing the cost and effort required to field space based laser defenses. Diffractive optics (thin, optically slow, lenses) are a novel means of providing very large aperture (typically 20-50 meter) space optics; they are lightweight and packageable, with greatly relaxed optical tolerances compared to conventional reflectors. These optics are currently under active investigation (at LLNL and elsewhere) for large aperture imaging applications; but their virtues should prove equally attractive for this application as well.

NTIS

Lasers ; Diffractive Optics ; Ballistic Missiles

20020012339 Stanford Linear Accelerator Center , Menlo Park, CA USA

Solenoid Fringe Optics

Nash, B. ; Mar. 26, 2001 ; 6p ; In English

Report No.(s): DE2001-784881 ; SLAC-AP-136 ; No Copyright ; Avail: Department of Energy Information Bridge

Suppose that a charged particle is moving in the z direction and we wish to consider its dynamics under magnetic fields in the z direction. Suppose we are given some Bz(z). B must satisfy Maxwell's equations. In the absence of charge and time dependent electric fields, this means that the divergence and curl of B must be 0. Let us consider fields with axial symmetry about the z axis.

NTIS

Electric Fields ; Maxwell Equation ; Beams (Radiation)

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20020006074 Brookhaven National Lab. , Upton, NY USA

Calculations for a mercury jet target in a solenoid magnet capture system

Gallardo, ; Kahn, ; Palmer, ; Thieberger, ; Weggel, ; Jun. 18, 2001 ; 4p ; In English

Report No.(s): DE2001-785362 ; BNL-68559 ; No Copyright ; Avail: Department of Energy Information Bridge

A mercury jet is being considered as the production target for a muon storage ring facility to produce an intense neutrino beam. A 20 T solenoid magnet that captures pion for muon production surrounds the mercury target. As the liquid metal jet enters or exits the field eddy currents are induced. We calculate the effects that a liquid metal jet experiences in entering and exiting the magnetic field for the magnetic configuration considered in the Neutrino Factory Feasibility Study II.
NTIS
Solenoids ; Mercury (Metal) ; Storage Rings (Particle Accelerators)

20020006076 Los Alamos National Lab. , NM USA
Radiographic results from the ntlx series of hydrodynamic experiments
Olson, R. T. ; Oro, D. M. ; Jun. 01, 2001 ; 5p ; In English
Report No.(s): DE2001-783297 ; LA-UR-01-3134 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The NTLX series of experiments are focused on measuring the shock induced hydrodynamic flow of a Sn-PMMA target. For these experiments multi-frame flash X-ray radiography is used to measure the position of the Sn-PMMA target interface and the location of shock in the PMMA as a function of time. Four radiographs are acquired at 700 ns intervals having a line-of-sight following the target's axis of symmetry. Because the X-ray spectrum from the sources has an end-point energy of 300 keV with a strong component of approx. keV tungsten K-line radiation, the Sn portion of the target is radiographically opaque. However, X-rays are transmitted through the PMMA portion of the target thereby allowing motion of the Sn-PMMA interface to be imaged. Also, the shock location is tracked as a function of time due to the density increase in the shocked PMMA. The resulting radiographs are analyzed to provide the trajectory and shape of both the shock and Sn-PMMA interface. In addition, the shock velocity in the Sn is determined for asymmetric target geometries.
NTIS
Radiography ; Hydrodynamics ; Time Dependence

20020006105 Los Alamos National Lab. , NM USA
Analysis of data from z-pinch mtf target plasma experiments
Wysocki, F. ; Taccetti, J. ; Apr. 01, 1999 ; 5p ; In English
Report No.(s): DE2001-772999 ; LA-UR-99-3581 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Los Alamos National Laboratory Colt facility has been used to create target plasma for Magnetized Target Fusion (MTF). The primary results regarding magnetic field, plasma density, plasma temperature, and hot plasma lifetime are summarized and the suitability of these plasma targets for MTF is assessed.
NTIS
Targets ; Controlled Fusion ; Plasmas (Physics) ; Zeta Pinch

20020006124 Oak Ridge National Lab. , TN USA
Charge Transfer Experiment
Havener, C. C. ; Feb. 26, 2001 ; 19p ; In English
Report No.(s): DE2001-776211 ; P01-110084 ; No Copyright ; Avail: Department of Energy Information Bridge
Low energy charge transfer is an important process in plasmas where multicharged ions and neutral atoms or molecules can exist at eV/amu energies and below. At eV/amu collision energies there are no scaling laws to characterize the charge transfer cross section and both theory and experiment are difficult. The capabilities of current experimental techniques used to measure low energy total and state-selective cross sections are discussed.
NTIS
Charge Transfer ; Molecules ; Ions ; Plasmas (Physics) ; Energy Transfer

20020006132 Princeton Univ. , Plasma Physics Lab. , NJ USA
Fundamental Statistical Descriptions of Plasma Turbulence in Magnetic Fields
Krommes, J. A. ; Feb. 16, 2001 ; 368p ; In English
Report No.(s): DE2001-775687 ; PPPL-3546 ; No Copyright ; Avail: Department of Energy Information Bridge
A pedagogical review of the historical development and current status (as of early 2000) of systematic statistical theories of plasma turbulence is undertaken. Emphasis is on conceptual foundations and methodology, not practical applications. Particular attention is paid to equations and formalism appropriate to strongly magnetized, fully ionized plasmas. Extensive reference to the literature on neutral-fluid turbulence is made, but the unique properties and problems of plasmas are emphasized throughout. Discussions are given of quasilinear theory, weak-turbulence theory, resonance-broadening theory, and the clump algorithm. Those are developed independently, then shown to be special cases of the direct-interaction approximation (DIA), which provides

a central focus for the article. Various methods of renormalized perturbation theory are described, then unified with the aid of the generating-functional formalism of Martin, Siggia, and Rose. A general expression for the renormalized dielectric function is deduced and discussed in detail. Modern approaches such as decimation and PDF methods are described. Derivations of DIA-based Markovian closures are discussed. The eddy-damped quasinormal Markovian closure is shown to be nonrealizable in the presence of waves, and a new realizable Markovian closure is presented. The test-field model and a realizable modification thereof are also summarized. Numerical solutions of various closures for some plasma-physics paradigms are reviewed. The variational approach to bounds on transport is developed. Miscellaneous topics include Onsager symmetries for turbulence, the interpretation of entropy balances for both kinetic and fluid descriptions, self-organized criticality, statistical interactions between disparate scales, and the roles of both mean and random shear. Appendices are provided on Fourier transform conventions, dimensional and scaling analysis, the derivations of nonlinear gyrokinetic and gyrofluid equations, stochasticity criteria for quasilinear theory, formal aspects of resonance-broadening theory, Novikov's theorem, the treatment of weak inhomogeneity, the derivation of the Vlasov weak-turbulence wave kinetic equation from a fully renormalized description, some features of a code for solving the direct-interaction approximation and related Markovian closures, the details of the solution of the EDQNM closure for a solvable three-wave model, and the notation used in the article.
NTIS
Plasma Turbulence ; Magnetic Fields ; Perturbation Theory ; Plasma Physics ; Nonlinear Equations ; Numerical Analysis ; Turbulent Flow

20020006213 Research Triangle Inst. , Research Triangle Park, NC USA
Comprehensive Evaluation of Catalytic Hydroreduction and Nonthermal Plasma as Alternative Technologies for Detoxification of Chemical Wastes ***Final Report , 1 Apr. 1995-30 Sep. 2001***
Jang, B. W. ; Spivey, J. J. ; Savage, C. R. ; Timmons, R. B. ; Sep. 2001 ; 51p ; In English
Contract(s)/Grant(s): DAAH04-95-K-0001
Report No.(s): AD-A395435 ; ARO-34523.6-CH-ERI ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The longevity of the catalytic hydrotreatment of chloroethyl ethyl sulfide has been demonstrated over Ni-Mo/AC and Pt/MZ391 catalysts. 99.996% to 99.999% destruction efficiency was achieved. The results suggest that catalytic Hydrotreatment is a promising technology for the detoxification of mustard gas. The RF non-thermal plasma technology has been successfully demonstrated to be effective for the removal and destruction of DNT, TNT, RDX, and Comp B on shell surfaces. Destruction and removal efficiency above 99.99% was achieved for most of the tests. N2, CO2, and H2O are the major decontamination products with small amounts of NO(sub x), mainly NO, generated. The process is economical and environmentally benign. It is estimated that the current nondestructive decontamination process can be scaled up to decontaminate shell casings at an operating cost of less than $30/metric ton.
DTIC
Decontamination ; Catalysts ; Hazardous Wastes ; Plasmas (Physics)

20020006330 Florida State Univ. , Tallahassee, FL USA
Thermal hydraulic characteristics study of prototype NET and CEA Cable-In-Conduit Conductors (CICCs)
Maekawa, R. ; Oct. 31, 1995 ; 178p ; In English
Report No.(s): DE2001-6638 ; No Copyright ; Avail: Department of Energy Information Bridge
The thermal hydraulic characteristics of low temperature helium in a Cable-in-Conduit Conductor (CICC) significantly affects the overall design and performance of the associated large scale superconducting magnet system. It is essential to understand the transient and steady state behavior of the helium in the conductor. Throughout the development of CICCs, the reduction of flow impedance has been one of the key factors to improving the overall pressure drop. The newly developed CICC for the ITER (International Thermonuclear Experimental Reactor) project has a hybrid cooling scheme: a central channel that is surrounded by bundles, for which the thermal hydraulic characteristics are not well understood. This thesis describes an experimental and analytical investigation of thermal hydraulic characteristics of low temperature helium in conventional and hybrid CICCs. Pressure drop measurements for both NET and CEA conductors have been conducted, using low temperature helium and liquid nitrogen to obtain a range of Reynolds numbers. The results are correlated with classical friction factor and Reynolds number analysis. The flow impedance reduction of the CEA conductor is described by measures of a developed flow model. Thermally induced flow in the CEA conductor has been studied with an inductive heating method. The induced velocity in the central channel is measured by a Pitot tube with steady state Reynolds number up to (approximately) 7000. The transient pressure wave propagation has been recorded with pressure transducers placed equally along the conductor. The supercritical helium temperature in the central channel has been measured with the thermometer probe. However, the reduction of the central channel area significantly affects the overall thermal hydraulic characteristics of the conductor. The results suggest the importance

of the central channel. A transient heat transfer experiment studied the.transverse heat transfer mechanism in the CEA conductor. The temperatures in the central channel and bundle region were measured with different sized heat pulses. The results are discussed in terms of a heat transfer model which is based upon the communication of the helium in the central channel and bundle.
NTIS
Thermohydraulics ; Conductors

20020006384 Princeton Univ. , Plasma Physics Lab. , NJ USA
Plasma-material Interactions in Current Tokamaks and their Implications for Next-step Fusion Reactors
Federici, G. ; Skinner, C. H. ; Brooks, J. N. ; Coad, J. P. ; Grisolia, C. ; Jan. 10, 2001 ; 340p ; In English
Report No.(s): DE2001-773280 ; PPPL-3531 ; No Copyright ; Avail: Department of Energy Information Bridge
The major increase in discharge duration and plasma energy in a next-step DT (deuterium-tritium) fusion reactor will give rise to important plasma-material effects that will critically influence its operation, safety, and performance. Erosion will increase to a scale of several centimeters from being barely measurable at a micron scale in today's tokamaks. Tritium co-deposited with carbon will strongly affect the operation of machines with carbon plasma-facing components. Controlling plasma wall interactions is critical to achieving high performance in present-day tokamaks and this is likely to continue to be the case in the approach to practical fusion reactors. Recognition of the important consequences of these phenomena has stimulated an internationally coordinated effort in the field of plasma-surface interactions supporting the Engineering Design Activities of the International Thermonuclear Experimental Reactor (ITER) project and significant progress has been made in better under standing these issues. This paper reviews the underlying physical processes and the existing experimental database of plasma-material interactions both in tokamaks and laboratory simulation facilities for conditions of direct relevance to next-step fusion reactors. Two main topical groups of interactions are considered: (1) erosion/redeposition from plasma sputtering and disruptions, including dust and flake generation, and (2) tritium retention and removal. The use of modeling tools to interpret the experimental results and make projections for conditions expected in future devices is explained. Outstanding technical issues and specific recommendations on potential R and D (Research and Development) avenues for their resolution are presented.
NTIS
Tritium ; Plasma Interactions ; Fusion Reactors ; Thermonuclear Reactions ; Tokamak Devices

20020006765 Princeton Univ. , Plasma Physics Lab. , NJ USA
Localized Ballooning Modes in Compact Quasiaxially Symmetric Stellarators
Redi, M. H. ; Canik, J. ; Dewar, R. L. ; Fredrickson, E. D. ; Cooper, W. A. ; Jun. 14, 2001 ; 8p ; In English
Report No.(s): DE2001-786576 ; PPPL-3578 ; No Copyright ; Avail: Department of Energy Information Bridge
Understanding of ballooning mode stability boundaries may lead to performance improvement of toroidal devices through control of plasma disruptions. Toroidally localized ballooning modes have been found as precursors to high-beta plasma disruptions on the Tokamak Fusion Test Reactor (TFTR) arising in conditions of n=1 kink mode asymmetry. Recent optimization has shown that magnetohydrodynamic (MHD) stability as well as good particle confinement are likely to be achievable in the National Compact Stellarator Experiment (NCSX), a compact, quasiaxially symmetric stellarator (QAS) for values of the plasma near beta = 4%. The configuration, with a major radius of 1.42 m, an aspect ratio of 4.4, a toroidal magnetic field 1.2-1.7 T and 6 MW of neutral-beam heating, is stable to MHD instabilities, and is expected to be limited by high-n kink and ballooning modes. This paper describes the ballooning eigenvalue isosurfaces for NCSX, the first step in an examination of the kinetic stabilization of the ballooning beta limit using a hybrid WKB approach.
NTIS
Tokamak Devices ; Ballooning Modes ; Magnetohydrodynamic Stability

20020006766 Princeton Univ. , Plasma Physics Lab. , NJ USA
Study of Local Reconnection Physics in a Laboratory Plasma
Ji, H. ; Carter, T. ; Hsu, S. ; Yamada, M. ; Jun. 11, 2001 ; 22p ; In English
Report No.(s): DE2001-786575 ; PPPL-3577 ; No Copyright ; Avail: Department of Energy Information Bridge
A short review of physics results obtained in the Magnetic Reconnection Experiment (MRX) is given with an emphasis on the local features of magnetic reconnection in a controlled environment. Stable two-dimensional current sheets are formed and sustained by induction using two internal coils. The observed reconnection rates are found to be quantitatively consistent with a generalized Sweet-Parker model which incorporates compressibility, unbalanced upstream-downstream pressure, and the effective resistivity. The latter is significantly enhanced over its classical values in the low collisionality regime. Strong local ion heating is measured by an optical probe during the reconnection process, and at least half of the increased ion energy must be due to nonclassical processes, consistent with the resistivity enhancement. Characteristics of high-frequency electrostatic and

electromagnetic fluctuations detected in the current sheet suggest presence of the lower-hybrid-drift-like waves with significant magnetic components. The detailed structures of the current sheet are measured and compared with Harris theory and two-fluid theory.
NTIS
Plasmas (Physics) ; Magnetic Field Reconnection ; Controlled Atmospheres

20020006767 Princeton Univ. , Plasma Physics Lab. , NJ USA
High-harmonic Fast-wave Heating in NSTX
LeBlanc, B. P. ; Bell, R. E. ; Bonoli, P. T. ; Hosea, J. C. ; Johnson, D. W. ; Jun. 11, 2001 ; 12p ; In English
Report No.(s): DE2001-786574 ; PPPL-3576 ; No Copyright ; Avail: Department of Energy Information Bridge
High-Harmonic Fast-Wave (HHFW), a radio-frequency technique scenario applicable to high-beta plasmas, has been selected as one of the main auxiliary heating systems on the National Spherical Torus Experiment (NSTX). The HHFW antenna assembly comprises 12 toroidally adjacent current elements, extending poloidally and centered on the equatorial plane. This paper reviews experimental results obtained with a symmetrical (vacuum) launching spectrum with k(parallel lines) = 14 m(superscript '-1') at a frequency of 30 MHz. We describe results obtained when HHFW power is applied to helium and deuterium plasmas, during the plasma-current flattop period of the discharge. Application of 1.8-MW HHFW pulse to MHD quiescent plasmas resulted in strong electron heating, during which the central electron temperature T(subscript 'eo') more than doubled from approximately 0.5 keV to 1.15 keV. In deuterium plasmas, HHFW heating was found less efficient, with a central electron temperature increase of the order of 40% during a 1.8-MW HHFW pulse, from approximately 400 eV to approximately 550 eV. (At HHFW power of 2.4 MW, central electron temperature increased by 60%, reaching 0.625 keV.) HHFW heating in presence of MHD activity is also discussed. A short neutral-beam pulse was applied to permit charge-exchange recombination spectroscopy (CHERS) measurement of the impurity ion temperature T(subscript 'i'). Preliminary CHERS analysis show that ion temperature approximately equals electron temperature during HHFW heating. of special interest are deuterium discharges, where the application of HHFW power was done during the current ramp-up. We observe the creation of large density gradients in the edge region. In the latter case, the density rose spontaneously to n (subscript 'eo') less than or equal to 8 x 10 (superscript '13') cm (superscript '3').
NTIS
Plasma Density ; Deuterium Plasma ; Magnetohydrodynamics ; Charge Transfer

20020006878 Los Alamos National Lab. , NM USA
Transport Implications of Magnetic Helicity Injection
Moses, R. W. ; Gerwin, R. A. ; Schoenberg, K. F. ; Sep. 01, 2001 ; 40p ; In English
Report No.(s): PB2001-108000 ; LA-13852-MS ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Magnetic helicity injection is assessed as a means of sustaining macroscopic steady-state plasma currents in magnetic confinement devices. Coaxial helicity injection using electrodes (CHI) and oscillating field current drive (OFCD) are compared to inductive current drive. Magnetic helicity, K, is uniquely defined as the volume integral of A.B when the surface components of A are purely solenoidal. Using an Ohm's law including Hall terms, magnetic helicity transport modeling shows that no closed magnetic surfaces with time- and volume-averaged parallel currents can exist continuously within a plasma sustained only by CHI or OFCD. For CHI, parallel-thermal transport connects all parts of the plasma to the electrodes. It is shown that in fusion plasma configurations sustained by electrode helicity injection, the core electron temperature (in electron volts) can at most be 25% to 40% of the electrode voltage (in volts). For OFCD, parallel transport must also connect all of the plasma to the edge region.
NTIS
Magnetic Fields ; Plasma Currents ; Steady State ; Injection

20020007085 Princeton Univ. , Plasma Physics Lab. , NJ USA
Princeton Plasma Physics Laboratory Annual Site Environmental Report for Calendar Year 1999
Finley, V. ; Apr. 20, 2001 ; 109p ; In English
Report No.(s): DE2001-786573 ; PPPL-3557 ; No Copyright ; Avail: Department of Energy Information Bridge
The results of the 1999 environmental surveillance and monitoring program for the Princeton Plasma Physics Laboratory (PPPL) are presented and discussed. The purpose of this report is to provide the U.S. Department of Energy and the public with information on the level of radioactive and non-radioactive pollutants (if any) that are added to the environment as a result of PPPLs operations. The report also summarizes environmental initiatives, assessments, and programs that were undertaken in 1999.The Princeton Plasma Physics Laboratory has engaged in fusion energy research since 1951. The long-range goal of the U.S. Magnetic Fusion Energy Research Program is to create innovations to make fusion power a practical reality, an alternative energy

source. 1999 marked the first year of National Spherical Torus Experiment (NSTX) operations and Tokamak Fusion Test Reactor (TFTR) dismantlement and deconstruction activities. A collaboration among fourteen national laboratories, universities, and research institutions, the NSTX is a major element in the U.S. Fusion Energy Sciences Program. It has been designed to test the physics principles of spherical torus (ST) plasmas. The ST concept could play an important role in the development of smaller, more economical fusion reactors. With its completion within budget and ahead of its target schedule, NSTX first plasma occurred on February 12, 1999. The 1999 performance of the Princeton Plasma Physics Laboratory was rated outstanding by the U.S. Department of Energy in the Laboratory Appraisal report issued early in 2000. The report cited the Laboratorys consistently excellent scientific and technological achievements, its successful management practices, and included high marks in a host of other areas including environmental management, employee health and safety, human resources administration, science education, and communications.Groundwater investigations continued under a voluntary agreement with the New Jersey Department of Environmental Protection. PPPL monitored for the presence of non-radiological contaminants, mainly volatile organic compounds (components of degreasing solvents). Monitoring revealed the presence of low levels of volatile organic compounds in an area adjacent to PPPL.Also, PPPLs radiological monitoring program characterized the ambient,background levels of tritium in the environment and from the TFTR stack; the data are presented in this report.
NTIS
Environmental Monitoring ; Plasmas (Physics) ; Environment Management ; Fusion Reactors ; Ground Water

20020008099 Princeton Univ. , Plasma Physics Lab. , NJ USA
Low Frequency Fishbone Mode Induced by Circulating Particles in Spherical Tori
Kolesnichenko, Y. I. ; Marchenko, V. S. ; White, R. B. ; Feb. 02, 2001 ; 13p ; In English
Report No.(s): DE2001-775577 ; PPPL-3540 ; No Copyright ; Avail: Department of Energy Information Bridge
It is found that high beta in low-aspect-ratio tori tends to stabilize the fishbone instability in a plasma with energetic circulating ions. The stabilization results from enhancement of the toroidal drift motion by large Shafranov shift, which makes it difficult to reconcile the condition of considerable energy exchange between the ions and the internal kink perturbation with the condition of the resonant wave-particle interaction.
NTIS
Circulation ; Ions ; Stabilization ; Toruses

20020008643 Argonne National Lab. , IL USA
Pair creation and plasma oscillations
Prozorkevich, A. V. ; Vinnik, D. V. ; Schmidt, S. M. ; Hecht, M. B. ; Roberts, C. D. ; Dec. 15, 2000 ; 13p ; In English
Report No.(s): DE2001-772134 ; ANL/PHY/CP-103670 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We describe aspects of particle creation in strong fields using a quantum kinetic equation with a relaxation-time approximation to the collision term. The strong electric background field is determined by solving Maxwell's equation in tandem with the Vlasov equation. Plasma oscillations appear as a result of feedback between the background field and the field generated by the particles produced. The plasma frequency depends on the strength of the initial background fields and the collision frequency, and is sensitive to the necessary momentum-dependence of dressed-parton masses.
NTIS
Pair Production ; Plasma Waves ; Plasma Oscillations ; Collision Rates

20020008679 Lawrence Livermore National Lab. , Livermore, CA USA
Modeling beam-driven and laser-driven plasma Wakefield accelerators with XOOPIC
Bruhwiler, D. L. ; Giacone, R. ; Cary, J. R. ; Verboncoeur, J. P. ; Mardahl, P. ; Jun. 01, 2000 ; 14p ; In English
Report No.(s): DE2001-776653 ; LBNL-47538 ; No Copyright ; Avail: Department of Energy Information Bridge
We present 2-D particle-in-cell simulations of both beam-driven and laser-driven plasma wakefield accelerators, using the object-oriented code XOOPIC, which is time explicit, fully electromagnetic, and capable of running on massively parallel supercomputers. Simulations of laser-driven wakefields with low (approximately 10(exp 16) W/square cm) and high (approximately 10(exp 18) W/square cm) peak intensity laser pulses are conducted in slab geometry, showing agreement with theory. Simulations of the E-157 beam wakefield experiment at the Stanford Linear Accelerator Center, in which a 30 GeV electron beam passes through 1 m of preionized lithium plasma, are conducted in cylindrical geometry, obtaining good agreement

with previous work. We briefly describe some of the more significant modifications to XOOPIC required by this work, and summarize the issues relevant to modeling electron-neutral collisions in a particle-in-cell code.
NTIS
Electron Beams ; Lasers ; Plasma Accelerators

20020008680 Argonne National Lab. , IL USA
Betatron radiation from electron beams in plasma focusing channels
Esarey, E. ; Catravas, P. ; Leemans, W. P. ; Jun. 01, 2000 ; 14p ; In English
Report No.(s): DE2001-776651 ; LBNL-47535 ; No Copyright ; Avail: Department of Energy Information Bridge
Spontaneous radiation emitted from an electron undergoing betatron motion is a plasma focusing channel is analyzed and applications to plasma wakefield accelerator experiments and to the ion channel laser (ICL) are discussed. Important similarities and differences between a free electron laser (FEL) and in an ICL are delineated. It is shown that the frequency of spontaneous radiation is a strong function of the betatron strength parameter a(sub (beta)), which plays a similar role to that of the wiggler strength parameter in a conventional FEL. For a(sub (beta)) (approx-gt) 1, radiation is emitted in numerous harmonics. Furthermore, a(sub (beta)) is proportional to the amplitude of the betatron orbit, which varies for every electron in the beam. This places serious limits on the possibility of realizing an ICL.
NTIS
Electron Beams ; Plasma Accelerators ; Free Electron Lasers

20020009495 Brookhaven National Lab. , Upton, NY USA
Design, fabrication and test of the react and wind, Nb3Sn, LDX floating coil conductor
Smith, ; Michael, ; Minervini, ; Takayasu, ; Schultz, ; Sep. 17, 2000 ; 5p ; In English
Report No.(s): DE2001-781377 ; BNL-68286 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Levitated Dipole Experiment (LDX) is a novel approach for studying magnetic confinement of a fusion plasma. In this approach, a superconducting ring coil is magnetically levitated for up to 8 hours a day in the center of a 5 meter diameter vacuum vessel. The levitated coil, with on-board helium supply, is called the gloating Coil (F-Coil). Although the maximum field at the coil is only 5.3 tesla, a react-and-wind Nb3Sn conductor was selected because the relatively high critical temperature will enable the coil to remain levitated while it warms from 5 K to 10 K. Since pre-reacted Nb3Sn tape is no longer commercially available, a composite conductor was designed that contains an 18 strand Nb3Sn Rutherford cable. The cable was reacted and then soldered into a structural copper channel that completes the conductor and also provides quench protection. The strain state of the cable was continuously controlled during fabrication steps such as: soldering into the copper channel, spooling, and coil winding, to prevent degradation of the critical current. Measurements of strand and cable critical currents are reported, as well as estimates of the effect of fabrication, winding and operating strains on critical current.
NTIS
Magnetic Suspension ; Plasmas (Physics) ; Magnetic Coils ; Plasma Control

20020009588 Princeton Univ. , Plasma Physics Lab. , NJ USA
Magnetorotational Instability in a Rotating Liquid Metal Annulus
Ji, H. ; Goodman, J. ; Kageyama, A. ; Mar. 10, 2001 ; 9p ; In English
Report No.(s): DE2001-780617 ; PPPL-3548 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Although the magnetorotational instability (MRI) has been widely accepted as a powerful accretion mechanism in magnetized accretion disks, it has not been realized in the laboratory. The possibility of studying MRI in a rotating liquid-metal annulus (Couette flow) is explored by local and global stability analysis and magnetohydrodynamic (MHD) simulations. Stability diagrams are drawn in dimensionless parameters, and also in terms of the angular velocities at the inner and outer cylinders. It is shown that MRI can be triggered in a moderately rapidly rotating table-top apparatus, using easy-to-handle metals such as gallium. Practical issues of this proposed experiment are discussed.
NTIS
Liquid Metals ; Accretion Disks ; Magnetohydrodynamics ; Couette Flow ; Angular Velocity

20020009690 Princeton Univ. , Plasma Physics Lab. , NJ USA
Impact of MHD Equilibrium Input Variations on the High-Beta Stability Boundaries of NSTX
Paoletti, F. ; Sabbagh, S. A. ; Manickam, J. ; Menard, J. ; Akers, R. J. ; Mar. 20, 2001 ; 15p ; In English
Report No.(s): DE2001-781170 ; PPPL-3550 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Ideal MHD stability limits of anticipated plasma configurations for the National Spherical Torus Experiment (NSTX) (Ono, M., et al., Nucl. Fusion 40 (2000) 557) and the dependence on the parameters defining the MHD equilibrium are evaluated. The study provides a quantitative computational evaluation of the stability limit variations induced by changes to the equilibrium of NSTX high-beta plasmas. The analysis is based on a reference free-boundary equilibrium with beta = 41.5%, monotonic safety factor q profile, and broad pressure profile p. On this reference target local variation of the plasma boundary, safety factor q, and pressure p profiles are imposed. Localized inflection of the outboard plasma boundary, produced by near-field effects from poloidal shaping field coils, weaken the stability due to the destabilization of high-n ballooning modes. Variation of the q profile at different radial location can also degrade stability. Both experimental profiles from existing tokamaks and spherical torus machines and profiles generated from transport modeling of anticipated neutral-beam-heated plasmas are used. Degraded stability is found at increasing pressure peaking factor due to the destabilization of n = 1 kink/ballooning modes. Direct access to the second region of stability is found in certain configurations and, for the entire set of variations considered, the lower calculated beta-limits values are still in the range of 20.0% without considering the stabilizing effect of the passive conducting structures.
NTIS
Stability ; Magnetohydrodynamic Stability ; Ballooning Modes ; Destabilization ; Magnetohydrodynamics

20020009691 Princeton Univ. , Plasma Physics Lab. , NJ USA
Parametric Excitations of Fast Plasma Waves by Counter-propagating Laser Beams
Shvets, G. ; Fisch, N. J. ; Mar. 19, 2001 ; 18p ; In English
Report No.(s): DE2001-781169 ; PPPL-3549 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Short- and long-wavelength plasma waves can become strongly coupled in the presence of two counter-propagating laser pump pulses detuned by twice the cold plasma frequency. What makes this four-wave interaction important is that the growth rate of the plasma waves occurs much faster than in the more obvious co-propagating geometry.
NTIS
Plasma Waves ; Pulsed Lasers ; Laser Beams

20020010240 Sandia National Labs. , Albuquerque, NM USA
Analysis of Radiation-Driven Explosive Flyers
Lawrence, R. J. ; Asay, J. R. ; Trucano, T. G. ; Hall, C. A. ; Jul. 19, 1999 ; 6p ; In English
Report No.(s): DE2001-9502 ; SAND99-0036C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
There is great interest in being able to use the x-ray output from a Z-pinch for equation of state measurements at extreme conditions. However, the direct x-ray output form the pinch produces a very sharp and rapidly attenuating pressure pulse in target materials. to obtain high quality measurements with this source, a mechanism for generating non-attenuating waves is needed. One possibility involves using the x-ray source to throw a near-normal density intermediate drive at the target, a situation similar to more conventional configurations. to scope out preliminary design parameters, they used the ALEGRA code to simulate a number of different possibilities involving the driver and the gap between it and the target. They used a somewhat idealized radiation source--a main x-ray pulse 30 ns long at its base and peaking at a blackbody temperature of 100 eV. The calculations suggest that a 100-micron aluminum driver with a 90-micron gap will yield a 15-ns-wide non-attenuating pulse with an amplitude of over 250 GPa.
NTIS
Equations of State ; X Ray Sources ; Zeta Pinch ; Radiation Sources

20020010373 Princeton Univ. , Plasma Physics Lab. , NJ USA
Drift Mode Calculations in Nonaxisymmetric Geometry
Rewoldt, G. ; Ku, L. P. ; Cooper, W. A. ; Tang, W. M. ; Jul. 01, 1999 ; 23p ; In English
Report No.(s): DE2001-9115 ; PPPL-3354 ; DE-AC02-76CHO3073 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A fully kinetic assessment of the stability properties of toroidal drift modes has been obtained for nonaxisymmetric (stellarator) geometry, in the electrostatic limit. This calculation is a comprehensive solution of the linearized gyrokinetic equation, using the lowest-order 'ballooning representation' for high toroidal mode number instabilities, with a model collision operator. Results for toroidal drift waves destabilized by temperature gradients and/or trapped particle dynamics are presented, using three-dimensional magnetohydrodynamic equilibria generated as part of a design effort for a quasiaxisymmetric stellarator. Comparisons of these results with those obtained for typical tokamak cases indicate that the basic trends are similar.
NTIS
Stability ; Drift (Instrumentation) ; Stellarators

20020010374 Lawrence Livermore National Lab. , Livermore, CA USA

Scientific Benefits of Inertially Confined Fusion Research

Key, M. ; May 14, 1999 ; 18p ; In English

Report No.(s): DE2001-9096 ; UCRL-ID-134026 ; No Copyright ; Avail: Department of Energy Information Bridge

A striking feature of 25 years of research into inertially confined fusion (ICF) and inertial fusion energy (IFE) has been its significant impact in other fields of science. Most ICF facilities worldwide are now being used in part to support a wider portfolio of research than simply ICF. Reasons for this trend include the high intrinsic interest of the new science coupled with the relative ease and low marginal cost of adapting the facilities, particularly lasers, to carry out experiments with goals other than ICF. The availability at ICF laboratories of sophisticated theory and modeling capability and advanced diagnostics has given added impetus. The expertise of ICF specialists has also triggered more lateral scientific spin-offs leading for example to new types of lasers and to related developments in basic science. In a generic sense, the facilities developed for ICF have made possible study of new regimes of the properties of matter at extremely high-energy density and the interaction of ultraintense light with matter. This general opportunity has been exploited in numerous and diverse specific lines of research. Examples elaborated below include laboratory simulation of astrophysical phenomena; studies of the equation of state (EOS) of matter under conditions relevant to the interior of planets and stars; development of uniquely intense sources of extreme ultraviolet (EUV) to hard x-ray emission, notably the x-ray laser; understanding of the physics of strong field interaction of light and matter; and related new phenomena such as laser-induced nuclear processes and high-field-electron accelerators. Some of these developments have potential themselves for further scientific exploitation such as the scientific use of advanced light sources. There are also avenues for commercial exploitation, for example the use of laser plasma sources in EUV lithography. Past scientific progress is summarized here and projections are made for new science that may flow from the next generation of ICF and IFE driver facilities. It will be seen that this beneficial spin off strengthens the case for investing in ICF and IFE.

NTIS

Equations of State ; Inertial Confinement Fusion ; Research Facilities ; Lasers

20020010624 Lawrence Livermore National Lab. , Livermore, CA USA

Thomson scattering from Inertial Confinement Fusion targets

Baldis, H. A. ; Estabrook, K. G. ; Glenzer, S. H. ; Suter, L. J. ; Jul. 22, 1999 ; 8p ; In English

Report No.(s): DE2001-9357 ; UCRL-JC-134883 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We have applied ultraviolet Thomson scattering to accurately measure the electron and ion temperature in high-density gas-filled hohlraums at the Nova laser facility. The implementation of a short-wavelength probe laser that operates at 263 nm (4(omega)) has allowed us for the first time to investigate scalings to high gas fill densities and to characterize the hohlraum conditions of the low-Z gas plasma. as well as of the high-Z wall plasma. These measurements have provided us with a unique data set that we use to make critical comparisons with radiation-hydrodynamic modeling using the code LASNEX. This code is presently being applied to design fusion targets for the National Ignition Facility. The Thomson scattering experiments show the existence of electron temperature gradients in the gas plasma that are well modeled when including a self-consistent calculation of magnetic fields. The fields are of relatively small strength not affecting the Thomson scattering spectra directly but limiting the electron thermal transport in the gas resulting into temperature gradients consistent with the experimental observations. In addition, the ion temperature data show that the stagnation time of the gas plasma on the hohlraum axis, which is driven by the radial inward flowing plasma, is sensitive to the gas fill density and is well described by the calculations.

NTIS

Inertial Confinement Fusion ; Thomson Scattering ; Hohlraums

20020010921 Lawrence Livermore National Lab. , Livermore, CA USA

Thermal electric and magnetic fields at the surface of an electron beam target

Garcia, M. ; Jun. 09, 1999 ; 20p ; In English

Report No.(s): DE2001-9124 ; UCRL-JC-134513 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A relativistic electron beam pulse of high current density will heat a thin target plate to a plasma state as it traverses. The gradient of plasma temperature - Te is predominantly radial, and the gradient of plasma density - ne is predominantly axial. The cross product of these terms is significant at the vacuum-to-metal interface through which the beam enters. This cross product is a thermal source of magnetization, which can be much larger than the vacuum magnetic field of the electron beam, and it is of opposite polarity. The thermal energy density in the target can be hundreds of times larger than the energy density of the vacuum magnetic field of the beam. If the nose of the electron beam current pulse rises linearly with time then the thermal magnetization

increases as time squared. Heat pushes electrons axially from the interior of the plate to the surfaces, and radially away from the beam axis. The electric field that arises from this effect is essentially the negative of the pressure gradient, it points outward.
NTIS
Targets ; Magnetic Fields ; Electric Fields ; Thermal Energy ; Relativistic Electron Beams

20020010924 Lawrence Livermore National Lab. , Livermore, CA USA
Voltage breakdown limits at a high material temperature for rapid pulse heating in a vacuum
Pincosy, P. A. ; Speer, R. ; Jun. 07, 1999 ; 7p ; In English
Report No.(s): DE2001-9109 ; UCRL-JC-132642 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The proposed Advanced Hydro Facility (AHF) is required to produce multi-pulse radiographs. Electron beam pulse machines with sub-microsecond repetition are not yet available to test the problem of electron beam propagation through the hydro-dynamically expanding plasma from the nearby previously heated target material. A proposed test scenario includes an ohmically heated small volume of target material simulating the electron beam heating, along with an actual electron beam pulse impinging on nearby target material. A pulse power heating circuit was tested to evaluate the limits of pulse heating a small volume of material to tens of kilo-joules per gram. The main pulse heating time (50 to 100 ns) was to simulate the electron beam heating of a converter target material. to avoid skin heating non-uniformity a longer time scale pulse of a few microseconds first heats the target material to a few thousand degrees near the liquid to vapor transition. Under this state the maximum electric field that the current carrying conductor can support is the important parameter for insuring that the 100 ns heating pulse can deposit sufficient power. A small pulse power system was built for tests of this limit. Under cold conditions the vacuum electric field hold-off limit has been quoted as high as many tens of kilovolts per centimeter. The tests for these experiments found that the vacuum electric field hold-off was limited to a few kilovolts per centimeter when the material approached melting temperatures. Therefore the proposed test scenario for AHF was not achievable.
NTIS
Pulse Heating ; Plasmas (Physics) ; Vacuum ; Electrical Faults

20020010927 Lawrence Livermore National Lab. , Livermore, CA USA
Self-Effect in Expanding Electron Beam Plasma
Garcia, M. ; May 07, 1999 ; 47p ; In English
Report No.(s): DE2001-9100 ; UCRL-ID-134375 ; No Copyright ; Avail: Department of Energy Information Bridge
An analytical model of plasma flow from a metal plate hit by an intense, pulsed, electron beam aims to bridge the gap between radiation-hydrodynamics simulations and experiments, and to quantify the self-effect of the electron beam penetrating the flow. Does the flow disrupt the tight focus of the initial electron bunch, or later pulses in a train? This work aims to model the spatial distribution of plasma speed, density, degree of ionization, and magnetization to inquire. The initial solid density, several eV plasma expands to 1 cm and 10(exp -4) relative density by 2 microseconds, beyond which numerical simulations are imprecise. Yet, a Faraday cup detector at the ETA-II facility is at 25 cm from the target and observes the flow after 50 microseconds. The model helps bridge this gap. The expansion of the target plasma into vacuum is so rapid that the ionized portion of the flow departs from local thermodynamic equilibrium. When the temperature (in eV) in a parcel of fluid drops below V(sub i) x ((2(gamma)-2)/(5(gamma)+17)), where V(sub i) is the ionization potential of the target metal (7.8 eV for tantalum), and gamma is the ratio of specific heats (5/3 for atoms), then the fractional ionization and electron temperature in that parcel remain fixed during subsequent expansion. The freezing temperature as defined here is V(sub i)/19. The balance between the self-pinching force and the space charge repulsion of an electron beam changes on penetrating a flow: (1) the target plasma cancels the space-charge field; (2) internal eddy currents arise to counter the magnetization of relativistic electrons; and (3) electron beam heating alters the flow magnetization by changing the plasma density gradient and the magnitude of the conductivity.
NTIS
Electron Beams ; Hydrodynamics ; Magnetohydrodynamic Flow ; Mathematical Models ; Spatial Distribution ; Plasmas (Physics)

20020010928 Lawrence Livermore National Lab. , Livermore, CA USA
Technology Benefits of Inertial Confinement Fusion Research
Powell, H. T. ; May 26, 1999 ; 27p ; In English
Report No.(s): DE2001-9099 ; UCRL-ID-134137 ; No Copyright ; Avail: Department of Energy Information Bridge
The development and demonstration of inertial fusion is incredibly challenging because it requires simultaneously controlling and precisely measuring parameters at extreme values in energy, space, and time. The challenges range from building megajoule (10(exp 6) J) drivers that perform with percent-level precision to fabricating targets with submicron specifications to

measuring target performance at micron scale (10(exp -6) m) with picosecond (10(exp -12) s) time resolution. Over the past 30 years in attempting to meet this challenge, the inertial fusion community around the world has invented new technologies in lasers, particle beams, pulse power drivers, diagnostics, target fabrication, and other areas. These technologies have found applications in diverse fields of industry and science. Moreover, simply assembling the teams with the background, experience, and personal drive to meet the challenging requirements of inertial fusion has led to spin-offs in unexpected directions, for example, in laser isotope separation, extreme ultraviolet lithography for microelectronics, compact and inexpensive radars, advanced laser materials processing, and medical technology. The experience of inertial fusion research and development of spinning off technologies has not been unique to any one laboratory or country but has been similar in main research centers in the US, Europe, and Japan. Strengthening and broadening the inertial fusion effort to focus on creating a new source of electrical power (inertial fusion energy (IFE)) that is economically competitive and environmentally benign will yield rich rewards in technology spin-offs. The additional challenges presented by IFE are to make drivers affordable, efficient, and long-lived while operating at a repetition rate of a few Hertz; to make fusion targets that perform consistently at high-fusion yield; and to create target chambers that can repetitively handle greater than 100-MJ yields while producing minimal radioactive by-products. Meeting these challenges will produce spin-off value of enormous magnitude. By exploring the technology spin-offs of the inertial fusion community to date, we can glimpse the expected future rewards from an IFE program.
NTIS
Inertial Confinement Fusion ; Technology Transfer

20020010931 Princeton Univ. , Plasma Physics Lab. , NJ USA
Design and Operation of Hall Thruster with Segmented Electrodes
Litvak, A. A. ; Dorf, L. A. ; Fisch, N. J. ; Raitses, Y. ; Jul. 01, 1999 ; 11p ; In English
Report No.(s): DE2001-9073 ; PPPL-3353 ; No Copyright ; Avail: Department of Energy Information Bridge
Principles of the Hall thruster with segmented electrodes are explored. A suitable vacuum facility was put into service. For purposes of comparison between segmented and conventional thruster approaches, a modular laboratory prototype thruster was designed and built. Under conventional operation, the thruster achieves state-of-the-art efficiencies (56% at 300 V and 890 W). Very preliminary results under operation with segmented electrodes are also described.
NTIS
Electrodes ; Hall Thrusters ; Prototypes

20020010940 Lawrence Livermore National Lab. , Livermore, CA USA
Kinetic Tandem Concept: Theory and computer simulations of the potential barriers
Byers, J. A. ; Post, R. F. ; Feb. 11, 1999 ; 16p ; In English
Report No.(s): DE2001-8324 ; UCRL-ID-133115 ; Rept-98-FS-001 ; No Copyright ; Avail: Department of Energy Information Bridge
The Kinetic Tandem fusion plasma confinement concept is a member of the class of open magnetic confinement systems whose magnetic topology is that of a tube of magnetic flux open at both ends. In open-ended systems the central problem is that of limiting the rate of plasma losses out the ends. In a conventional tandem mirror system end-plugging is accomplished by the generation of positive potential barriers within special short mirror cells located at each end of a long central confinement cell. The kinetic tandem concept accomplishes the same end result by employing dynamic effects, but without the necessity of special end cells. The field employed in the kinetic tandem is a simple axially symmetric solenoidal field whose intensity tapers to low values at the ends. Since the field line curvature is everywhere positive such a field is stabilizing for MHD interchange modes. Into each end are injected ion beams that are aimed nearly parallel to the field line direction. The ions from these beams then are radially compressed, stopped, and reflected back by magnetic mirror action in climbing up the magnetic gradient. In this way ion density peaks are formed between which the plasma is to be confined. As in the original tandem mirror concept, a localized ambipolar potential arises to maintain quasi-neutrality between the ions and the electrons. provided the plasma density in the plugs is higher than that of the plasma contained between them the ions of the central plasma will be confined between the plugs by the positive potential barriers represented by the plugs. The plasma electrons will at the same time be confined by the overall positive potential of the plasma with respect to the ends. In this report some analytical calculations of the formation of the plugs will be given. These calculations were then confirmed and extended by computer simulations, using the LLNL code ICEPIC. Within the assumptions made in the theoretical calculations and in the code representation, fusion-relevant plug plasma parameters were achieved, and no evidence of unstable behavior was detected in the simulations.
NTIS
Computerized Simulation ; Kinetic Theory ; Magnetohydrodynamics ; Tandem Mirrors ; Plasma Control

20020011153 Lawrence Livermore National Lab. , Livermore, CA USA

Uedge modeling of the effect of divertor modifications on divertor performance

Porter, G. D. ; Rensink, M. ; Roglien, T. ; Wolf, N. S. ; Jun. 23, 1999 ; 6p ; In English

Report No.(s): DE2001-9865 ; UCRL-JC-134531 ; AT5010200 ; No Copyright ; Avail: Department of Energy Information Bridge

The DIII-D upper divertor will be modified in late 1999 by installing a continuous dome in the private flux region with an independent pumping capability for the inner strike point. A ”bump” on the inner cylinder also has been considered to enhance impurity and neutral control. Using the UEDGE code, we have examined the effect of this dome and the ”bump” on core ionization and core impurity content. For typical parameters, results indicate that the planned divertor modifications enable detachment at higher heating power and the ”fueling efficiency” (ratio of core neutral ionization rate to total divertor ion current) decreases, however, the core carbon content increases. The inner ”bump” does enhance ”fueling efficiency” compared to the private flux dome alone, but it does not reduce the increased core impurity content.

NTIS

Diverters ; Plasma Physics

20020011360 NASA Ames Research Center , Moffett Field, CA USA

Neutral Gas Temperature Estimates in an Inductively Coupled CF4 Plasma by Fitting Diatomic Emission Spectra

Cruden, Brett A. , Eloret Corp. , USA ; Rao, M. V. V. S. , Eloret Corp. , USA ; Sharma, Surendra P. , NASA Ames Research Center , USA ; Meyyappan, M. , NASA Ames Research Center , USA ; [2001] ; 31p ; In English

Contract(s)/Grant(s): RTOP 704-40-32 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This work examines the accuracy of plasma neutral temperature estimates by fitting the rotational band envelope of different diatomic species in emission. Experiments are performed in an inductively coupled CF4 plasma generated in a Gaseous Electronics Conference reference cell. Visible and ultraviolet emission spectra are collected at a power of 300 W (approximately 0.7 W/cc) and pressure of 30 mtorr. The emission bands of several molecules (CF, CN, C2, CO, and SiF) are fit simultaneously for rotational and vibrational temperatures and compared. Four different rotational temperatures are obtained: 1250 K for CF and CN, 1600 K for CO, 1800 K for C2, and 2300 K for SiF. The vibrational temperatures obtained vary from 1750-5950 K, with the higher vibrational temperatures generally corresponding to the lower rotational temperatures. These results suggest that the different species have achieved different degrees of equilibration between the rotational and vibrational modes and may not be equilibrated with the translational temperatures. The different temperatures are also related to the likelihood that the species are produced by ion bombardment of the surface, with etch products like SiF, CO, and C2 having higher temperatures than species expected to have formed in the gas phase.

Author

Emission Spectra ; Gas Temperature ; Neutral Gases ; Plasma Temperature ; Spectrum Analysis ; Accuracy

20020011677 NASA Ames Research Center , Moffett Field, CA USA

Etching in Chlorine Discharges Using an Integrated Feature Evolution-Plasma Model

Hwang, Helen H. , NASA Ames Research Center , USA ; Bose, Deepak , Eloret Corp. , USA ; Govindan, T. R. , NASA Ames Research Center , USA ; Meyyappan, M. , NASA Ames Research Center , USA ; May 10, 2001 ; 29p ; In English

Contract(s)/Grant(s): NAS2-99092 ; RTOP 704-40-32 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Etching of semiconductor materials is reliant on plasma properties. Quantities such as ion and neutral fluxes, both in magnitude and in direction, are often determined by reactor geometry (height, radius, position of the coils, etc.) In order to obtain accurate etching profiles, one must also model the plasma as a whole to obtain local fluxes and distributions. We have developed a set of three models that simulates C12 plasmas for etching of silicon, ion and neutral trajectories in the plasma, and feature profile evolution. We have found that the location of the peak in the ion densities in the reactor plays a major role in determining etching uniformity across the wafer. For a stove top coil inductively coupled plasma (ICP), the ion density is peaked at the top of the reactor. This leads to nearly uniform neutral and ion fluxes across the wafer. A side coil configuration causes the ion density to peak near the sidewalls. Ion fluxes are thus greater toward the wall’s and decrease toward the center. In addition, the ions bombard the wafer at a slight angle. This angle is sufficient to cause slanted profiles, which is highly undesirable.

Author

Plasma Etching ; Semiconductors (Materials) ; Ion Density (Concentration)

20020011712 Sandia National Labs. , Albuquerque, NM USA

Equation-of-State Measurements with Z-Pinch Sources

Asay, J. R. ; Hall, C. ; Bailey, J. E. ; Knudson, M. D. ; Holland, K. G. ; Jul. 22, 1999 ; 8p ; In English

Report No.(s): DE2001-9506 ; SAND99-0450C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Validation of material models in a variety of scientific and technological applications requires accurate data regarding the high-pressure thermodynamic and mechanical properties. Traditional laboratory techniques for striking these measurements involve light gas guns to generate the required thermodynamic states, and the use of high-resolution time-resolved diagnostics to measure the desired material properties. EOS and constitutive material properties of importance to modeling needs include high-pressure Hugoniot curves and off-Hugoniot properties, such as. material strength and isentropic compression and decompression (1). Conventional light gas guns are limited to impact pressures of about 7 Mbar in high-impedance materials. Pulsed radiation sources, such as high-intensity lasers, and pulsed power techniques significantly extend the accessible pressures and are becoming accepted methods for meeting the needs of material models in regimes inaccessible by gas guns. A present limitation of these new approaches is that samples must necessarily be small, typically a few tens of microns in thickness, which severely limits the accuracy of EOS measurements that can be made and also the ability to perform a variety of off-Hugoniot measurements. However, recent advances in z-pinch techniques for high-pressure material response studies provide potential opportunities for achieving accuracies comparable with gas guns because of the significantly larger samples that can be studied. Sample thicknesses approaching 1 mm may be possible with advances presently being made. These sample dimensions are comparable with gas gun sample dimensions so that accuracies should be comparable. The Sandia Z accelerator (2) is a recently developed facility that generates x-ray energies of about 2 MJ over time scales of 5-10 ns with resulting temperatures of 100-150 eV in containment fixtures, referred to as hohlraums, that are a few cubic centimeters in volume. This intense radiation source can be used to ablatively drive shock waves to about pressures of about 10 Mbar in a variety of materials. Because of the large source. In this paper, we discuss recent developments in the use of the Sandia Z accelerator for Hugoniot and off-Hugoniot measurements. Preliminary data on high-pressure dynamic response include Hugoniot EOS data on aluminum to about 5 Mbar using the z-pinch technique and isentropic compression data on iron and copper to about 300 and 130 kbar, respectively, using the direct current mode on Z. The isentropic compression experiments are performed on sample thicknesses to 0.8 mm and allow determination of the cx-s phase transition and the kinetic properties of this transition. Specifically, isentropic compression data on iron have been analyzed with a two-phase rate dependent model of the bcc-hcp phase transition, which shows that the relatively slow rates of pressure application achieved with this technique result in observable kinetic effects that can be easily analyzed. Other work in progress with the Z Accelerator includes EOS studies of liquid deuterium and the development of uniform, constant pressure drives that will provide higher accuracy in EOS measurements.
NTIS
Ablative Materials ; Body Centered Cubic Lattices ; Impact Loads ; Equations of State

20020012221 Lawrence Livermore National Lab. , Livermore, CA USA
Stability of spheromaks compressed by liquid walls
Fowler, T. K. ; Aug. 17, 1999 ; 9p ; In English
Report No.(s): DE2001-13826 ; UCRL-ID-135551 ; No Copyright ; Avail: Department of Energy Information Bridge
We consider Rayleigh-Taylor instability of the liquid-plasma interface of a spheromak ignited by slow compression discussed previously. We conclude that instability may indeed occur despite the stabilizing influence of magnetic shear in the spheromak. If it occurs, instability would be greatest for modes concentrated toward the midplane. As for the cylindrical LINUS configuration, rotation about the geometric axis would stabilize these modes, but at the price of roughly doubling the input energy and reducing the gain. However, even in the absence of rotation, in a sphere instability occurs only at the end of compression near the stagnation point. Revised estimates of the fusion energy gain taking this brief period of instability into account still give, within the uncertainties, a gain G approx. 20 for our earlier example with an input energy of 150 MJ and fusion yield of 3 GJ.
NTIS
Plasmas (Physics) ; Spheromaks ; Walls ; Liquids ; Taylor Instability

20020012237 Lawrence Livermore National Lab. , Livermore, CA USA
Abstracts of the international conference on the solid-state lasers for application to inertial confinement fusion (3rd)
Lowdermilk, W. H. ; Jun. 12, 1998 ; 235p ; In English
Report No.(s): DE2001-13422 ; CONF-980653-ABS ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Current NIF baseline employs a color separation grating (CSG) for diverting the unconverted light away from the ICF target. The NIF CSG consists of a three level lamellar grating structure which diverts nearly all of the unconverted lw and 2w light while leaving the 3w light undiffracted. Nearly 84% of the diffracted light is contained in two orders (-1 and +2 for example) with the remaining energy distributed in several higher orders. The direction of the diffraction can be rotated by changing the orientation on the CSG on the optic. From fabrication considerations, it is preferable to have a minimal number of different CSG orientations. At the same time, it is important to ensure that the diffracted light is not hitting the target insertion module and the various

diagnostic ports near the target chamber center and is prevented from entering other laser ports. For some users on NIF it is also desirable to provide a fairly large (several cm long) gap near the hohlraum.
NTIS
Inertial Confinement Fusion ; Solid State Lasers ; Conferences

20020012238 Lawrence Livermore National Lab. , Livermore, CA USA
Inertial Confinement Fusion , Volume 9 ***Quarterly Report , Oct. - Dec. 1998***
Powell, H. ; Oct. 13, 1999 ; 144p ; In English
Report No.(s): DE2001-13420 ; UCRL-LR-105821-99-1 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In 1994, a group of scientists and engineers at Lawrence Livermore National Laboratory (LLNL), with input from the other U.S. inertial confinement fusion (ICF) laboratories, formed a four-year laser development plan to enable the construction of the laser hardware for the National Ignition Facility (NIF). The risk-reduction laser activities necessary to complete detailed Title II engineering for NIF were defined, the manpower requirements and overall costs in each area were estimated, the required development laboratories and teams were identified, and preliminary milestones were proposed. With both financial and technical help from the French Commissariat a L'Energie Atomique (CEA), we began laser development activities in earnest in 1995. Simultaneous with the laser-component development activities, a NIF Project engineering team was assembled and began the design of the real NIF hardware, interfaces, and assembly plans. The development and engineering activities were completely on schedule four years later at the end of 1998, as marked by the completion of detailed Title II engineering reviews. The activities in the intervening four years were intense and involved a large number of people from LLNL, Sandia National Laboratories (SNL), Los Alamos National Laboratory (LANL), the French CEA, and many other groups. Laser-development activities covered most of this period while the team continuously redefined the milestones and conducted frequent laser-technology reviews. This issue of the ICF Quarterly Report describes the NIF laser component designs that resulted from these laser development and engineering activities.
NTIS
Inertial Confinement Fusion ; Laser Applications

20020012243 Lawrence Livermore National Lab. , Livermore, CA USA
SSPX simulation model
Fowler, T. K. ; Sep. 20, 1999 ; 10p ; In English
Report No.(s): DE2001-13082 ; UCRL-ID-135797 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An analytical approximation to an R-L-C circuit representing SSPX is shown to reproduce the observed capacitor bank efficiency and gun optimization data. As in the SPICE code, the spheromak gun is represented by a fixed resistance chosen to balance energy transfer to the gun. A revised estimate of the magnetic decay time in SSPX Shot 1822 then brings our estimate of the gun efficiency itself in line with the observed spheromak magnetic field for this shot.
NTIS
Spheromaks ; Circuits

20020012295 Stanford Linear Accelerator Center , Menlo Park, CA USA
Ultra-High Gradient Plasma Wakefield Booster
Chen, P. ; Jul. 12, 2001 ; 13p ; In English
Report No.(s): DE2001-784981 ; SLAC-PUB-8876 ; No Copyright ; Avail: Department of Energy Information Bridge

We present a Plasma Wakefield Acceleration (PWFA) scheme that can in principle provide an acceleration gradient above 100 GeV/m, based on a reasonable modification of the existing SLAC beam parameters. We also study a possible up-grade of the Stanford Linear Collider (SLC) to hundreds of GeV center-of-mass energy using such a PWFA as a booster. The emittance degradation of the accelerated beams by the plasma wakefield focus is relatively small due to a uniform transverse distribution of the driving beam and the single stage acceleration.
NTIS
Plasma Acceleration ; Plasma Waves ; Linear Accelerators

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20020006072 Brookhaven National Lab. , Upton, NY USA
Rotating metal band target for pion production at neutrino factories and muon colliders
King, ; Simos, ; Weggel, ; Mokhov, ; Jun. 18, 2001 ; 4p ; In English
Report No.(s): DE2001-785365 ; BNL-68557 ; No Copyright ; Avail: Department of Energy Information Bridge

A conceptual design is presented for a high power pion production target for neutrino factories and muon colliders that is based on a rotating metal band of either inconel alloy 718, titanium alloy 6A1-4V grade 5 or nickel. The band is 5 meters in diameter and is tangentially intercepted by a pulsed proton beam inside a 20 Tesla tapered solenoidal magnetic pion capture channel. The mechanical layout and cooling setup of the target are summarized and results are presented from realistic MARS and ANSYS computer simulations of pion yields, energy depositions and schock heating stresses. The target scenario is predicted to perform satisfactorily and with conservative safety margins for multi-megawatt pulsed proton beams.
NTIS
Neutrinos ; Muons ; Nickel Alloys ; Heat Resistant Alloys ; Computerized Simulation

20020006121 Argonne National Lab. , IL USA
Ion beam deposition and surface characterization of thin multi-component oxide films during growth
Krauss, A. R. ; Im, J. ; Smentkowski, V. ; Schultz, J. A. ; Auciello, O. ; Jan. 13, 1998 ; 32p ; In English
Report No.(s): DE2001-7842 ; ANL/CHM/CP-91798 ; No Copyright ; Avail: Department of Energy Information Bridge

Ion beam deposition of either elemental targets in a chemically active gas such as oxygen or nitrogen, or of the appropriate oxide or nitride target, usually with an additional amount of ambient oxygen or nitrogen present, is an effective means of depositing high quality oxide and nitride films. However, there are a number of phenomena which can occur, especially during the production of multicomponent films such as the ferroelectric perovskites or high temperature superconducting oxides, which make it desirable to monitor the composition and structure of the growing film in situ. These phenomena include thermodynamic (Gibbsian), and oxidation or nitridation-driven segregation, enhanced oxidation or nitridation through production of a highly reactive gas phase species such as atomic oxygen or ozone via interaction of the ion beam with the target, and changes in the film composition due to preferential sputtering of the substrate via primary ion backscattering and secondary sputtering of the film. Ion beam deposition provides a relatively low background pressure of the sputtering gas, but the ambient oxygen or nitrogen required to produce the desired phase, along with the gas burden produced by the ion source, result in a background pressure which is too high by several orders of magnitude to perform in situ surface analysis by conventional means. Similarly, diamond is normally grown in the presence of a hydrogen atmosphere to inhibit the formation of the graphitic phase.
NTIS
Ion Beams ; Thin Films ; Ceramics ; Crystal Growth ; Oxide Films ; Perovskites ; Substrates ; Oxygen Atoms ; Ferroelectricity

20020006142 Brookhaven National Lab. , Upton, NY USA
Domain wall fermion calculation of nucleon G(sub A)/G(sub V)
Blum, T. ; Ohta, S. ; Sasaki, S. ; Aug. 17, 2000 ; 4p ; In English
Report No.(s): DE2001-774484 ; BNL-67855 ; KB0201 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors present a preliminary domain-wall fermion lattice-QCD calculation of isovector vector and axial charges, g(sub V) and g(sub A), of the nucleon. Since the lattice renormalizations, Z(sub V) and Z(sub A), of the currents are identical with DWF, the lattice ratio (g(sub A)/g(sub V))(sup lattice) directly yields the continuum value. Indeed Z(sub V) determined from the matrix element of the vector current agrees closely with Z(sub A) from a non-perturbative renormalization study of quark bilinears. They also obtain spin related quantities (Delta)q/g(sub V) and (delta)q/g(sub V).
NTIS
Fermions ; Nucleons ; Quantum Chromodynamics

20020006148 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Moments of Structure Functions in Full QCD
Dolgov, D. ; Brower, R. ; Capitani, S. ; Negele, J. W. ; Pochinsky, A. ; Aug. 01, 2000 ; 5p ; In English
Report No.(s): DE2001-773285 ; JLAB-THY-00-41 ; DOE/ER/40150-1792 ; HEP-LAT/0011 ; No Copyright ; Avail: Department of Energy Information Bridge

Moments of the quark density distribution, moments of the quark helicity distribution, and the tensor charge are calculated in full QCD. Calculations of matrix elements of operators from the operator product expansion have been performed on 16(exp 3) x 32 lattices for Wilson fermions at (beta) = 5.6 using configurations from the SESAM collaboration and at (beta) = 5.5 using configurations from SCRI. One-loop perturbative renormalization corrections are included. Selected results are compared with corresponding quenched calculations and with calculations using cooled configurations.
NTIS
Quantum Chromodynamics ; Distribution Moments ; Quarks ; Density Distribution ; Structured Grids (Mathematics)

20020006244 Federal Energy Technology Center , Morgantown, WV USA
Hemispheric center for environmental technology. Monthly Progress Report, September 1999
Ebadian, M. A. ; Sep. 30, 1999 ; 88p ; In English
Report No.(s): DE2001-772524 ; DE-FG01-95EW55094-72 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Princeton Plasma Physics Laboratory (PPPL) demonstration of the diamond wire cutting technology on the surrogate of the Tokamak Fusion Test Reactor (TFTR), Figure 1, was performed from August 23-September 3, 1999. The plated diamond wire, Figure 2, was successful in cutting through all components of the TFTR surrogate including stainless steel, inconel and graphite. The demonstration tested three different void fill materials (mortar with sand, Rheocell-15, and foam) and three cooling systems (water, air, and liquid nitrogen). The optimum combination was determined to be the use of the low-density concrete void fill, Rheocell-15 with an average density of 52 lbs/ft(sup 3), using a water coolant. However, the liquid nitrogen performed better than expected with only minor problems and was considered to be a successful demonstration of the Bluegrass Concrete Cutting, Inc. proprietary liquid-nitrogen coolant system. Data from the demonstration is being calculated and a summary of the technology demonstration will be included in the October monthly report. An ITSR will be written comparing the diamond wire saw to the plasma arc (baseline) technology. The MTR Chemical Protective Suit, a proprietary new suit from Kimberly Clark, was evaluated from 8/9/99 to 8/12/99 at Beaver, WV. This particular suit was tested on subjects performing three different tasks: climbing through a horizontal confined space, vertical confined space (pit), and loading and unloading material using a wheel barrow. Multiple test subjects performed each task for 20 minutes each. Performance of the innovative suit was compared to two commonly used types of protective clothing. Vital statistics, including body temperature and heart rate, were continuously monitored and recorded by an authorized physician. A summary of the demonstration will be included in the October monthly report. Along with the MTR Chemical Protective Suit, the VitalSense(trademark) Telemetric Monitoring System from Mini Mitter Co., Inc. was evaluated. A summary of the demonstration will be included in the October monthly report. A Kool-Vest from MicroClimate Systems, Inc. was evaluated during assessment at Beaver, WV from 8/16/99 to 8/17/99. The evaluation was performed in the same manner as the MTR Chemical Protective Suit described above. A summary of the demonstration will be included in the October monthly report. A brochure announcing the new Gateway to Environmental Technology (GET) website was produced by FIU-HCET and is being distributed to the D&D community by FETC-DDFA. The website provides links to the TIS and other decision support systems developed at FIU-HCET.
NTIS
Nuclear Reactors ; Plasma Physics ; Tokamak Devices ; Fusion Reactors

20020006305 Argonne National Lab. , IL USA
Thermal management of masks for deep x-ray lithography
Khounsary, A. ; Chojnowski, D. ; Mancini, D. C. ; Lai, B. ; Dejus, R. ; Nov. 18, 1997 ; 12p ; In English
Report No.(s): DE2001-7845 ; ANL/XFD/CP-92699 ; No Copyright ; Avail: Department of Energy Information Bridge

This paper addresses some options and techniques in the thermal management of masks used in deep x-ray lithography. The x-ray masks are thin plates made of low-atomic-number materials on which a patterned thin film of a high-atomic-number metal has been deposited. When they are exposed to an x-ray beam, part of the radiation is transmitted to replicate the pattern on a downstream photoresist, and the remainder is absorbed in the mask in the form of heat. This heat load can cause deformation of the mask and thus image distortion in the lithography process. The mask geometry considered in the present study is 100 mm x 100 mm in area, and about 0.1 to 2 mm thick. The incident radiation is a bending magnet x-ray beam having a footprint of 60 mm x 4 mm at the mask. The mask is scanned vertically about (+-) 30 mm so that a 60 mm x 60 mm area is exposed. the maximum absorbed heat load in the mask is 80 W, which is significantly greater than a few watts encountered in previous systems. In this paper, cooling techniques, substrate material selection, transient and steady state thermal and structural behavior, and other thermo-mechanical aspects of mask design are discussed. It is shown that, while diamond and graphite remain attractive

candidates, at present beryllium is a more suitable material for this purpose and, when properly cooled, can provide the necessary dimensional tolerance.
NTIS
Temperature Control ; Temperature Effects ; Thin Films ; Thin Plates ; Magnets ; Lithography

20020006319 Federal Energy Technology Center , Morgantown, WV USA
[Applying the MFIX Computer Code to FWDC Engineering Problems] ***Final Report***
Oct. 2000 ; 94p ; In English
Report No.(s): DE2001-772551 ; DOE/NETL-2001/1137 ; CRADA-97-F001 ; No Copyright ; Avail: Department of Energy Information Bridge
This report documents the results of work conducted under the Cooperative Research and Development (CRADA) No. 97-F001 between the Foster Wheeler Development Corporation, FWDC, and the National Energy Technology Laboratory, NETL. Under this agreement, FWDC and NETL worked together to further investigate the applicability of the MFIX computer code to FWDC engineering problems. MFIX is a transient, finite difference, FORTRAN code that solves the equations of transport for interacting fluid and granular solid phases. It is designed to model fluidized bed reactors. Under the CRADA, work was divided into three tasks. The first task involved the continued validation of the hydrodynamic and chemistry capabilities of the MFIX code. The second task involved a parametric evaluation of the MFIX code's ability to predict bubble shape. Task 3 was to modify MFIX to make it execute faster and more easily on personal computers. Task 1 was accomplished by both FWDC and NETL while Tasks 2 and 3 were completed primarily by NETL. Non technical details of the CRADA can be found in Appendix A.
NTIS
Two Dimensional Flow ; Applications Programs (Computers) ; Finite Difference Theory

20020006496 California Inst. of Tech. , Dept. of Electrical Engineering , Pasadena, CA USA
Inductively Coupled Plasma Reactive Ion Etching (ICP-RIE): Nanofabrication Tool for High Resolution Pattern Transfer ***Final Report , 31 Mar. 2000-30 Mar 2001***
Scherer, Axel ; Oct. 15, 2001 ; 4p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0106
Report No.(s): AD-A395670 ; ARO-40833.1-EL-RIP ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
High resolution lithography and directional ion etching are increasingly important for the fabrication of nanostructures. As part of this equipment proposal, a reactive ion etching system was purchased from Oxford Instruments for $305,000. The Army Research Office provided $274,000, and Caltech cost share amounted to $31,500. This instrument was connected and etching conditions were optimized for the fabrication of nanostructures in silicon, silicon dioxide and gallium arsenide. In this final progress report, we will present some examples of functional devices which have been defined by using this very capable ion etching system.
DTIC
High Resolution ; Nanostructures (Devices) ; Inductively Coupled Plasma Mass Spectrometry ; Etching ; Fabrication ; Ions

20020006525 Los Alamos National Lab. , NM USA
Complexity at mesoscale
Bishop, A. ; Rasmussen, K. ; Dec. 01, 2000 ; 16p ; In English
Report No.(s): DE2001-772830 ; LA-UR-00-6101 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Through three examples the authors illustrate some of the concepts and ingredients required for pattern formation at mesoscopic scales. Two examples built on microscopic models where mesoscopic patterns emerge from homogeneous ground states driven into instability by external forcing. In contrast, the third example builds on a mesoscopic phenomenological Ginzburg-Landan type model of solid-solid structural phase transition. Here, mesoscopic textures emerge as a result of competing length scales arising from the constraints of elastic compatibility.
NTIS
Mesoscale Phenomena ; Phenomenology

20020006529 Los Alamos National Lab. , NM USA
Transport in the heavy fermion superconductor upt3
Graf, M. ; Apr. 01, 1999 ; 3p ; In English
Report No.(s): DE2001-773894 ; LA-UR-99-3419 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We report new theoretical results and analysis for the transport properties of superconducting UPt(sub 3)based on the leading models for the pairing symmetry. We use Fermi surface data and the measured inelastic scattering rate to show that the low temperature thermal conductivity and transverse sound attenuation in the A and B phase of UPt3 are in excellent agreement with pairing states belonging to the two-dimensional orbital E(sub 2u) representation.
NTIS
Superconductors (Materials) ; Fermions ; Fermi Surfaces ; Transport Properties ; Superconductivity ; Low Temperature

20020006833 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Generation of THz Radiation by Excitation of InAs with a Free Electron Laser
Tani, M. ; Kono, S. ; Gu, P. ; Sakai, K. ; Usami, M. ; Jan. 01, 2001 ; 3p ; In English
Report No.(s): DE2001-775302 ; JLAB-ACT-01-01 ; DOE/ER/40150-1813 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Terahertz (THz) radiation is generated by exciting an un-doped InAs wafer with a femtosecond free-electron laser (FEL) at the Thomas Jefferson National Accelerator Facility. A microwatt level of THz radiation is detected from the unbiased InAs emitter when it is excited with the femtosecond FEL pulses operated at a wavelength of 1.06 (mu)-m and 10 W average power.
NTIS
Radio Frequencies ; Indium Arsenides ; Free Electron Lasers ; Emitters

20020006843 Oak Ridge National Lab. , TN USA
Surface Charge and Ion Adsorption on Metal Oxides to 290 degrees C
Wesolowski, D. A. ; Jan. 09, 2001 ; 6p ; In English ; 6th International STMP, Hydrothermal Reactions
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774652 ; P00-108950 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The results of metal oxide surface protonation and specific ion adsorption studies are presented, which employed 'in situ' pH monitoring in both conventional glass-electrode autotitrators to 50 degrees C, and hydrogen-electrode concentration cells to 290 degrees C. Our recent studies of rutile and magnetite surface protonation and the sorption of Ca(sup 2+) on rutile surfaces are reviewed, and modeling of these results are discussed, including the development of a method to estimate the pH of zero charge of oxide surfaces from 0 to 300 degrees C. New results are discussed on the protonation of zirconium oxide surfaces to 50 degrees C and the sorption of Nd(sup 3+) on rutile surfaces from 25-25O degrees C. We also discuss preliminary results on the sorption of oxalate and sulfate on rutile surfaces to 100 degrees C. These studies demonstrate that both proton-induced surface charging and the specific adsorption of electrolyte ions on oxide surfaces increase as temperature increases into the hydrothermal regime.
NTIS
Adsorption ; Metal Oxides ; Zirconium Oxides

20020006884 Sandia National Labs. , Albuquerque, NM USA
Atomic Resolution Microscopy of Semiconductor Defects and Interfaces
Baca, A. G. ; Browning, N. D. ; James, E. M. ; Reno, J. L. ; Xin, Y. ; Jun. 17, 1999 ; 6p ; In English
Report No.(s): DE2001-7880 ; SAND99-1303C ; No Copyright ; Avail: Department of Energy Information Bridge
The optical arrangement of the scanning transmission electron microscope (STEM) allows formation of incoherent images by use of a large annular detector. Here we show this capability in the imaging of defects in GaN and the interfacial region of an Au/GaAs ohmic contact. A resolution of around 0.15 nm is attained. Such Z-contrast images show strong atomic number contrast and allow the probe to be positioned accurately at the defect or interface for the purpose of performing high spatial resolution electron energy-loss spectroscopy (EELS).
NTIS
Imaging Techniques ; Optical Scanners ; Scanning Electron Microscopy ; Defects ; Semiconductors (Materials) ; Atomic Structure

20020007102 Los Alamos National Lab. , NM USA
Spin-Orbit Scattering in dx2-y2 Superconductors
Graf, M. ; Apr. 01, 1999 ; 4p ; In English
Report No.(s): DE2001-773893 ; LA-UR-99-3424 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The authors show that spin-orbit scattering off an isolated magnetic impurity in a singlet d(sub x(sup 2)-y(sup 2)) superconductor generates a d(sub xy) order parameter with locally broken time-reversal symmetry. A consequence of the induced d(sub xy) component are orbital charge currents and a magnetic field in the vicinity of the magnetic impurity.
NTIS
Scattering ; Superconductors (Materials)

20020007934 Sandia National Labs. , Albuquerque, NM USA
Thin Film Models of Magnesium Orthovanadate Catalysts for Oxidative Dehydrogenation
Sault, ; Mudd, ; Miller, ; Ruffner, ; Rodriguez, ; Mar. 01, 2001 ; 52p ; In English
Report No.(s): DE2001-776352 ; SAND2000-3157 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Magnesium vanadates are potentially important catalytic materials for the conversion of alkanes to alkenes via oxidative dehydrogenation. However, little is known about the active sites at which the catalytic reactions take place. It may be possible to obtain a significant increase in the catalytic efficiency if the effects of certain material properties on the surface reactions could be quantified and optimized through the use of appropriate preparation techniques. Given that surface reactivity is often dependent upon surface structure and that the atomic level structure of the active sites in these catalysts is virtually unknown, we desire thin film samples consisting of a single magnesium vanadate phase and a well defined crystallographic orientation in order to reduce complexity and simplify the study of active sites. This report describes the use of reactive RF sputter deposition to fabricate very highly oriented, stoichiometric Mg3(VO4)(sub 2) thin films, and subsequent studies of the reactivity of these films under reaction conditions typically found during oxidative dehydrogenation. We demonstrate that the synthesis methods employed do in fact result in stoichiometric films with the desired crystallographic orientation, and that the chemical behavior of the films closely approximates that of bulk, high surface area Mg3(VO4)(sub 2) powders. We further use these films to demonstrate the effects of oxygen vacancies on chemical behavior, demonstrate that surface composition can vary significantly under reaction conditions, and obtain the first evidence for structure sensitivity in Mg3(VO4)(sub 2) catalysts.
NTIS
Catalysts ; Dehydrogenation

20020008124 Oak Ridge National Lab. , TN USA
Nitrogen Passivation of the Interface States Near the Conduction Band Edge of 4H-Silicon Carbide
Williams, J. R. ; Jan. 25, 2001 ; 12p ; In English
Report No.(s): DE2001-774682 ; P01-109714 ; No Copyright ; Avail: Department of Energy Information Bridge

This paper describes the development of a nitrogen-based passivation technique for interface states near the conduction band edge (D(sub it)(E(sub c)) in 4H-SiC/SiO2. These states have been observed and characterized in several laboratories for n- and p-SiC since their existence was first proposed. The origin of these states remains a point of discussion, but there is now general agreement that these states are largely responsible for the lower channel mobilities that are reported for n-channel, inversion mode 4H-SiC MOSFET's. Over the past year, much attention has been focused on finding methods by which these states can be passivated. The nitrogen passivation process that is described herein is based on post-oxidation, high temperature anneals in nitric oxide.
NTIS
Conduction Bands ; Nitrogen ; Passivity

20020008126 Oak Ridge National Lab. , TN USA
Effects of ArF Excimer Irradiation on Multi-Energy Ge and Se Ion Implanted Silica
Magruder, R. H. ; Jan. 10, 2001 ; 7p ; In English
Report No.(s): DE2001-774680 ; P00-109293 ; No Copyright ; Avail: Department of Energy Information Bridge

Silica samples were implanted at multiple energies with Se and Ge ions producing implanted layers approximately 2.4 microns in depth starting at approximately 0.5 microns below the surface. In each case, the concentration of implanted species was approximately 0.05 atomic %. The optical absorption of the samples was measured from 2.7 to 6.5 eV. In all spectra, local maxima at 5.0 eV with shoulders at 5.9 eV were observed. The spectra have been assumed to be describable as a superposition of Gaussian absorption bands with mean energies taken from the literature of 4.8, 5.01, 5.17, 5.88, and 7.15 eV. The relative strengths of each of these bands have been obtained by linear regression and the variability of these strengths measured as a function of excimer laser irradiation. These fits show that additional bands at 3.7 and 6.4 eV, whose parameters have been obtained

by nonlinear methods, are required to fit the data for the Se implanted samples, while bands at 5.54 and 6.4 eV are needed to fit the absorption of the Ge implanted samples.
NTIS
Absorption Spectra ; Silicon Dioxide ; Ion Implantation

20020008135 Oak Ridge National Lab. , TN USA
Progress Towards a Low-Cost Coated Conductor Technology
Annavarapu, S. ; Jan. 10, 2001 ; 4p ; In English ; M2S-HTSC-VI Superconductivity for The New Millennium
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774665 ; P00-106592 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Progress in the development of an economically and technically viable YBCO coated conductor technology for HTS wire using deformation-textured buffered substrates and solution-deposited superconductor layers is reported. Biaxially textured Ni substrates have been fabricated using a deformation texturing process. Epitaxial oxide buffer layers have been deposited by a combination of e-beam deposition and magnetron sputtering. Epitaxial YBCO films have been grown using a trifluoroacetate solution precursor. The resulting composite conductors have critical current densities approaching 2 MA/cm(sup 2) at 77K in self-field. Critical current densities of 4.5 MA/cm(sup 2) have been also obtained on CeO(sub 2) buffered YSZ single crystal substrates, demonstrating performance parity with vacuum deposited YBCO films.
NTIS
YBCO Superconductors ; Superconducting Films ; Current Density ; Coatings

20020008154 Lawrence Livermore National Lab. , Livermore, CA USA
Microstructure and thermal stability of transition metal nitrides and borides on GaN
Jasinski, J. ; Kaminska, E. ; Piotrowska, A. ; Barcz, A. ; Zielinski, M. ; Jun. 28, 2000 ; 6p ; In English
Report No.(s): DE2001-775134 ; LBNL-45980 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Microstructure and thermal stability of ZrN/ZrB2 bilayer deposited on GaN have been studied using transmission electron microscopy (TEM) methods and secondary ion mass spectrometry (SIMS). It has been demonstrated that annealing of the contact structure at 1100 C in N2 atmosphere does not lead to any observable metal/semiconductor interaction. In contrast, a failure of the integrity of ZrN/ZrB2 metallization at 800 C, when the heat treatment is performed in O2 ambient has been observed.
NTIS
Borides ; Gallium Nitrides ; Transition Metals

20020008158 California Inst. of Tech. , Pasadena, CA USA
Experimental Studies of the Vibrational Entropies of Alloy Phases
Fultz, B. ; Feb. 18, 2001 ; 5p ; In English
Report No.(s): DE2001-774687 ; DOE/ER45572 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This is the annual progress report for Grant DE-FG03-96ER45572. This research is on the entropy of materials, particularly alloy phases. It is an experimental effort utilizing inelastic neutron scattering facilities at two DOE (Department of Energy) facilities: Oak Ridge National Laboratory (HFIR (high flux isotope reactor)) and Argonne National Laboratory (IPNS (Intense Pulsed Neutron Source)), and the NIST (National Institute of Standards and Technology) Center for Neutron Research. It includes an overview of completed research in 2000, a list of publications, and personnel supported under this grant.
NTIS
Vibration ; Alloys ; Entropy

20020008168 Ohio State Univ. , Dept. of Electrical Engineering , Columbus, OH USA
Acquisition of a Tandem High-Resolution X-Ray Diffractometer-Photoluminescence System ***Final Report, 1 Apr. 2000-31 Mar. 2001***
Ringel, Steven A. ; Oct. 12, 2001 ; 6p ; In English
Contract(s)/Grant(s): DAAD19-00-1-0035
Report No.(s): AD-A395679 ; 739024 ; ARO-40731.1-MS-RIP ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche
A high-resolution x ray diffractometer (HRXRD) with triple axis diffraction capabilities, combined in a single unit with a photo luminescence (PL) system has been acquired. This instrument combines complementary structural and optical characterization methods that will enhance ARO (Army Research Office)-funded research involving growth and defect-control studies of highly lattice-mismatched III-V/IV heterostructures. The HRXRD capabilities include double and triple axis diffraction, asymmetric and grazing incidence reflectivity, x ray topography, and fluorescence. The PL capabilities include

variable temperature measurements and lateral mapping of optical properties. PL and HRXRD analyses are possible at the same position, allowing for correlation between optical and structural properties. This system is installed and operational in a dedicated facility for this purpose. Measurements to understand how defect control methodologies impact properties of lattice-mismatched heterostructures are underway. For our ARO-supported research involving III-V growth and integration onto Si via relaxed compositionally graded GeSi buffers, this instrument is being used to investigate the outstanding issues related to mismatched heteroepitaxy of III-arsenides, III-phosphides, LTG (low temperature grown) III-V's and on group IV substrates. These include quantifying the degree and distribution of lattice strain and relaxation in multiple layers, lattice tilt, composition, bandgap, interface and surface roughness, thermal expansion effects, mosaic spread, etc.
DTIC
Photoluminescence ; X Ray Diffraction ; Diffractometers

20020008213 California Univ. , Berkeley, CA USA
Simultaneous ballistic deficit immunity and resilience to parallel noise sources: A new pulse shaping technique
Fabris, L. ; Becker, J. A. ; Goulding, F. S. ; Madden, N. W. ; Oct. 11, 2000 ; 5p ; In English
Contract(s)/Grant(s): W-7405-eng-48
Report No.(s): DE2001-776581 ; LBNL-45554 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A new and different time variant pulse processing system has been developed based on a simple CR-RC filter and two analog switches. The new pulse processing technique combines both ballistic deficit immunity and resilience to parallel noise without a significant compromise to the low energy resolution, generally considered a mutually exclusive requirement. The filter is realized by combining two different pulse-shaping techniques. One of the techniques creates a low rate of curvature at the pulse peak, which reduces ballistic deficit, while the second technique increases the tolerance to low frequency noise by modifying the noise history. Several experimental measurements are presented, including tests on a co-planar grid CdZnTe detector. Improvements on both the resolution and line shape are shown for the 662 keV line of 137Cs.
NTIS
Pulses ; Resilience

20020008636 Lawrence Livermore National Lab. , Livermore, CA USA
Influence of low temperature-grown GaAs on lateral thermal oxidation of Al(0.98)Ga(0.02)As
Ferrer, J. C. ; Liliental-Weber, Z. ; Reese, H. ; Chiu, Y. J. ; Hu, E. ; Jun. 29, 2000 ; 4p ; In English
Report No.(s): DE2001-775136 ; LBNL-45983 ; No Copyright ; Avail: Department of Energy Information Bridge
The lateral thermal oxidation process of Al(sub 0.98)Ga(sub 0.02)As layers has been studied by transmission electron microscopy. Growing a low-temperature GaAs layer below the Al(sub 0.98)Ga(sub 0.02)As has been shown to result in better quality of the oxide/GaAs interfaces compared to reference samples. While the later have As precipitation above and below the oxide layer and roughness and voids at the oxide/GaAs interface, the structures with low-temperature have less As precipitation and develop interfaces without voids. These results are explained in terms of the diffusion of the As toward the low temperature layer. The effect of the addition of a SiO(sub 2) cap layer is also discussed.
NTIS
Low Temperature ; Oxidation ; Aluminum Gallium Arsenides ; Morphology ; Gallium Arsenide Lasers ; Temperature Effects

20020008669 Lawrence Livermore National Lab. , Livermore, CA USA
X-ray and photoelectron spectroscopy of the structure, reactivity, and electronic structure of semiconductor nanocrystals
Hamad, K. S. ; May 01, 2000 ; 200p ; In English
Report No.(s): DE2001-776734 ; LBNL-45582 ; No Copyright ; Avail: Department of Energy Information Bridge
Semiconductor nanocrystals are a system which has been the focus of interest due to their size dependent properties and their possible use in technological applications. Many chemical and physical properties vary systematically with the size of the nanocrystal and thus their study enables the investigation of scaling laws. Due to the increasing surface to volume ratio as size is decreased, the surfaces of nanocrystals are expected to have a large influence on their electronic, thermodynamic, and chemical behavior. In spite of their importance, nanocrystal surfaces are still relatively uncharacterized in terms of their structure, electronic properties, bonding, and reactivity. Investigation of nanocrystal surfaces is currently limited by what techniques to use, and which methods are suitable for nanocrystals is still being determined. This work presents experiments using x-ray and electronic spectroscopies to explore the structure, reactivity, and electronic properties of semiconductor (CdSe, InAs) nanocrystals and how they vary with size. Specifically, x ray absorption near edge spectroscopy (XANES) in conjunction with multiple scattering simulations affords information about the structural disorder present at the surface of the nanocrystal. X ray photoelectron spectroscopy (XPS) and ultraviolet photoelectron spectroscopy (UPS) probe the electronic structure in terms of hole screening,

and also give information about band lineups when the nanocrystal is placed in electric contact with a substrate. XPS of the core levels of the nanocrystal as a function of photo-oxidation time yields kinetic data on the oxidation reaction occurring at the surface of the nanocrystal.
NTIS
Semiconductors (Materials) ; Nanocrystals ; Nanostructure (Characteristics) ; Surface Properties

20020008677 California Univ., Lawrence Berkeley Lab. , Berkeley, CA USA
Optical spectroscopy of strongly correlated electron systems
Schumacher, A. B. ; Feb. 27, 2001 ; 110p ; In English
Report No.(s): DE2001-776655 ; LBNL-47562 ; No Copyright ; Avail: Department of Energy Information Bridge
In this thesis, both time-resolved, nonlinear optical spectroscopy and linear spectroscopy are used to investigate the interactions and dynamics of elementary excitations in strongly correlated electron systems. In the first part, we investigate the renormalization of magnetic elementary excitations in the transition metal oxide Cr2O3. We have created a non-equilibrium population of antiferromagnetic spin waves and characterized its dynamics, using frequency- and time-resolved optical spectroscopy of the exciton-magnon transition. We observed a time-dependent pump-probe line shape, which results from excitation induced renormalization of the spin wave band structure. We present a model that reproduces the basic characteristics of the data, in which we postulate the optical nonlinearity to be dominated by interactions with long-wavelength spin waves, and the dynamics due to spin wave thermalization. Using linear spectroscopy, coherent third-harmonic generation and pump-probe experiments, we measured the optical properties of the charge-transfer (CT) gap exciton in SR2CuO2Cl2, an undoped model compound for high-temperature superconductors. A model is developed which explains the pronounced temperature dependence and newly observed Urbach tail in the linear absorption spectrum by a strong, phonon-mediated coupling between the charge-transfer exciton and ligand field excitations of the Cu atoms. The third-order nonlinear optical susceptibility within the Cu-O plane of SR2CuO2Cl2 is fully characterized in both amplitude and phase, and symmetry based conclusions are made with respect to the spatial arrangement of the underlying charge distribution. Theoretical considerations ascribe a newly reported resonance in the third-order nonlinear susceptibility at 0.7 eV to a three-photon transition from the ground state to the charge-transfer exciton. An even parity intermediate state of Cudd character, is found to contribute to the transition. Finally, preliminary results of time-resolved pump-probe spectroscopy confirm that the CT exciton or one of its constituent parts couples strongly to phonons, and we suggest ultrafast thermalization with the lattice as the dominating mechanism underlying the dynamical properties.
NTIS
Spectroscopy ; Electrons ; Elementary Excitations ; Particle Interactions

20020008890 Los Alamos National Lab. , NM USA
Dielectric Properties of Ba(0.6)SR(0.4)TiO(3) Thin Films with Various Strain States
Park, B. ; Peterson, E. ; Apr. 01, 2001 ; 13p ; In English
Report No.(s): DE2001-777450 ; LA-UR-01-1929 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We could systematically control the strain states of a Ba(0.6)SR(0.4)TiO3 film by depositing a very thin Ba(1-x)SR(x)TiO3 interlayer between the main layer of the Ba(0.6)SR(0.4)TiO3 and a MgO(001) substrate. Ba(0.6)SR(0.4)TiO3 films showed very strong dependence of dielectric properties on the strain states. The strain induced by the MgO substrate was relaxed faster than that induced by an interlayer.
NTIS
Dielectric Properties ; Interlayers ; Thin Films

20020008904 Argonne National Lab. , IL USA
Practical superconductor development for electrical power applications ***Quarterly Report , Period ending 31 Dec. 2000***
Goretta, K. C. ; Jan. 15, 2001 ; 21p ; In English
Report No.(s): DE2001-776744 ; ANL/ET/RP-103823 ; No Copyright ; Avail: Department of Energy Information Bridge
This is a multiyear experimental research program focused on improving relevant material properties of high-T(sub c) superconductors (HTSs) and on development of fabrication methods that can be transferred to industry for production of commercial conductors. The development of teaming relationships through agreements with industrial partners is a key element of the Argonne National Laboratory (ANL) program. Recent results are presented on YBa(sub 2)Cu(sub 3)O(sub x) (Y-123)

coated conductors, including fabrication by pulsed laser deposition (PLD) and sol-gel techniques. An approach to understanding the critical current density (J(sub c)) of grain boundaries is also presented and a technique is identified for increasing J(sub c).
NTIS
High Temperature Superconductors ; Superconductivity ; Product Development ; Production Engineering ; Electronic Equipment

20020009030 Lawrence Livermore National Lab. , Livermore, CA USA
InGaAs/GaAs quantum dot interdiffusion induced by cap layer overgrowth
Jasinski, J. ; Babinski, A. ; Czeczott, M. ; Bozek, R. ; Jun. 28, 2000 ; 6p ; In English
Report No.(s): DE2001-775135 ; LBNL-45981 ; No Copyright ; Avail: Department of Energy Information Bridge
The effect of thermal treatment during and after growth of InGaAs/GaAs quantum dot (QD) structures was studied. Transmission electron microscopy and atomic force microscopy confirmed the presence of interacting QDs, as was expected from analysis of temperature dependence of QD photoluminescence (PL) peak. The results indicate that the effect of post-growth annealing can be similar to the effect of elevated temperature of capping layer growth. Both, these thermal treatments can lead to a similar In and Ga interdiffiusion resulting in a similar blue-shift of QD PL peak.
NTIS
Indium Gallium Arsenides ; Quantum Dots ; Diffusion ; Photoluminescence ; Annealing

20020009110 National Renewable Energy Lab. , Golden, CO USA
Deposition and Characterization of Mo/CuInGaSe2/CdS/ZnO Solar Cells
AlThani, H. A. ; Hasoon, F. S. ; Alleman, J. L. ; Feb. 01, 2001 ; 14p ; In English
Report No.(s): DE2001-776249 ; NREL/CP-520-29641 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Molybdenum thin films were deposited on sodalime glass (SLG) substrates using direct-current planar magnetron sputtering, with a sputtering power density of 1.18 W/sq cm. The working gas (Ar) pressure was varied from 0.6 mtorr to 16 mtorr to gain a better understanding of the effect of sputtering pressure on the morphology and microstructure of the Mo. Thin films of Cu(In,Ga)Se2 (CIGS) were deposited on the Mo-coated glass using the three-stage coevaporation process. The morphology of both the Mo-coated SLG and the CIGS thin films grown on it was examined using high-resolution scanning electron microscopy. The film microstructure, such as the preferred orientation, and the residual intrinsic stress were examined by X-ray diffraction.
NTIS
Deposition ; Metal Films ; Microstructure ; Molybdenum ; Morphology ; Thin Films

20020009121 Lawrence Livermore National Lab. , Livermore, CA USA
HRTEM image simulations of structural defects in gate oxides
Taylor, S. ; Mardinly, J. ; OKeefe, M. A. ; Gronsky, R. ; Feb. 10, 2000 ; 3p ; In English
Report No.(s): DE2001-775173 ; LBNL-47221 ; No Copyright ; Avail: Department of Energy Information Bridge
We have performed high-resolution transmission electron microscope image simulations to assess the visibility of various structural defects in gate oxides at electron microscope resolutions.
NTIS
Computerized Simulation ; Transmission Electron Microscopy ; Crystal Defects ; High Resolution ; Imaging Techniques

20020009122 Lawrence Livermore National Lab. , Livermore, CA USA
HRTEM image simulations for gate oxide metrology
Taylor, S. ; Mardinly, J. ; OKeefe, M. A. ; Gronsky, R. ; Feb. 10, 2000 ; 3p ; In English
Report No.(s): DE2001-775172 ; LBNL-47220 ; No Copyright ; Avail: Department of Energy Information Bridge
High resolution transmission electron microscopy (HRTEM) has found extensive use in the semiconductor industry for performing device metrology and characterization. However, shrinking device dimensions (gate oxides are rapidly approaching 10(angstrom)) present challenges to the use of HRTEM for many applications, including gate oxide metrology. In this study, we performed HRTEM image simulations of a MOSFET device to examine the accuracy of HRTEM in measuring gate oxide thickness. Length measurements extracted from simulated images were compared to actual dimensions in the model structure to assess TEM accuracy. The effects of specimen tilt, specimen thickness, objective lens defocus and coefficient of spherical aberration (C(sub s)) on measurement accuracy were explored for nominal 10(angstrom) and 16(angstrom) gate oxide thicknesses. The gate oxide was modeled as an amorphous silicon oxide situated between a gate electrode and substrate, both modeled as single crystal Si(100). Image simulations of the sandwich structure were performed in cross-section (with Si(110) parallel to beam direction) using the multislice approximation for a 200 kV microscope with C(sub s)=0.5mm. Amorphous slices

were added to the top and bottom of the specimen to simulate the amorphization that occurs during typical specimen preparation. The actual gate oxide thickness, T, is defined as the distance between the bounding Si atoms in the model structure. The gate oxide thickness was also measured directly in pixels from the simulated image. We use a statistical routine to calculate the standard deviation in pixel intensity for each horizontal row (or y-coordinate) in the simulated image. Local minima in the standard deviation, which correspond to low-intensity regions between Si(110) dumbbells, were used to calibrate the image length scale. The measured gate oxide thickness was then compared to the actual (model) thickness to assess accuracy for a variety of microscope and specimen conditions. Results reveal no consistent trends in measurement accuracy as a function of specimen thickness, specimen tilt, or objective lens defocus.
NTIS
Metrology ; Imaging Techniques ; Transmission Electron Microscopy ; High Resolution ; Semiconductor Devices ; Amorphous Silicon ; Silicon Oxides

20020009124 Lawrence Livermore National Lab. , Livermore, CA USA
NCEM one-Angstrom microscope project reaches 0.89 Angstrom resolution
OKeefe, M. A. ; Wang, Y. C. ; Feb. 17, 2000 ; 3p ; In English
Report No.(s): DE2001-775170 ; LBNL-47218 ; No Copyright ; Avail: Department of Energy Information Bridge
Sub-Angstrom transmission electron microscopy to a resolution of 0.89 has been achieved at the National Center for Electron Microscopy and is available to electron microscopists who have a requirement for this level of resolution.
NTIS
Transmission Electron Microscopy ; Imaging Techniques ; Spatial Resolution

20020009154 Princeton Univ. , Dept. of Electrical Engineering , NJ USA
Rapid Thermal Chemical Vapor Deposition for Dual-Gated Sub-100 nm MOSFET's ***Final Report , 1 Aug. 1996-31 Oct. 1999***
Sturm, James C. ; Oct. 18, 2001 ; 13p ; In English
Contract(s)/Grant(s): DAAH04-96-1-0357
Report No.(s): AD-A395666 ; ARO-36239.1-RT-RIP ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The main overall goal of this project was to improve the high speed performance of transistors and integrated circuits based on silicon, which is the material on which most microelectronic circuitry (such as microprocessors and memory chips) is based. This project examines the scaling of MOSFETs (metal oxide semiconductors field effect transistors) to very small channel dimensions using a vertical structure which is defined by Rapid Thermal Chemical Vapor Deposition. The scaling of vertical p-channel MOSFETs with the source and drain doped with boron during low temperature epitaxy is limited by the diffusion of boron during subsequent side wall gate oxidation. by introducing thin SiGeC layers in the source and drain regions, this diffusion has been suppressed, enabling for the first time the scaling of vertical p-channel MOSFETs to under 100 nm in channel length to be realized. Device operation with a channel length down to 25 nm has been achieved.
DTIC
Metal Oxide Semiconductors ; Field Effect Transistors ; Vapor Deposition

20020009505 Brookhaven National Lab. , Upton, NY USA
Ex-Situ Post-Deposition Processing for Large Area Y(1)Ba(2)Cu(3)O(7) Films and Coated Tapes
Solovyov, ; Wiesmann, ; Wu, ; Zhu, ; Suenaga, ; Sep. 18, 2000 ; 4p ; In English
Report No.(s): DE2001-780781 ; BNL-68263 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Ex-situ post-deposition reaction processing is considered a promising alternative to in-situ physical vapor deposition techniques for coated Y(sub 1)Ba(sub 2)Cu(sub 3)O(sub 7) conductor development. It was reported recently, that attempts at ex-situ processing of long Y(sub 1)Ba(sub 2)Cu(sub 3)O(sub 7) precursor tapes resulted in an inhomogeneous growth rate over the tape length and rather poor properties for the whole sample. We performed a set of experiments in order to clarify the mechanisms for the ex-situ processing of large area films and estimate properties of long coated conductors manufactured by the ex-situ technique. It was found that rate limiting step of ex-situ growth of Y(sub 1)Ba(sub 2)Cu(sub 3)O(sub 7) is removal of the reaction product, hydrofluoric acid, by both gas diffusion and convection in the reaction atmosphere. We report on a quantitative model that well describes the observed growth rates for films with various areas.
NTIS
Deposition ; Superconducting Films ; Crystal Growth ; Gaseous Diffusion ; Coatings

20020009573 Brookhaven National Lab. , Upton, NY USA

Persistent current effects in bscco common coil dipoles

Sampson, ; Ghosh, ; Cozzolino, ; Harrison, ; Wanderer, ; Sep. 17, 2000 ; 4p ; In English

Report No.(s): DE2001-781376 ; BNL-68285 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A series of one-meter long racetrack-shaped windings has been fabricated from BSCCO tape conductors obtained from four manufacturers. Two coils were built from each conductor type and tested in the ”common coil” dipole configuration in liquid helium. The effect of the remnant magnetization currents was determined by measuring the residual dipole and sextupole fields after cycling the magnets to progressively higher currents. Two coil sets have been measured and the results are compared to those obtained from a Nb3Sn ribbon magnet of the same geometry.

NTIS

BSCCO Superconductors ; Magnetization

20020009584 Brookhaven National Lab. , Upton, NY USA

Interferometric electron ruler with picometer accuracy in gauaging lattice displacement

Wu, ; Zhu, ; Tafto, ; Aug. 05, 2001 ; 2p ; In English

Report No.(s): DE2001-780681 ; BNL-68152 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We report a novel technique to accurately measure interfacial lattice displacement by forming an electron probe close to a specimen in a manner similar to that originally proposed by Gabor to record a hologram. This method is based on the quantitative analysis of the interference pattern of shadow images in coherent electron diffraction. The approach is unique in that there are no adjustable microscope parameters, the contrast is strong even when the fault is viewed edge-on, and a large number of shadow images of the fault corresponding to different Bragg reflections can be studied simultaneously. Since it is an interferometric technique, the spatial resolution of the measurement is not limited by the wave length of the fast electrons. 1pm accuracy has been demonstrated in measuring the displacement associated stacking faults and grain boundaries in Bi-based superconductors. It is, to our knowledge, the highest that has been ever achieved in measurements of displacement vectors.

NTIS

Electron Diffraction ; Crystal Lattices

20020009615 Lawrence Livermore National Lab. , Livermore, CA USA

Shape from equal thickness contours

Cong, G. ; Parvin, B. ; May 10, 1998 ; 8p ; In English

Report No.(s): DE2001-779705 ; LBNL-41678 ; No Copyright ; Avail: Department of Energy Information Bridge

A unique imaging modality based on Equal Thickness Contours (ETC) has introduced a new opportunity for 3D shape reconstruction from multiple views. We present a computational framework for representing each view of an object in terms of its object thickness, and then integrating these representations into a 3D surface by algebraic reconstruction. The object thickness is inferred by grouping curve segments that correspond to points of second derivative maxima. At each step of the process, we use some form of regularization to ensure closeness to the original features, as well as neighborhood continuity. We apply our approach to images of a sub-micron crystal structure obtained through a holographic process.

NTIS

Crystal Structure ; Pattern Recognition ; Thickness

20020009645 Oak Ridge National Lab. , TN USA

Solid State Division ***Progress Report , Period ending 30 Sep. 1999***

Cooke, J. F. ; Feb. 26, 2001 ; 316p ; In English

Report No.(s): DE2001-777703 ; ORNL-6964 ; No Copyright ; Avail: Department of Energy Information Bridge

This report covers research progress in the Solid State Division from April 1, 1997, through September 30, 1999. During this period, the division conducted a broad, interdisciplinary materials research program in support of Department of Energy science and technology missions. The report includes brief summaries of research activities in condensed matter theory, neutron scattering, synthesis and characterization of materials, ion beam and laser processing, and the structure of solids and surfaces. An addendum includes listings of division publications and professional activities. Over the past two years, a number of important infrastructure improvements that will provide significant new research opportunities and unique capabilities for the division in neutron scattering and synchrotron x-ray research, electron microscopy, nanostructure fabrication, and theory have been pursued. A major upgrade of neutron scattering capabilities at the High Flux Isotope Reactor (HFIR), including a high-performance cold source, new beam lines and guides, and new and upgraded instrumentation, is under way. These upgrades, together with the proposed Spallation Neutron Source at ORNL, will provide the nation with unsurpassed capabilities worldwide in neutron

scattering. The division is also involved in the development of two synchrotron beam lines at the Advanced Photon Source at Argonne National Laboratory, an upgrade of the Z-contrast scanning transmission electron microscope to sub-angstrom resolution, development of a unique laser molecular beam epitaxy laboratory, and acquisition of a 11-Gflop parallel computer. Theoretical progress has included new insights into thin-film and surface phenomena, highly correlated systems, many body effects, quantum dots, and simulation of laser ablation. Neutron scattering has seen continued growth in the scientific user program along with progress on a broad research front including superconductivity, magnetism, polymers and complex fluids, residual stress mapping, and improved instrumentation. Advances in materials synthesis and processing are reported for superconductors, thin-film batteries, thermoelectrics, nanocrystals, and optical materials. Ion, laser, and molecular beam processing research has led to new understanding and control of defects, heterostructures, and nanostructure and thin-film growth. Significant progress has been made in the understanding of electrons at surfaces and in the evolution of surface morphology. New insights have been revealed on interfaces using atomic resolution scanning transmission electron microscopy and on microstructural properties in the mesoscale regime using synchrotron x-ray scattering.
NTIS
Synchrotrons ; Solid State Physics ; Molecular Beam Epitaxy ; Microstructure ; Computerized Simulation ; X Ray Scattering

20020010363 Sandia National Labs. , Albuquerque, NM USA
InAsSb/InPSb Strained-Layer Superlattice Growth Using Metal-Organic Chemical Vapor Deposition
Biefeld, R. M. ; Kurtz, S. R. ; Phillips, J. D. ; Aug. 09, 1999 ; 18p ; In English
Report No.(s): DE2001-9565 ; SAND99-0728C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The authors report on the metal-organic chemical vapor deposition (MOCVD) of strained layer superlattices (SLSs) of InAsSb/InPSb as well as mid-infrared optically pumped lasers grown using a high speed rotating disk-reactor (RDR). The devices contain AlAsSb cladding layers and strained, type I, InAsSb/InPSb active regions. by changing the layer thickness and composition of InAsSb/InPSb SLSs, they have prepared structures with low temperature (lt; 20 K) photoluminescence wavelengths ranging from 3.4 to 4.8 (micro)m. They find a variation in bandgap of 0.272 to 0.324 eV for layer thicknesses of 9.0 to 18.2 nm. From these data they have estimated a valence band offset for the InAsSb/InPSb interface of about 400 meV. The optical properties of the superlattices revealed an anomalous low energy transition that can be assigned to an antimony rich interfacial layer in the superlattice. An InAsSb/InPSb SLS, laser was grown on an InAs substrate with AlAs(sub 0.16)Sb(sub 0.84) cladding layers. A lasing threshold and spectrally narrowed laser emission were seen from 80 through 200 K, the maximum temperature where lasing occurred. The temperature dependence of the SLS laser threshold is described by a characteristic temperature, T(sub 0) = 72 K, from 80 to 200 K.
NTIS
Optical Properties ; Superlattices ; Metalorganic Chemical Vapor Deposition ; Cladding ; Energy Gaps (Solid State)

20020010379 Lawrence Livermore National Lab. , Livermore, CA USA
Design and development of the vacuum systems for the APT project ED and D cryomodule
Hansen, G. ; Kishiyama, K. ; Shen, S. ; Shoaff, P. V. ; Mar. 25, 1999 ; 5p ; In English
Report No.(s): DE2001-9620 ; UCRL-JC-133054 ; DP0404012 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The mechanical design for both the insulating vacuum system and the cavity vacuum system of the APT ED and D Cryomodule is summarized. The pre-cooldown pressure limits for the insulating vacuum and the cavity vacuum are 10(exp -5) Torr and 10(exp -6) Torr, respectively. In addition, the cold cavity operating pressure limits are 10(exp -6) Torr for the insulating system and 10(exp -8) Torr for the cavity system. The designs of these systems utilize both turbomolecular pumps and the cold surfaces of the superconducting Nb cavities to arrive at and maintain their operating vacuum pressures. A synopsis of the analysis undertaken to predict the vacuum system performance is also presented.
NTIS
Superconductors (Materials) ; Mechanical Engineering

20020010597 Sandia National Labs. , Albuquerque, NM USA
Pressure as a Probe of the Physics of Relaxor Ferroelectrics
Samara, G. A. ; Aug. 09, 1999 ; 6p ; In English
Report No.(s): DE2001-9704 ; SAND99-2072C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Pressure studies have provided new insights into the physics of compositionally-disordered ABO(sub 3) oxide relaxors. Specifically results are presented and discussed on a pressure-induced ferroelectric-to-relaxor crossover phenomenon, the

continuous evolution of the energetics and dynamics of the relaxation process, and the interplay between pressure and electric field in determining the dielectric response.
NTIS
Ferroelectric Materials ; Physics ; Order-Disorder Transformations

20020010600 Sandia National Labs. , Albuquerque, NM USA
Nucleation and Growth During Faceting of the Platinum Covered W(111) Surface
Hannon, J. B. ; Kellogg, G. L. ; Madey, T. E. ; Pelhos, K. ; Jul. 20, 1999 ; 24p ; In English
Report No.(s): DE2001-9640 ; SAND99-1901C ; No Copyright ; Avail: Department of Energy Information Bridge
Low energy electron microscopy (LEEM) and scanning tunneling microscopy (STM) have been used to investigate the faceting of W(111) as induced by Pt. The atomically rough W(111) surface, when fully covered with a monolayer film of Pt and annealed to temperatures higher than approximately 750 K, experiences a significant morphological restructuring: the initially planar surface undergoes a faceting transition and forms three-sided pyramids with (l brace)211(r brace) faces. When Pt is dosed onto the heated surface, the transition from planar to faceted structure proceeds through the nucleation and growth of spatially separated faceted regions, as shown by LEEM. STM reveals the atomic structure of the partially faceted surface, with large planar regions, dotted by clusters of pyramids of various sizes.
NTIS
Nucleation ; Platinum ; Electron Microscopy

20020010614 Sandia National Labs. , Albuquerque, NM USA
Picosecond Electronic Spectroscopy to Determine the Transformation Mechanism for the Pressure-Induced Phase Transition in Shocked CdS
Knudson, M. D. ; Gupta, Y. M. ; Kunz, A. B. ; Jul. 21, 1999 ; 6p ; In English
Report No.(s): DE2001-9590 ; SAND99-1848C ; No Copyright ; Avail: Department of Energy Information Bridge
Plate impact, shock wave experiments provide a unique method to investigate the time-dependent mechanisms and the kinetics associated with pressure-induced phenomena, such as chemical reactions and phase transformations. The very rapid and well defined loading conditions associated with plate-impact experiments permit real-time examination of the shock-induced changes. Further, the ability to propagate the shock wave along various crystallographic directions provides the means to perform careful analysis of the stress and orientational dependence. Recently, an experimental method has been developed to observe real-time changes in the absorption transmission of materials, with 100 or 200 ps resolution, in single-event, plate impact shock experiments. These data can provide useful information regarding the material under investigation. In particular, the dependence of the absorption edge on photon energy can distinguish between direct and indirect electronic transitions, and can provide an estimate of the band-gap energy of the material. Along with ab-initio techniques to calculate the electronic structure of a crystalline system, this electronic information can be used to gain insight regarding the crystal structure. The wurtzite-to-rocksalt phase transition in cadmium sulfide (CdS) is well suited to investigation through the use of fast electronic spectroscopy; the wurtzite and rocksalt phases exhibit a direct and indirect band gap with band gap energies of 2.5 and 1.5-1.7 eV, respectively. The intent of this work was to use picosecond electronic spectroscopy and ab-initio methods to examine the real-time structural changes that occur in the initial stages of the shock-induced wurtzite-to-rocksalt phase transition in single crystal CdS.
NTIS
Cadmium Sulfides ; Chemical Reactions ; Crystal Structure ; Electronic Structure

20020011159 Argonne National Lab. , IL USA
Use of cubic Nd-Ba-Cu-O seeds to create Theta(100), 90 deg-Theta(100), and Theta(001) tilt Y-Ba-Cu-O grain boundaries
Field, M. B. ; Oct. 20, 1998 ; 6p ; In English
Report No.(s): DE20-0111053 ; ANL/MSD/CP-97476 ; No Copyright ; Avail: Department of Energy Information Bridge
Using seeding techniques to control the orientation of grains, we have been able to create a wide variety of YBa2Cu3O(sub 6+x), grain boundaries. In addition to five domain samples with 90(degree)(100) twist and tilt grain boundaries, we have now developed a method to produce grain boundaries in the same sample that have the misorientations (theta)(001) tilt, (theta)(100) tilt, and 90(degree) (approximately) (theta)(100), where the disorientation angle (theta) is fully controllable. We will demonstrate how these boundaries can be synthesized, give experimental evidence via polarized light microscopy and electron backscatter patterns (EBSP) that the intended grain boundaries were indeed formed, and discuss the importance of these boundaries in future grain boundary studies.
NTIS
YBCO Superconductors ; Grain Boundaries

20020011163 Helsinki Univ. of Technology , Dept. of Engineering Physics and Mathematics , Espoo Finland
Nuclear Magnetism and Superconductivity in Rhodium. Low Temperature Laboratory
Knuuttila, T. ; November 2000 ; 128p ; In English
Report No.(s): PB2001-108049 ; Copyright ; Avail: National Technical Information Service (NTIS)

Rhodium is an excellent candidate for studies of nuclear magnetism and its interaction with superconductivity, as it possesses suitable properties for practical experiments in both aspects. This thesis presents the results of SQUID-NMR studies of a rhodium single crystal at record low temperatures. In the following sections the cryogenics and the sample properties are first shortly reviewed. The measurement setups and typical measurement schemes are presented. The main results of the experiments are then described, starting from the susceptibility measurements and the search for the ordered spin state, followed by multiple spin flip resonances, and concluded by the measurements in the superconducting state.
NTIS
Magnetic Properties ; Rhodium ; Single Crystals ; Superconductivity

20020011212 Lawrence Livermore National Lab. , Livermore, CA USA
Extreme States of Matter on Nova
Remington, B. A. ; Mar. 22, 1999 ; 7p ; In English
Report No.(s): DE2001-9652 ; UCRL-ID-133627 ; REPT-98-ERI-009 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This is the final report for the LDRD 90-ERI-009 involving Lasers and MRI to develop dynamic diffraction experiments to diagnose shocked solid-state lattices on intense lasers such at the Nova and Trident lasers. This was in collaboration with the US San Diego, University of Oxford, and Los Alamos National Laboratory. During this period, we have developed successful dynamic diffraction experiments on (111) and (400) Silicon lattices, both on the Nova laser and on the Trident laser. We also developed simultaneous transmission Bragg diffraction measurements of orthogonal lattice planes, to look for evidence of the transition to 3D. No evidence for lateral lattice adjustment was observed for (400 Si), which is a theoretical puzzle still under active investigation.
NTIS
Diffraction ; Lasers

20020011609 NASA Goddard Space Flight Center , Greenbelt, MD USA
The Effect of Twin Boundaries on the Spectroscopic Performance of CdZnTe Detectors
Parker, Bradford H. , NASA Goddard Space Flight Center , USA ; Stahle, C. M. , NASA Goddard Space Flight Center , USA ; Roth, D. , NASA Glenn Research Center , USA ; Babu, S. , NASA Goddard Space Flight Center , USA ; Tueller, Jack , NASA Goddard Space Flight Center , USA ; [2001] ; 11p ; In English ; SPIE's International Symposium on Optical Science and Technology , 29 Jul. - 3 Aug. 2001 , San Diego, CA , USA ; Sponsored by International Society for Optical Engineering , USA ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

Most single grains in cadmium zinc telluride (CdZnTe) grown by the high-pressure Bridgman (HPB) technique contain multiple twin boundaries. As a consequence, twin boundaries are one of the most common macroscopic material defects found in large area (400 to 700 sq mm) CdZnTe specimens obtained from HPB ingots. Due to the prevalence of twin boundaries, understanding their effect on detector performance is key to the material selection process. Twin boundaries in several 2 mm thick large area specimens were first, documented using infrared transmission imaging. These specimens were then fabricated into either 2 mm pixel or planar detectors in order to examine the effect of the twin boundaries on detector performance. Preliminary results show that twin boundaries, which are decorated with tellurium inclusions, produce a reduction in detector efficiency and a degradation in resolution. The extent of the degradation appears to be a function of the density of tellurium inclusions.
Author
Cadmium Tellurides ; Zinc ; Grain Size ; Crystal Growth ; Bridgman Method ; Spectroscopy ; Defects

20020011616 Sandia National Labs. , Albuquerque, NM USA
Computational Modeling of Heterogeneous Reactive Materials at the Mesoscale
Baer, M. R. ; Sep. 22, 1999 ; 9p ; In English
Report No.(s): DE2001-13064 ; SAND99-1036C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The mesoscopic processes of consolidation, deformation and reaction of shocked porous energetic materials are studied using shock physics analysis of impact on a collection of discrete 'crystals.' Highly resolved three dimensional CTH simulations indicate that rapid deformation occurs at material contact points causing large amplitude fluctuations of stress states with wavelengths of the order of several particle diameter. Localization of energy produces 'hot-spots' due to shock focusing and

plastic work near internal boundaries as material flows into interstitial regions. Numerical experiments indicate that 'hot-spots' arc strongly influenced by multiple crystal interactions. Chemical reaction processes also produce multiple wave structures associated with particle distribution effects. This study provides new insights into the micromechanical behavior of heterogeneous energetic materials strongly suggesting that initiation and sustained reaction of shocked heterogeneous materials involves states distinctly different from single jump state descriptions.
NTIS
Crystals ; Chemical Reactions ; Mesoscale Phenomena ; Shock ; Impact

20020011640 Computer Sciences Corp. , Moffett Field, CA USA
Computational Nanotechnology of Molecular Materials, Electronics, and Actuators with Carbon Nanotubes and Fullerenes
Srivastava, Deepak , Computer Sciences Corp. , USA ; Menon, Madhu , Kentucky Univ. , USA ; Cho, Kyeongjae , Stanford Univ. , USA ; [2001] ; 32p ; In English
Contract(s)/Grant(s): NSF DMR-98-09686 ; DOE-00-63857 ; NASA-00-64338 ; RTOP 704-40-32 ; DEPSCor-99-63231 ; DEPSCor-99-63232 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The role of computational nanotechnology in developing next generation of multifunctional materials, molecular scale electronic and computing devices, sensors, actuators, and machines is described through a brief review of enabling computational techniques and few recent examples derived from computer simulations of carbon nanotube based molecular nanotechnology.
Author
Actuators ; Computerized Simulation ; Molecular Electronics ; Nanotechnology

20020012219 Fermi National Accelerator Lab. , Batavia, IL USA
Perturbative two- and three-loop coefficients from large b Monte Carlo
Mackenzie, ; Shakespeare, N. H. ; Oct. 18, 1999 ; 8p ; In English
Report No.(s): DE2001-13830 ; FERMILAB-CONF-99/293-T ; No Copyright ; Avail: Department of Energy Information Bridge
Perturbative coefficients for Wilson loops and the static quark self-energy are extracted from Monte Carlo simulations at large Beta on finite volumes, where all the lattice moments are large. The Monte Carlo results are in excellent agreement with perturbation theory through second order. New results for third order coefficients are reported. Twisted boundary conditions are used to eliminate zero modes and to suppress 2(3) tunneling.
NTIS
Coefficients ; Monte Carlo Method ; Perturbation Theory ; Finite Volume Method

20020012225 Lawrence Livermore National Lab. , Livermore, CA USA
Electron field emission from undoped and doped DLC films
Chakhovskoi, A. G. ; Evtukh, A. A. ; Felter, T. E. ; Klyui, N. I. ; Kudzinovsky, S. Y. ; Jun. 01, 1999 ; 8p ; In English
Report No.(s): DE2001-13796 ; UCRL-JC-134060-Rev-1 ; No Copyright ; Avail: Department of Energy Information Bridge
Electron field emission and electrical conductivity of undoped and nitrogen doped DLC films have been investigated. The films were grown by the PE CVD method from CH(4):H(2) AND CH(4):H(2):N(2) gas mixtures, respectively. By varying nitrogen content in the gas mixture over the range 0 to 45%, corresponding concentrations of 0 to 8 % (atomic) could be achieved in the films. Three different gas pressures were used in the deposition chamber: 0.2, 0.6 and 0.8 Torr. Emission current measurements were performed at approximately 10 to the minus 6 power Torr using the diode method with emitter-anode spacing set at 20 micrometers. The current - voltage characteristics of the Si field electron emission arrays covered with DLC films show that threshold voltage varies in a complex manner with nitrogen content. As a function of nitrogen content, V(th) initially increases rapidly, then decreases and finally increases again for the highest concentration. Corresponding Fowler-Nordheim (F-N) plots follow F-N tunneling over a wide range. The F-N plots were used for determination of the work function, threshold voltage, field enhancement factor and effective emission area. For a qualitative explanation of experimental results, we treat the DLC film as a diamond-like (sp3 bonded) matrix with graphite-like inclusions.
NTIS
Doped Crystals ; Electron Emission ; Vapor Deposition ; Gas Mixtures ; Diamond Films

20020012236 Sandia National Labs. , Albuquerque, NM USA

New mechanical characterization method for thin film microactuators and its application to NiTiCi shape memory alloy

Seward, K. P. ; Jun. 01, 1999 ; 73p ; In English

Report No.(s): DE2001-13579 ; UCRL-LR-134231 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In an effort to develop a more full characterization tool of shape memory alloys, a new technique is presented for the mechanical characterization of microactuators and applied to SMA thin films. A test instrument was designed to utilize a spring-loaded transducer in measuring displacements with resolution of 1.5 pm and forces with resolution of 0.2 mN. Employing an out-of-plane loading method for freestanding SMA thin films, strain resolution of 30deg and stress resolution of 2.5 MPa were achieved. This new testing method is presented against previous SMA characterization methods for purposes of comparison.

NTIS

Mechanical Properties ; Thin Films ; Actuators

20020012244 Sandia National Labs. , Albuquerque, NM USA

Edge State Propagation Direction in the Fractional Quantum Hall Regime: Multi-Terminal Magnetocapacitance Experiment

Johnson, ; Moon, ; Reno, ; Simmons, ; Sep. 20, 1999 ; 17p ; In English

Report No.(s): DE2001-13079 ; SAND99-2151C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The propagation direction of fractional quantum Hall effect (FQHE) edge states has been investigated experimentally via the symmetry properties of the multi-terminal capacitances of a two dimensional electron gas. Although strong asymmetries with respect to zero magnetic field appear, no asymmetries with respect to even denominator Landau level filling factor v are seen. This indicates that current-carrying FQHE edge states propagate in the same direction as integer QHE edge states. In addition, anomalous capacitance features, indicative of enhanced bulk conduction, are observed at v = 1/2 and 3/2.

NTIS

Magnetic Fields ; Quantum Hall Effect

20020012331 Stanford Linear Accelerator Center , Menlo Park, CA USA

Photovoltage Effects in Photoemission from Thin GaAs Layers

Maruyama, T. ; Apr. 09, 2001 ; 26p ; In English

Report No.(s): DE2001-784892 ; SLAC-PUB-8753 ; No Copyright ; Avail: Department of Energy Information Bridge

A set of thin GaAs p-type negative electron affinity (NEA) photocathodes have been used to measure the yield of photoemitted electrons at high intensity excitation. The active layer thickness is 100 nm and the p-type doping ranges from 5x10(exp 18)/cc to 5x10(exp 19)/cc for a set four samples. The results show that the surface escape probability is a linear function of the NEA energy. The surface photovoltage effect on photoemission is found to diminish to zero at a doping level of 5x10(exp 19)cc. The experimental results are shown to be in good agreement with calculations using a charge limit model based on surface photovoltage kinetics that assume a constant electron energy relaxation rate in the band bending region.

NTIS

Gallium Arsenides ; Photoelectric Emission ; Photovoltages ; Electron Energy ; Negative Conductance

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20020006096 Los Alamos National Lab. , NM USA

High power operations at the low energy demonstration accelerator (leda)

Duran, M. ; Harris, V. R. ; Jan. 01, 2001 ; 12p ; In English

Report No.(s): DE2001-773885 ; LA-UR-01-552 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Recently, the Low-Energy Demonstration Accelerator (LEDA) portion of the Accelerator Production of Tritium (APT) project reached its 100-mA, 8-hr continuous wave (CW) beam operation milestone. The LEDA accelerator is a prototype of the low-energy front-end of the linear accelerator (linac) that would have been used in an APT plant. LEDA consists of a 75-keV proton injector, 6.7-MeV, 350-MHz CW radio-frequency quadrupole (RFQ) with associated high-power and low-level RF systems, a short high-energy beam transport (HEBT) and high-power (670-kW CW) beam dump. Details of the LEDA design

features will be discussed along with the operational health physics experiences that occurred during the LEDA commissioning phase.
NTIS
Continuous Radiation ; Linear Accelerators ; Prototypes ; Tritium

20020006099 Los Alamos National Lab. , NM USA
New developments on the e-p instability at the proton storage ring (psr)
Macek, R. ; Jan. 01, 2001 ; 12p
Report No.(s): DE2001-773428 ; LA-UR-01-203 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
New results are reported from an R and D program aimed at greater understanding and control of the e-p instability observed at the Los Alamos Proton Storage Ring (PSR). Numerous characteristics of the electron cloud for both stable and unstable beams in PSR were measured with ANL electron analyzers and various collection plates. Strong suppression of the electron flux density by TiN coating of the vacuum chamber in a straight section was also observed, thereby confirming an essential role for secondary emission at the walls. Landau Damping by a variety of techniques including higher rf voltage, transverse coupling, multipole fields in the lattice, and the use of inductive inserts has been effective in controlling the e-p instability. by these methods, the instability threshold has been raised significantly to 9.7 micro Coulombs per stored pulse.
NTIS
Protons ; Stability ; Storage Rings (Particle Accelerators) ; Electron Clouds ; Titanium Nitrides

20020006242 Los Alamos National Lab. , NM USA
e-A Physics at a Collider
Garvey, G. T. ; Jan. 09, 2001 ; 18p ; In English
Report No.(s): DE2001-772924 ; LA-UR-01-59 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
An electron-nucleus (e-A) collider with center-of-mass energy in excess of 50 GeV per electron-nucleon collision will allow the physics community to obtain unprecedented new knowledge of the partonic structure of nuclei. If reliable information is to be extracted on these partonic densities, it is essential to realize that with our current level of understanding of QCD, momentum transfers to the struck partons greater than 1 GeV/c are necessary. This requirement puts a priority on high center-of-mass energy if partonic densities are to be measured over a wide range. Comparing the partonic structure of the free nucleon to that of bound nucleons and measuring the systematic changes in that structure as a function of nucleon number (A) will provide deeper insight into the origins and dynamics of nuclear binding. In addition, e-A collisions will allow the exploration of partonic densities appreciably higher than is accessible in e-p collisions. An e-A collider will allow one to measure the gluonic structure functions of nuclei down to x (approximately) 10(sup (minus)3), information valuable in its own right and essential to a quantitative understanding of highly relativistic A-A collisions. The time-space evolution of partons can only be investigated by studying the modifications of hard collisions that take place when nuclear targets are employed. In a hard collision the partonic fragments interact, hadronize, and reinteract on their way to the distant detectors without revealing their evolution into the hadrons finally detected. Nuclear targets of differing A place varying amounts of nuclear matter in proximity to the hard collision producing unique information about the quantum fluctuations of incident projectile prior to the collision and on the early evolution of the produced partons. Using charged leptons (e, (mu)) to investigate this physics has been the richest source of information to date and extending the reach of these investigations by the constructing an e-A collider is the best opportunity within reach of the US nuclear science community. This work will potentially affect all areas of strong interaction research. A host of additional issues of considerable interest to nuclear scientists can be investigated; some of which are discussed below.
NTIS
Electron Scattering ; Nucleons ; Collisions

20020006770 Fermi National Accelerator Lab. , Batavia, IL USA
Development of high data readout rate pixel module and detector hybridization at Fermilab
Zimmermann, S. ; Mar. 20, 2001 ; 6p ; In English
Report No.(s): DE2001-776027 ; FERMILAB-CONF-00/348 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper describes the baseline design and a variation of the pixel module to handle the data rate required for the BTeV experiment at Fermilab. The present prototype has shown good electrical performance characteristics. Indium bump bonding is proven to be capable of successful fabrication at 50 micron pitch on real detectors. For solder bumps at 50 micron pitch, much

better results have been obtained with the fluxless PADS processed detectors. The results are adequate for our needs and our tests have validated it as a viable technology.
NTIS
Indium ; Radiation Detectors ; Electrical Properties ; Bonding

20020007931 Los Alamos National Lab. , NM USA
High current l-band linac
Russell, S. ; Carlsten, B. ; Goettee, J. ; Feb. 01, 2001 ; 3p ; In English
Report No.(s): DE2001-774508 ; LA-UR-01-0828 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Sub-Picosecond Accelerator (SPA) at the Los Alamos National Laboratory is an L-band photoinjector. Using magnetic compression, the SPA routinely compresses 8 MeV, 1 nC per bunch electron beams from an initial temporal FWHM (full width at half maximum) bunch length of 20 ps to less than 1 ps. In recent plasma wakefield accelerator experiments, we have compressed a 2 nC per bunch electron beam to an approximate temporal length of 1 ps.
NTIS
Electron Beams ; Linear Accelerators

20020008085 Argonne National Lab. , IL USA
Report of the Working Group on Precision Measurements: Measurements of the W BosonMass and Width
Brock, R. ; Erler, J. ; Kim, Y. K. ; Marciano, W. ; Ashmanskas, W. ; Nov. 29, 2000 ; 39p ; In English
Report No.(s): DE2001-772108 ; ANL-HEP-CP-00-123 ; No Copyright ; Avail: Department of Energy Information Bridge
We discuss the prospects for measuring the W mass and width in Run 2. The basic techniques used to measure M(sub W) are described and the statistical, theoretical and detector-related uncertainties are discussed in detail. Alternative methods of measuring the W mass at the Tevatron and the prospects for M(sub W) measurements at other colliders are also described.
NTIS
Bosons ; Precision ; Particle Mass

20020008152 Fermi National Accelerator Lab. , Batavia, IL USA
Search for single top quarks at D-Zero
Heinson, A. P. ; Mar. 20, 2001 ; 17p ; In English
Report No.(s): DE2001-776030 ; FERMILAB-CONF-01/005-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We present details of a search for electroweak production of single top quarks in the electron+jets and muon+jets decay channels. The measurements use (approx) 90 pb(sup (minus)1) of data from Run 1 of the Fermilab Tevatron collider, collected at 1.8 TeV with the DO detector. We use events that include a tagging muon, implying the presence of a b jet, to set an upper limit at the 95% confidence level on the cross section for the s-channel process p(bar p) (r-arrow) tb + X of 39 pb. The upper limit for the t-channel process p(bar p) (r-arrow) tqb + X is 58 pb.
NTIS
Cross Sections ; Particle Production ; Electroweak Interactions (Field Theory) ; Particle Accelerators ; Quantum Theory

20020008153 Fermi National Accelerator Lab. , Batavia, IL USA
Search for electroweak production of single top quarks at D-Zero
Heinson, A. P. ; Mar. 20, 2001 ; 3p ; In English
Report No.(s): DE2001-776028 ; FERMILAB-CONF-01/004-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper discusses a search for electroweak production of single top quarks in the electron+jets and muon+jets decay channels. The measurements use (approx) 90 pb(sup (minus)1) of data from Run 1 of the Fermilab Tevatron collider, collected at 1.8 TeV with the DO detector. We use events that include a tagging muon, implying the presence of a b jet, to set an upper limit at the 95% confidence level on the cross section for the s-channel process p(bar p) (r-arrow) tb + X of 39 pb. The upper limit for the t-channel process p(bar p) (r-arrow) tqb + X is 58 pb.
NTIS
Cross Sections ; Particle Production ; Quarks ; Electroweak Interactions (Field Theory)

20020008182 Fermi National Accelerator Lab. , Batavia, IL USA

QCD at the Tevatron: Jets and Fragmentation

Elvira, V. D. ; Sep. 27, 2001 ; 11p ; In English

Report No.(s): DE2001-786826 ; FERMILAB-CONF-01/281-E ; No Copyright ; Avail: Department of Energy Information Bridge

At the Fermilab Tevatron energies, (3-1800 GeV and 3-630 GeV), jet production is the dominant process. During the period 1992-1996, the theta and CDF experiments accumulated almost 100 pb-1 of data and performed the most accurate jet production measurements up to this date. These measurements and the NLO-QCD theoretical predictions calculated during the last decade, have improved our understanding of QCD, our knowledge of the proton structure, and pushed the limit to the scale associated with quark compositeness to 2.4-2.7 TeV. In this paper, we present the most recent published and preliminary measurements on jet production and fragmentation by the Dtheta and CDF collaborations.

NTIS

Quantum Chromodynamics ; Particle Accelerators ; Fragmentation

20020008185 Oak Ridge National Lab. , TN USA

MESON2000 Conference Summary

Barnes, T. ; Apr. 26, 2001 ; 11p ; In English

Report No.(s): DE2001-786758 ; P01-110657 ; No Copyright ; Avail: Department of Energy Information Bridge

This short contribution is a lite MESON2000 conference summary. As appropriate for the 600th anniversary of the Jagellonian University, it begins with a brief summary of the last 600 years of European history and its place in hadron physics. Next a physicist chiralty order parameter PC is introduced. When applied to MESON2000 plenary speakers this order parameter illustrates the separation of hadron physicists into disjoint communities. The individual plenary talks in MESON2000 are next sorted according to the subconference associated with each of the 36 plenary speakers. Finally, I conclude with a previously unreported Feynman story regarding the use of model in hadron physics.

NTIS

Mesons ; Conferences

20020008191 Fermi National Accelerator Lab. , Batavia, IL USA

Adjustable Permanent Quadrupoles Using Rotating Magnet Material Rods for the NextLinear Collider

Volk, J. T. ; Sep. 24, 2001 ; 4p ; In English

Report No.(s): DE2001-786649 ; FERMILAB-CONF-01/257-E ; No Copyright ; Avail: Department of Energy Information Bridge

The proposed Next Linear Collider (NLC) will require over 1400 adjustable quadrupoles between the main linacs' accelerator structures. These 12.7 mm bore quadruples will have a range of integrated strength from 0.6 to 132 Tesla, with a maximum gradient of 135 Tesla per meter, an adjustment range of +0-20% and effective lengths from 324 mm to 972 mm. The magnetic center must remain stable to within 1 micrometer during the 20% adjustment. In an effort to reduce estimated costs and increase reliability, several designs using hybrid permanent magnets have been developed. All magnets have iron poles and use either Samarium Cobalt or Neodymium Iron to provide the magnetic fields. Two prototypes use rotating rods containing permanent magnetic material to vary the gradient. Gradient changes of 20% and center shifts of less than 20 microns have been measured. These data are compared to an equivalent electromagnet prototype. See High Reliability Prototype Quadruple for the Next Linear Collider by C.E. Rago, C.M. Spencer, Z. Wolf submitted to this conference.

NTIS

Quadrupoles ; Magnetic Materials ; Magnetic Fields

20020008406 Oak Ridge National Lab. , TN USA

Exotic Mesons, Theory and Experiment

Barnes, T. ; Apr. 26, 2001 ; 13p ; In English

Report No.(s): DE2001-786774 ; P01-110656 ; No Copyright ; Avail: Department of Energy Information Bridge

In this talk I summarize the status of exotic mesons, including both theoretical expectations and experimental candidates. The current experimental candidates are 'spin-parity-exotics;' since these are most often considered possible hybrid mesons, the theoretical discussion will be mainly concerned with hybrids. The exotic meson candidates discussed are the surprisingly light pi 1 (1400) and pi 1 (1600).

NTIS

Mesons ; Quarks

20020008668 Lawrence Livermore National Lab. , Livermore, CA USA
Neutrino Factory and Muon Collider Collaboration R and D Program
Zisman, M. S. ; Jul. 01, 2000 ; 18p ; In English
Report No.(s): DE2001-776735 ; LBNL-46573 ; No Copyright ; Avail: Department of Energy Information Bridge
The Neutrino Factory and Muon Collider Collaboration (MC) comprises some 140 scientists and engineers located at U.S. National Laboratories and Universities, and at a number of non-U.S. research institutions. In the past year, the MC R (research) and D (development) program has shifted its focus mainly toward the design issues related to the development of a Neutrino Factory based on a muon storage ring. In this paper the status of the various R and D activities is described, and future plans are outlined.
NTIS
Muons ; Neutrinos ; Research and Development ; Particle Production

20020008670 Brookhaven National Lab. , Upton, NY USA
Low loss rapid cycling synchrotron design for the Spallation Neutron Source
Wei, J. ; Beebe-Wang, J. ; Blaskiewicz, M. ; Brennan, M. ; Cameron, P. ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-776733 ; BNL-67376 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper summarizes a low loss (10-s) alternative design for the Spallation Neutron Source (SNS) based on Rapid Cycling Synchrotrons (RCS).
NTIS
Neutron Sources ; Spallation ; Synchrotrons ; Design Optimization

20020008671 Brookhaven National Lab. , Upton, NY USA
Synchrotrons and accumulators for high intensity protons: Issues and experiences
Wei, ; Jun. 30, 2000 ; 5p ; In English
Report No.(s): DE2001-776730 ; BNL-67379 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper summarizes physical and engineering issues of high-intensity synchrotrons and accumulators, and discusses future applications and outlook.
NTIS
Accumulators ; Protons ; Synchrotrons

20020008672 Brookhaven National Lab. , Upton, NY USA
Chromatic correction and optical compensation in the SNS accumulator ring using sextupoles
Tsoupas, ; Gardner, ; Lee, ; Papaphilippou, ; Wei, ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-776729 ; BNL-67373 ; No Copyright ; Avail: Department of Energy Information Bridge
The accumulator ring of the Spallation Neutron Source (SNS) will accumulate a high intensity beam of 2.1 x 10(sup 14) protons in a single bunch with large transverse emittance of 160(pi) mm mrad at 95% beam intensity and energies of 1 to 1.3 GeV. In order to keep low beam losses ((approx) 10(sup (minus)4) in the ring, it is necessary to control the chromaticity and to minimize the dependence of the optical properties on the momentum spread. In this paper, we describe the procedure to accomplish this by using chromaticity sextupoles. We finally discuss the impact of these sextupoles in nonlinear dynamics.
NTIS
Neutron Sources ; Spallation ; Proton Beams ; Storage Rings (Particle Accelerators)

20020008673 Brookhaven National Lab. , Upton, NY USA
Role of quantum mechanics in neutrino factories
Gallardo, ; Sessler, ; Wurtele, ; Dec. 06, 2000 ; 14p ; In English
Report No.(s): DE2001-776727 ; BNL-67925 ; No Copyright ; Avail: Department of Energy Information Bridge
A compilation is made of the various ways in which quantum phenomena enter into the design and operation of a neutrino factory. They include production of pions, decay of pions into muons, ionization energy loss of muons in material, scattering and energy straggling of muons in material, polarization of muons, and the decay of muons into neutrinos, and the radiation effect of neutrinos. For each process formulas are presented which cover the basic mechanism. A discussion is presented of the areas of uncertainty and of the experiments, underway and proposed, which will reduce the uncertainty to an acceptable level.
NTIS
Neutrinos ; Quantum Mechanics ; Particle Production ; Systems Engineering

20020008678 Lawrence Livermore National Lab. , Livermore, CA USA
Studies of space-charge effects in ultrashort electron bunches
Fubiani, G. ; Leemans, W. ; Esarey, E. ; Jun. 01, 2000 ; 13p ; In English
Report No.(s): DE2001-776654 ; LBNL-47539 ; No Copyright ; Avail: Department of Energy Information Bridge

Laser-driven plasma-based accelerators are capable of producing ultrashort electron bunches in which the longitudinal size is much smaller than the transverse size. We present theoretical studies of the transport of such electron bunches in vacuum. Space charge forces acting on the bunch are calculated using an ellipsoidal bunch shape model. The effects of space charge forces and energy spread on longitudinal and transverse bunch properties are evaluated for various bunch lengths energies and amount of charge.
NTIS
Plasma Accelerators ; Electron Beams ; Electron Bunching

20020008684 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Amplification of Beam Acceleration in a Plasma by Plasma Instability
Lebedev, V. ; Sep. 01, 1998 ; 13p ; In English
Report No.(s): DE2001-777287 ; JLAB-ACP-98-03 ; DOE/ER/40150-1825 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Although achieving of high accelerating field in a plasma has been demonstrated experimentally, a practical use of such a scheme for building a large accelerator is questionable. A novel scheme of beam acceleration by a plasma wave is considered in this article. The scheme is based on an initial excitation of a plasma wave by a probe beam with comparatively modest intensity. This seed excitation is then amplified by plasma instability, so that the test beam which follows the probe beam with a small delay will be accelerated by the plasma wave with an amplitude significantly exceeding the initial amplitude of the wave. Because of small interaction between the synchronization beam and the plasma, such a scheme allows one to excite a plasma over large length and, consequently, to build a large accelerator.
NTIS
Excitation ; Magnetohydrodynamic Stability ; Plasma Waves ; Plasmas (Physics)

20020008685 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Electron Beam Diagnostics for Jefferson Lab's High Power Free-Electron Laser
Krafft, G. A. ; Jordan, K. ; Kehne, D. ; Benson, S. ; Denard, J. ; May 01, 1997 ; 3p ; In English
Report No.(s): DE2001-776934 ; JLAB-ACC-97-43 ; DOE/ER/40150-1822 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

In this paper the current plans for the diagnostic complement for Jefferson Lab IRFEL are presented. Diagnostic devices include optical transition radiation beam viewers, both stripline and button beam position monitors, multislit beam emittance measuring devices, coherent synchrotron and transition radiation bunch length monitoring devices, and synchrotron light cameras for measuring the beam profile at high average power. Most devices have update rates of order 1 sec or shorter, and all are controlled through an EPICS control system.
NTIS
Electron Beams ; Diagnosis ; Emittance ; Power Beaming

20020008876 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Operational Experience with the CEBAF Control System
White, K. ; Kehne, D. ; Oct. 01, 1995 ; 5p ; In English
Report No.(s): DE2001-777760 ; JLAB-ACC-95-003 ; DOE/ER/40150-1833 ; No Copyright ; Avail: Department of Energy Information Bridge

This paper describes our operational experience with the CEBAF (Continuous Electron Beam Accelerator Facility) control system. CEBAF is operated using a variety of software packages and custom applications. In the spirit of collaboration and software sharing, the current system utilizes code developed at four major laboratories as well as commercial packages and custom applications. The basis of the CEBAF control system is EPICS (Experimental Physics and Industrial Control System), originally developed at LANL (Los Alamos National Laboratory) and ANL (Argonne National Laboratory). The CEBAF accelerator is operated primarily using the common EPICS tools such as the archiver, alarm handler and display manager. In order to supplement the features of EPICS, custom applications have been developed and incorporated into the control system using C, C++, and TCL (Tool Command Language). Additionally, the CEBAF helium plant is controlled using the CEBAF TACL system which requires communications between the two control systems. CATER, a problem tracking program developed at SLAC (Stanford Linear

Accelerator Center), has also been integrated into the operational software. Current plans call for the integration of an on-line logbook developed at APS (Advanced Photon Source) and the internal development of a down-time logger program. We discuss how these various tools and applications are used operationally, the advantages and disadvantages of the systems and the challenges related to integrating this diverse array of software.
NTIS
Control Systems Design ; Particle Accelerators

20020008886 Oak Ridge National Lab. , TN USA
R-Matrix Resonance Analysis and Statistical Properties of the Resonance Parameters of 233U in the Neutron Energy Range from Thermal to 600 eV
Leal, L. C. ; Feb. 27, 2001 ; 59p ; In English
Report No.(s): DE2001-777670 ; ORNL/TM-2000/372 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The R-matrix resonance analysis of experimental neutron transmission and cross sections of (sup 233)U, with the Reich-Moore Bayesian code SAMMY, was extended up to the neutron energy of 600 eV by taking advantage of new high resolution neutron transmission and fission cross section measurements performed at the Oak Ridge Electron Linear Accelerator (ORELA). The experimental data base is described. In addition to the microscopic data (time-of-flight measurements of transmission and cross sections), some experimental and evaluated integral quantities were included in the data base. Tabulated and graphical comparisons between the experimental data and the SAMMY calculated cross sections are given. The ability of the calculated cross sections to reproduce the effective multiplication factors k(sub eff) for various thermal, intermediate, and fast systems was tested. The statistical properties of the resonance parameters were examined and recommended values of the average s-wave resonance parameters are given.
NTIS
Resonance ; Neutron Cross Sections ; Matrices (Mathematics) ; Electron Accelerators

20020008895 Los Alamos National Lab. , NM USA
Perturbation Approach for Quantum Computation
Berman, G. P. ; Kamenev, D. I. ; Tsifrinovich, V. I. ; Apr. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-777152 ; LA-UR-01-1873 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We discuss how to simulate errors in the implementation of simple quantum logic operations in a nuclear spin quantum computer with many qubits, using radio-frequency pulses. We verify our perturbation approach using the exact solutions for relatively small (L = 10) number of qubits.
NTIS
Errors ; Nuclear Spin ; Quantum Mechanics ; Perturbation Theory

20020008902 Thomas Jefferson National Accelerator Facility , Newport News, VA USA
Status of the Control System for the CLAS Detector at Jefferson Lab
Carroll, T. ; Gilmer, A. ; Vineyard, M. ; Auger, T. ; Brooks, W. ; Nov. 01, 1997 ; 3p ; In English
Report No.(s): DE2001-776931 ; JLAB-ACC-97-41 ; DOE/ER/40150-1820 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
A control system for Hall B at the Thomas Jefferson National Accelerator Facility is being developed within the framework of the Experimental Physics and Industrial Control System (EPICS). The Hall B equipment currently under EPICS control include numerous beam line devices, high voltage supplies, detector gas systems, and safety systems. The status of the control system is described.
NTIS
High Voltages ; Safety ; Supplying ; Analyzers ; Automatic Control

20020009115 Los Alamos National Lab. , NM USA
Color Dipole Approach to the Drell-Yan Process in pa Collisions
Kopeliovich, B. ; Mar. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-776169 ; LA-UR-01-1457 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In the target rest frame and at high energies, Drell-Yan (DY) dilepton production looks like bremsstrahlung of massive photons, rather than parton annihilation. The projectile quark is decomposed into a series of Fock states. Configurations with fixed transverse separations are interaction eigenstates for pp scattering. The DY cross section can then be expressed in terms of the

same color dipole cross section as DIS. This approach is especially suitable to describe nuclear effects, since it allows to apply Glauber multiple scattering theory. We go beyond the Glauber eikonal approximation by taking into account transitions between interaction eigenstates. We calculate nuclear shadowing at large Feynman-x(sub f) for DY in proton-nucleus collisions, compare to existing data from E772 and make predictions for RHIC. Nuclear effects on the transverse momentum distribution are also investigated.
NTIS
Particle Collisions ; Leptons ; Particle Production ; Dipoles

20020009136 Fermi National Accelerator Lab. , Batavia, IL USA
Precision Higgs physics at a future linear collider
Rainwater, D. ; Apr. 20, 2001 ; 10p ; In English
Report No.(s): DE2001-777947 ; FERMILAB-CONF-01/049-T ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Assuming that a Higgs sector is responsible for electroweak symmetry breaking, we attempt to address two important questions: How much better precision are various measurements of Higgs boson properties at a future linear collider than at the LHC. What can a future linear collider do for Higgs physics that the LHC cannot.
NTIS
Higgs Bosons ; Electroweak Interactions (Field Theory) ; Heavy Ions

20020009146 Atomic Energy Commission , Office of Technical Information , Washington, DC USA
Pressure Loss and Heat Transfer for Turbulent Flow
Koch, Rudolph ; VDI-Forschungsheft ; Sep. 1960 ; Volume 24 , No. 489 , pp. 3-44 ; In English
Report No.(s): AD-A395704 ; AEC-TR-3875 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
No abstract.
DTIC
Heat Transfer ; Turbulent Flow ; Air Flow ; Pressure Drop

20020009509 Fermi National Accelerator Lab. , Batavia, IL USA
Soft and Hard Interactions in p(pbar) Collisions at (radical)s = 1800 and 630 GeV
Rimondi, F. ; Apr. 18, 2001 ; 6p ; In English
Report No.(s): DE2001-777787 ; FERMILAB-CONF-01/042-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Soft proton-antiproton interactions are selected from events collected with the CDF minimum-bias trigger at (radical)(s) = 1800 and 630 GeV. The analysis of their properties compared at the two energies reveals important and unexpected invariances. This paper describes an attempt to address the problem and the study of the properties of genuine soft interactions. These are identified as a subsample of proton antiproton interactions collected with the CDF minimum bias trigger. In the analysis a splitting procedure of the full minimum bias sample in two subsamples, one highly enriched in soft interactions and the other enriched in hard interactions, is applied. The two subsamples are analyzed separately through the compared measures of some inclusive distributions and final state correlations at different c.m.s. energies. The results evidence some interesting unobserved properties of the isolated soft sample and, in particular, a remarkably unpredicted invariance of some of the measured correlations and spectra between 630 and 1800 GeV.
NTIS
Bias ; Collisions ; Proton-Antiproton Interactions

20020009618 Brookhaven National Lab. , Upton, NY USA
Measurements of coupling impedance for the SNS accumulator ring
Wang, ; Zhang, ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-779670 ; BNL-67374 ; No Copyright ; Avail: Department of Energy Information Bridge
The measurements of coupling impedance for the US Spallation Neutron Source (SNS) ring are presented. The work involves a strip-line Beam Position Monitor (BPM) and a window-frame kicker magnet. The conventional wire method is employed with improved formulas. The SNS Accumulator Ring is designed to contain a proton bunch of 2 x 10(exp 14) particles at 1 GeV with a repetition rate of 60 Hz for achieving 2 MW output power. This will be the highest intensity of proton beams in the world. Care must be taken to prevent collective instabilities. An accurate impedance budget of the ring components supported by experiments is essential. Therefore, an important piece of the ring design is to measure the coupling impedance of some critical ring

components and to compare with theory, model and simulation in order to gain confidence in the ring design. In this paper we report the measurements of coupling impedance of a strip-line BPM and a window-frame kicker magnet for the SNS accumulator ring.
NTIS
Spallation ; Storage Rings (Particle Accelerators) ; Impedance

20020009619 Brookhaven National Lab. , Upton, NY USA
Scaling law for the impact of magnet fringe fields
Wei, ; Papaphilippou, ; Talman, ; Jun. 30, 2000 ; 3p ; In English
Report No.(s): DE2001-779669 ; BNL-67378 ; No Copyright ; Avail: Department of Energy Information Bridge
A general scaling law can be derived for the relative momentum deflection produced on a particle beam by fringe fields, to leading order. The formalism is applied to two concrete examples, for magnets having dipole and quadrupole symmetry. During recent years, the impact of magnet fringe fields is becoming increasingly important for rings of relatively small circumference but large acceptance. A few years ago, following some heuristic arguments, a scaling law was proposed, for the relative deflection of particles passing through a magnet fringe-field. In fact, after appropriate expansion of the magnetic fields in Cartesian coordinates, which generalizes the expansions of Steffen, one can show that this scaling law is true for any multipole magnet, at leading order in the transverse coefficients. This paper intends to provide the scaling law to estimate the impact of fringe fields in the special cases of magnets with dipole and quadrupole symmetry.
NTIS
Scaling Laws ; Magnetic Fields ; Particle Beams ; Magnets

20020009624 Brookhaven National Lab. , Upton, NY USA
Muon Sources, Neutrino Factory to mu+- Colliders
Parsa, Z. ; Jun. 10, 2000 ; 14p ; In English
Report No.(s): DE2001-777849 ; BNL-68105 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Employing intense muon sources to carry out forefront low energy research, such as the search for muon-number non-conservation, or for the purpose of providing intense high energy neutrino beams ((nu)factory) represents very interesting possibilities. If successful, such efforts would significantly advance the state of muon technology and provides intermediate steps in technologies required for a future high energy muon collider complex. High intensity muon: production, capture, cooling, acceleration and multiturn muon storage rings are some of the key technology issues that needs more studies and development. A muon collider require basically same number of muons as for the muon storage ring Neutrino Factory, but would require more cooling, and simultaneous capture of both (+-)mu. We present an overview of Muon Sources - Neutrino Factories, example of a muon storage ring at BNL, and possible upgrades to a full Muon Collider.
NTIS
Muons ; Neutrino Beams

20020009625 Brookhaven National Lab. , Upton, NY USA
Proceedings of Riken/BNL Research Center Workshop, Equilibrium and Non-Equilibrium Aspects of Hot, Dense QCD , Volume 28
DeVega, H. J. ; Boyanovsky, D. ; Jul. 17, 2000 ; 186p ; In English
Report No.(s): DE2001-777848 ; BNL-52613 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Relativistic Heavy Ion Collider (RHIC) at Brookhaven, beginning operation this year, and the Large Hadron Collider (LHC) at CERN, beginning operation approximately 2005, will provide an unprecedented range of energies and luminosities that will allow us to probe the Gluon-Quark plasma. At RHIC and LHC, at central rapidity typical estimates of energy densities and temperatures are e * 1-10 GeV/f(cubic m) and T0 * 300 - 900 MeV. Such energies are well above current estimates for the GQ plasma. Initially, this hot, dense plasma is far from local thermal equilibrium, making the theoretical study of transport phenomena, kinetic and chemical equilibration in dense and hot plasmas, and related issues a matter of fundamental importance. During the last few years a consistent framework to study collective effects in the Gluon-Quark plasma, and a microscopic description of transport in terms of the hard thermal (and dense) loops resummation program has emerged. This approach has the potential of providing a microscopic formulation of transport, in the regime of temperatures and densities to be achieved at RHIC and LHC. A parallel development over the last few years has provided a consistent formulation of non-equilibrium quantum field theory that provides a real-time description of phenomena out of equilibrium. Novel techniques including non-perturbative approaches and the dynamical renormalization group techniques lead to new insights into transport and relaxation. A deeper understanding of collective excitations and transport phenomena in the GQ plasma could lead to recognize novel potential experimental

signatures. New insights into small-c physics reveals a striking similarity between small-c and hard thermal loops, and novel real-time numerical simulations have recently studied the parton distributions and their thermalizations in the initial stages of a heavy ion collision.
NTIS
Conferences ; Dense Plasmas ; High Temperature Plasmas ; Quantum Chromodynamics

20020009626 Brookhaven National Lab. , Upton, NY USA
Rare k+ Decays from Experiment e787
Jain, ; Oct. 09, 2000 ; 11p ; In English
Report No.(s): DE2001-777782 ; BNL-68143 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
This paper presents the latest results from experiment E787, at Brookhaven National Laboratory, on K(+) to pi(+) nu(bar (nu)) and radiative K(+) decays. The result for K(+) to pi(+) nu(bar (nu)) uses data collected in runs taken during 1995, 1996 and 1997. In addition, they discuss plans for future measurements of K(+) to pi(+) nu(bar (nu)).
NTIS
Kaons ; Particle Decay ; Pions

20020009630 Brookhaven National Lab. , Upton, NY USA
Multiparticle Production at RHIC and LHC: A Classical Point of View
Krasnitz, ; Venugopalan, ; Oct. 09, 2000 ; 6p ; In English
Report No.(s): DE2001-777777 ; BNL-68097 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We report results of our ongoing nonperturbative numerical study of a classical effective theory describing low-x partons in the central region of a heavy-ion collision. In particular, we give estimates of the initial transverse energies and multiplicities for a wide range of collision regimes, including those at RHIC (Relativistic Heavy Ion Collider) and at LHC (Large Hadron Collider).
NTIS
Estimates ; Ionic Collisions ; Partons ; Hadrons

20020009640 Brookhaven National Lab. , Upton, NY USA
PHENIX Experiment at RHIC
Aronson, ; Jul. 27, 2000 ; 5p ; In English
Report No.(s): DE2001-777714 ; BNL-68077 ; No Copyright ; Avail: Department of Energy Information Bridge
PHENIX is a large detector at the Relativistic Heavy Ion Collider (RHIC) at BNL. RHIC and PHENIX have recently operated for the first time, producing and detecting collisions of gold ions at beam energies of 30 and 65 GeV per nucleon. The current performance and future plans of PHENIX and of RHIC are presented.
NTIS
Detection ; Heavy Ions ; Ionic Collisions ; Gold

20020009646 Fermi National Accelerator Lab. , Batavia, IL USA
Quarkonia Production and Polarization Studies with CDF
Papadimitriou, V. , Fermi National Accelerator Lab. , USA ; April 16, 2001 ; 7p ; In English ; Meeting of the Division of Particles and Fields (DPF 2000) , 9-12 August, 2000 , Columbus, OH , USA ; Sponsored by American Physical Society , USA
Report No.(s): DE2001-777595 ; FERMILAB-CONF-00/308-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
In this paper the authors present results on production and polarization of the J/(psi), (psi)(2S), (chi)e, (Upsilon) and (chi)b states at (radical)s = 1.8 TeV. These results were obtained from data taken with the CDF detector at Fermilab. They cover recently completed analyses of the 1992--96 collider run.
NTIS
Quarks ; Particle Collisions ; Polarization (Spin Alignment)

20020009647 Fermi National Accelerator Lab. , Batavia, IL USA

CP Violation at CDF

Boudreau, J. , Fermi National Accelerator Lab. , USA ; Apr. 16, 2001 ; 15p ; In English ; 5th ; 5th Workshop on Heavy Quarks at Fixed Target (HQ2K) , 9-12 Oct. 2000 , Rio de Janeiro , USA

Contract(s)/Grant(s): AC02-76CH03000

Report No.(s): DE2001-777594 ; FERMILAB-CONF-01/020-E ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A major goal of experimental particle physics over the next decade is to measure the sides and angles of the Unitarity triangle redundantly, and as precisely as possible. Overconstraining the triangle will test the Cabbibo-Kobayashi-Maskawa model of quark mixing. The CDF collaboration, due to begin a second run in March 2001 with major upgrades to both the accelerator and the detector, will study the angle (beta) using B(sup 0) decays, the angle (gamma) using B(sup 0) and B(sub s)(sup 0) decays, and a side of the triangle through the observation of B(sub s)(sup 0)--(bar B)(sub s)(sup 0) mixing. Projected sensitivities are driven mostly by previous measurements using data from the first run. One highlight of the Run I B physics program is a measurement of the CP violating parameter sin 2(beta) = 0.79(sub (minus)0.44)(sup +0.41), based on a tagged sample of 400 B(sup 0) decays in the mode B(sub 0)/(bar B)(sup 0) (r-arrow) J/(psi)K(sub s)(sup 0). The technology of flavor tagging, used here as well as in numerous B(sup 0)-(bar B)(sup 0) mixing analyses in run I, is crucial and will be augmented in Run II with better particle identification capabilities. Exclusive all-hadronic final states will enter the data sample in Run II through a new displaced track trigger.

NTIS

Particle Accelerators ; Nuclear Physics ; Symmetry

20020010123 Oak Ridge National Lab. , TN USA

SUGGEL: A program suggesting the orbital angular momentum of a neutron resonance from the magnitude of its neutron width

Oh, S. Y. , Oak Ridge National Lab. , USA ; Feb. 02, 2001 ; 63p ; In English

Contract(s)/Grant(s): AC05-96OR22464

Report No.(s): DE2001-777661 ; ORNL/TM-2000/314 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The SUGGEL computer code has been developed to suggest a value for the orbital angular momentum of a neutron resonance that is consistent with the magnitude of its neutron width. The suggestion is based on the probability that a resonance having a certain value of g(Gamma)(sub n) is an l-wave resonance. The probability is calculated by using Bayes theorem on the conditional probability. The probability density functions (pdf) of g(Gamma)(sub n) for up to d-wave (l=2) have been derived from the (chi)(sup 2) distribution of Porter and Thomas. The pdf take two possible channel spins into account. This code is a tool which evaluators will use to construct resonance parameters and help to assign resonance spin. The use of this tool is expected to reduce time and effort in the evaluation procedure, since the number of repeated runs of the fitting code (e.g., SAMMY) may be reduced.

NTIS

Probability Density Functions ; Computer Programs ; Spin Resonance

20020010125 Oak Ridge National Lab. , TN USA

Programmed Assembly of Quantum-Dot Arrays on DNA Templates: Hardware for Quantum Computing

Wells, J. C. , Oak Ridge National Lab. , USA ; Mar. 23, 2001 ; 3p ; In English ; Eight International Conference on Quantum Information

Contract(s)/Grant(s): AC05-96OR22464

Report No.(s): DE2001-777653 ; P01-110351 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This paper reports progress in the fabrication and characterization of an array of 1nm-scale colloidal particles (i.e., quantum-dot array) that can be operated to execute nontrivial and innovative computations, possibly including quantum logic. We discuss the actual fabrication of 2-nm metal clusters as an example of possible quantum dot implementation. Innovative and unconventional paradigms underlie the different stages of this work. For example, regular array geometry is achieved by directing appropriately derivatized metal clusters to preselected locations along a stretched strand of an engineered DNA sequence.

NTIS

Quantum Computation ; Quantum Dots ; Metal Clusters ; Colloids

20020010180 Brookhaven National Lab. , Upton, NY USA

Proceedings of riken/bnl research center workshop, equilibrium and non-equilibrium aspects of hot, dense qcd , Volume 28

De Vega, ; Boyanovsky, ; Jul. 17, 2000 ; 186p ; In English

Report No.(s): DE2001-777928 ; BNL-52613 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven, beginning operation this year, and the Large Hadron Collider (LHC) at CERN, beginning operation (approximately)2005, will provide an unprecedented range of energies and luminosities that will allow us to probe the Gluon-Quark plasma. At RHIC and LHC, at central rapidity typical estimates of energy densities and temperatures are e * 1-10 GeV/f cu m and T0 * 300 - 900 MeV. Such energies are well above current estimates for the GQ plasma. Initially, this hot, dense plasma is far from local thermal equilibrium, making the theoretical study of transport phenomena, kinetic and chemical equilibration in dense and hot plasmas, and related issues a matter of fundamental importance. During the last few years a consistent framework to study collective effects in the Gluon-Quark plasma, and a microscopic description of transport in terms of the hard thermal (and dense) loops resumation program has emerged. This approach has the potential of providing a microscopic formulation of transport, in the regime of temperatures and densities to be achieved at RHIC and LHC. A parallel development over the last few years has provided a consistent formulation of non-equilibrium quantum field theory that provides a real-time description of phenomena out of equilibrium. Novel techniques including non-perturbative approaches and the dynamical renormalization group techniques lead to new insights into transport and relaxation. A deeper understanding of collective.excitations and transport phenomena in the GQ plasma could lead to recognize novel potential experimental signatures. New insights into small-c physics reveals a striking similarity between small-c and hard thermal loops, and novel real-time numerical simulations have recently studied the parton distributions and their thermalizations in the initial stages of a heavy ion collision.

NTIS

Quantum Chromodynamics ; Computerized Simulation ; High Temperature Plasmas

20020010181 Brookhaven National Lab. , Upton, NY USA

Muon sources, neutrino factory to mu+- colliders

Parsa, ; Jun. 10, 2000 ; 14p ; In English

Report No.(s): DE2001-777929 ; BNL-68105 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Employing intense muon sources to carry out forefront low energy research, such as the search for muon - number non-conservation, or for the purpose of providing intense high energy neutrino beams ((nu)factory) represents very interesting possibilities. If successful, such efforts would significantly advance the state of muon technology and provides intermediate steps in technologies required for a future high energy muon collider complex. High intensity muon: production, capture, cooling, acceleration and multiturn muon storage rings are some of the key technology issues that needs more studies and development. A muon collider require basically same number of muons as for the muon storage ring Neutrino Factory, but would require more cooling, and simultaneous capture of both (+-)(mu). We present an overview of Muon Sources - Neutrino Factories, example of a muon storage ring at BNL, and possible upgrades to a full Muon Collider.

NTIS

Neutrinos ; Muons ; Neutrino Beams

20020010184 Brookhaven National Lab. , Upton, NY USA

Deeply Inelastic Scattering Off Nuclei at RHIC

Venugopalan, R. ; Sep. 14, 2001 ; 36p ; In English

Report No.(s): DE2001-779774 ; BNL-68091 ; No Copyright ; Avail: Department of Energy Information Bridge

In this talk, we discussed the physics case for an eA collider. We emphasized the novel physics that might be studied at small x. The interesting physics at intermediate x's has been discussed elsewhere. Plans for an electron-ion collider include, as a major part of the program, the possibility of doing polarized electron-polarized proton/light ion scattering. A discussion of the combined case for high energy electron nucleus and polarized electron-polarized proton scattering will be published separately.

NTIS

Inelastic Scattering ; Ion Scattering ; Proton Scattering ; Particle Interactions

20020010185 Brookhaven National Lab. , Upton, NY USA

Uniform Semiclassical Approximation in Quantum Statistical Mechanics

DeCarvalho, C. A. A. ; Cavalcanit, R. M. ; Fraga, E. S. ; Joras, S. E. ; Oct. 23, 2000 ; 5p ; In English

Report No.(s): DE2001-779786 ; BNL-68026 ; No Copyright ; Avail: Department of Energy Information Bridge

We present a simple method to deal with caustics in the semiclassical approximation to the partition function of a one-dimensional quantum system. The procedure, which makes use of complex trajectories, is applied to the quartic double-well potential.
NTIS
Approximation ; Quantum Mechanics

20020010616 Sandia National Labs. , Albuquerque, NM USA
Strong Resonant Intersubband Magnetopolaron Effect in Heavily Modulation-Doped GaAs/AlGaAs Single Quantum Wells at High Magnetic Fields
Jiang, H. W. ; Jones, E. ; Lee, X. Y. ; Leem, Y. A. ; McCombe, B. D. ; Jul. 20, 1999 ; 8p ; In English
Report No.(s): DE2001-9581 ; SAND99-1545C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Electron cyclotron resonance (CR) has been studied in magnetic fields up to 32 T in two heavily modulation -d-doped GaAs/Al(sub 0.3)Ga(sub 0.7)As single-quantum-well. Little effect on electron CR is observed in either sample in the region of resonance with the GaAs LO phonons. However, above w(sub LO) at B > 27 T, electron CR exhibits a strong avoided-level-crossing splitting for both samples at energies close to E(sub LO) + (E(sub 2)-E(sub 1)), where E(sub 2), and E(sub 1) are the energies of the bottoms of the second and the first subbands, respectively. The energy separation between the two branches is large, reaching a minimum of about 40 cm(sup (minus)1) around 30.5 T for both samples. This splitting is due to a three-level resonance between the second LL of the first electron subband and the lowest LL of the second subband plus a LO phonon. The large splitting in the presence of high electron densities is due to the absence of occupation (Pauli-principle) effects in the final states and weak screening for this three level process.
NTIS
Gallium Arsenides ; Magnetic Fields ; Doped Crystals ; Electron Cyclotron Resonance ; Aluminum Gallium Arsenides

20020010887 Stanford Linear Accelerator Center , Menlo Park, CA USA
Counterterms in Supergravity
Dixon, L. ; Jan. 24, 2001 ; 11p ; In English
Report No.(s): DE2001-784851 ; SLAC-PUB-8762 ; No Copyright ; Avail: Department of Energy Information Bridge
We examine the ultraviolet behavior of supergravity theories as a function of dimension and number supercharges.
NTIS
Supergravity ; Ultraviolet Radiation ; Linear Accelerators ; Computation

20020010952 Sandia National Labs. , Albuquerque, NM USA
From Atom-Picoseconds to Centimeter-Years in Simulation and Experiment
Horstemeyer, M. F. ; Hamilton, J. C. ; Thompson, A. ; Baskes, M. I. ; Plimpton, S. J. ; Dec. 01, 2000 ; 224p ; In English
Report No.(s): DE2001-781976 ; SAND2001-8111 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The final report for a Laboratory Directed Research and Development project entitled, 'From Atom-Picoseconds to Centimeter-Years in Simulation and Experiment' is presented. In this project, separate modeling methods at the atomic scale were used to bridge gaps in time and space with higher scales. For understanding of continuum mechanics quantities at various scales atomistic simulations that ranged from nanometers to microns were performed and experiments from centimeters to millimeters were performed. Certain continuum mechanical quantities were clearly defined as a function of size scale, for example, the yield stress. Several techniques were used to extend the time scale of simulations, including calculating prefactors and activation energies for diffusion events and mapping complex atomic motions onto more tractable lattice models. In the case of transport of small molecules in polymeric and nanoporous materials, new Monte Carlo methods for sampling transition rates were developed.
NTIS
Continuum Mechanics ; Monte Carlo Method ; Computerized Simulation

20020011614 Sandia National Labs. , Albuquerque, NM USA
Design of a Large Bore 60-T Pulse Magnet for Sandia National Laboratories
Lesch, ; Li, ; Pernambuco-Wise, ; Rovang, ; Schneider-Muntau, ; Sep. 23, 1999 ; 6p ; In English
Report No.(s): DE2001-13071 ; SAND99-1655C ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The design of a new pulsed magnet system for the generation of intense electron beams is presented. Determined by the required magnetic field profile along the axis, the magnet system consists of two coils (Coil No.1 and No.2) separated by a 32-mm

axial gap. Each coil is energized independently. Both coils are internally reinforced with HIM Zylon fiber/epoxy composite. Coil No.1 made with AI-15 Glidcop wire has a bore of 110-mm diameter and is 200-mm long; it is energized by a 1.3-MJ, 13-kV capacitor bank. The magnetic field at the center of this coil is 30 T. Coil No.2 made with CuNb wire has a bore of 45 mm diameter, generates 60 T with a pulse duration of 60 ms, and is powered by a 4.O-MJ, 17.7-kV capacitor bank. We present design criteria, the coupling of the magnets, and the normal and the fault conditions during operation.
NTIS
Electron Beams ; Epoxy Matrix Composites ; Fiber Composites ; Pulse Duration ; Capacitors

20020011619 Argonne National Lab. , IL USA
Electron beam bunch length characterizations using incoherent and coherent radiation on the APS SASE FEL project
Berg, W. J. ; Happek, U. ; Lewellen, J. W. ; Lumpkin, A. H. ; Sereno, N. S. ; Aug. 28, 1999 ; 18p ; In English
Report No.(s): DE2001-11807 ; ANL/ASD/CP-99024 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The Advanced Photon Source (APS) injector linac has been reconfigured with a low-emittance rf thermionic gun and a photocathode (PC) rf gun to support self-amplified spontaneous emission (SASE) free-electron laser (FEL) experiments. One of the most critical parameters for optimizing SASE performance (gain length) is the electron beam peak current, which requires a charge measurement and a bunch length measurement capability. We report here initial measurements of the latter using both incoherent optical transition radiation (OTR) and coherent transition radiation (CTR), A visible light Hamarnatsu C5680 synchroscan streak camera was used to measure the thermionic rf gun beam's bunch length ((sigma) (approximately)2 to 3ps) via OTR generated by the beam at 220 MeV and 200 mA macropulse average current. In addition, a CTR monitor (Michelson Interferometer) based on a Golay cell as the far infrared (FIR) detector has been installed at the 40-MeV station in the beamline. Initial observation s of CTR signal strength variation with gun a-magnet current and interferograms have been obtained. Progress in characterizing the beam at these locations and a comparison to other bunch length determinations will be presented.
NTIS
Coherent Radiation ; Electron Beams ; Free Electron Lasers ; Far Infrared Radiation ; Streak Cameras

20020012218 Fermi National Accelerator Lab. , Batavia, IL USA
New rare decay results from KTeV
Whitmore, J. ; Oct. 19, 1999 ; 12p ; In English
Report No.(s): DE2001-13831 ; FERMILAB-CONF-99-266-E.PS ; No Copyright ; Avail: Department of Energy Information Bridge
KTeV (Kaons at the TeVatron) is a fixed target experiment at Fermilab designed to study the properties of the neutral kaon system. Experimental program has two main experimental goals. The rare decays presented in this article contain leptons and photons in the final state; the salient features for detecting these particles in KTeV will be described below. Neutral beams are produced by striking a BeO target with an 800 GeV proton beam. The neutral beam passes through a series of collimators, a Pb absorber which converts photons, and a series of sweeping magnets which bend the charged particles out of the beamline.
NTIS
Kaons ; Particle Accelerators ; Neutral Beams ; Quantum Mechanics ; Flavor (Particle Physics) ; Particle Decay

20020012222 Fermi National Accelerator Lab. , Batavia, IL USA
Weak matrix elements in the large Nc limit
Bardeen, W. A. ; Oct. 15, 1999 ; 8p ; In English
Report No.(s): DE2001-13817 ; FERMILAB-CONF-99/255-T ; No Copyright ; Avail: Department of Energy Information Bridge
The matrix elements of the four quark operators needed to predict many weak interaction processes can be evaluated using the large Nc limit of quantum chromodynamics. At leading order in the large Nc expansion, the weak matrix elements of two quark operators, a common approximation being used today. At next leading order, the weak matrix elements acquire the leading scale and scheme dependence expected for these matrix elements which involve matching perturbative QCD calculations at short distance to non-perturbative hadronic matrix elements at long distance.
NTIS
Quantum Chromodynamics ; Weak Interactions (Field Theory) ; Hadrons ; Chiral Dynamics

20020012299 Stanford Linear Accelerator Center , Menlo Park, CA USA
Multiple-Trace Operators and Non-Local String Theories
Silverstein, E. M. ; Jul. 25, 2001 ; 22p ; In English
Report No.(s): DE2001-784977 ; SLAC-PUB-8843 ; No Copyright ; Avail: Department of Energy Information Bridge

We propose that a novel deformation of string perturbation theory, involving non-local interactions between strings, is required to describe the gravity duals of field theories deformed by multiple-trace operators. The new perturbative expansion involves a new parameter, which is neither the string coupling nor the coefficient of a vertex operator on the worldsheet. We explore some of the properties of the deformation, focusing on a special case where the deformation in the field theory is exactly marginal.
NTIS
String Theory ; Field Theory (Physics) ; Elementary Particle Interactions ; Perturbation Theory

20020012300 Stanford Linear Accelerator Center , Menlo Park, CA USA
Quantum Statistics Correction to Intrabeam Scattering Rates
Kabel, A. C. ; May 23, 2001 ; 8p ; In English
Report No.(s): DE2001-784976 ; SLAC-PUB-8841 ; No Copyright ; Avail: Department of Energy Information Bridge
Intrabeam scattering (IBS) is a relaxation process which brings a bunch of charged particles in an accelerator closer to its thermal equilibrium distribution. This leads to a time variation of collective quantities of the bunch, most notably of the emittance. The typical relaxation times can be calculated using the formalism of Bjorken and Mtingwa. This formalism treats the particles in the bunch as distinguishable classical particles. In this paper, we extend the results to include effects due to quantum statistics.
NTIS
Quantum Statistics ; Charged Particles ; Scattering ; Electron Bunching

20020012304 Stanford Linear Accelerator Center , Menlo Park, CA USA
Small Numbers From Tunneling Between Brane Throats
Kachru, S. ; Jul. 25, 2001 ; 12p ; In English
Report No.(s): DE2001-784972 ; SLAC-PUB-8819 ; No Copyright ; Avail: Department of Energy Information Bridge
Generic classes of string compactifications include brane throats emanating from the compact dimensions and separated by effective potential barriers raised by the background gravitational fields. The interaction of observers inside different throats occurs via tunnelling and is consequently weak. This provides a new mechanism for generating small numbers in Nature. We apply it to the hierarchy problem, where supersymmetry breaking near the unification scale causes TeV sparticle masses inside the standard model throat. We also design naturally long-lived cold dark matter which decays within a Hubble time to the approximate conformal matter of a long throat. This may soften structure formation at galactic scales and raises the possibility that much of the dark matter of the universe is conformal matter. Finally, the tunnelling rate shows that the coupling between throats, mediated by bulk modes, is stronger than a naive application of holography suggests.
NTIS
Supersymmetry ; Dark Matter ; Extraterrestrial Matter ; Holography ; String Theory

20020012306 Stanford Linear Accelerator Center , Menlo Park, CA USA
Hierarchies from Fluxes in String Compactifications
Kachru, S. ; Jul. 23, 2001 ; 35p ; In English
Report No.(s): DE2001-784970 ; SLAC-PUB-8807 ; No Copyright ; Avail: Department of Energy Information Bridge
Warped compactifications with significant warping provide one of the few known mechanisms for naturally generating large hierarchies of physical scales. We demonstrate that this mechanism is realizable in string theory, and give examples involving orientifold compactifications of IIB string theory and F-theory compactifications on Calabi-Yau four-folds. In each case, the hierarchy of scales is fixed by a choice of RR and NS fluxes in the compact manifold. Our solutions involve compactifications of the Klebanov-Strassler gravity dual to a confining N=1 supersymmetric gauge theory, and the hierarchy reflects the small scale of chiral symmetry breaking in the dual gauge theory.
NTIS
Broken Symmetry ; Gauge Theory ; Gravitation ; String Theory ; Supersymmetry

20020012309 Stanford Linear Accelerator Center , Menlo Park, CA USA
Radiative Corrections to the Casimir Force and Effective Field Theories
Melnikov, K. ; Jul. 25, 2001 ; 17p ; In English
Report No.(s): DE2001-784966 ; SLAC-PUB-8756 ; No Copyright ; Avail: Department of Energy Information Bridge
Radiative corrections to the Casimir force between two parallel plates are considered in both scalar field theory of one massless and one massive field the in QED. Full calculations are contrasted with calculations based on employing boundary-free

radiative corrections to the Casimir force between two parallel plates is clarified and the low-energy effective field theory for the Casimir effect in QED is constructed.
NTIS
Quantum Electrodynamics ; Scalars ; Parallel Plates

20020012310 Stanford Linear Accelerator Center , Menlo Park, CA USA
Domain Walls, Black Holes and Supersymmetric Quantum Mechanics
Shmakova, M. ; Jul. 25, 2001 ; 35p ; In English
Report No.(s): DE2001-784965 ; SLAC-PUB-8749 ; No Copyright ; Avail: Department of Energy Information Bridge
Supersymmetric solutions, such as BPS domain walls or black holes, in four- and five-dimensional supergravity theories with eight supercharges can be described by effective quantum mechanics with a potential term. We show how properties of the latter theory can help us to learn about the physics of supersymmetric vacua and BPS solutions in these supergravity theories. The general approach is illustrated in a number of specific examples where scalar fields of matter multiplets take values in symmetric coset spaces.
NTIS
Quantum Mechanics ; Supersymmetry ; Supergravity ; Scalars

20020012312 Stanford Linear Accelerator Center , Menlo Park, CA USA
Closed Strings From Nothing
Lawrence, A. ; Jul. 25, 2001 ; 26p ; In English
Report No.(s): DE2001-784963 ; SLAC-PUB-8735 ; No Copyright ; Avail: Department of Energy Information Bridge
We study the physics of open strings in bosonic and type II string theories in the presence of unstable D-branes. When the potential energy of the open string tachyon is at its minimum, Sen has argued that only closed strings remain in the perturbative spectrum. We explore the scenario of Yi and of Bergman, Hori and Yi, who argue that the open string degrees of freedom of strongly coupled and disappear through confinement. We discuss arguments using open string field theory and worldsheet boundary RG flows, which seem to indicate otherwise. We then describe a solitonic excitation of the open string tachyon and gauge field with the charge and tension of a fundamental closed string. The requires a double scaling limit where the tachyon is taken to its minimal value and the electric field is taken to its maximum value. The resulting flux tube has an unconstrained spatial profile; and for large fundamental string charge, it appears to have light, weakly coupled open strings living in the core. We argue that the flux tube acquires a size or order a through sigma model and string coupling effects; and we argue that confinement effects make the light degrees of freedom heavy and strongly interacting.
NTIS
String Theory ; Excitation ; Solitary Waves

20020012314 Stanford Linear Accelerator Center , Menlo Park, CA USA
D-branes in Massive IIA and Solitons in Chern-Simons Theory
Brodie, J. H. ; Jul. 25, 2001 ; 24p ; In English
Report No.(s): DE2001-784961 ; SLAC-PUB-8729 ; No Copyright ; Avail: Department of Energy Information Bridge
We investigate D2-branes and D4-branes parallel to D8-branes. The low energy world volume theory on the branes is non-supersymmetric Chern-Simons theory. We identify the fundamental strings as the anyons of the 2+1 Chern-Simons theory and the D0-branes as solitons. The Chern-Simons theory with a boundary is modeled using NS 5-branes with ending D6-branes. The brane set-up provides for a graphical description of anomaly inflow. We also model the 4+1 Chern-Simons theory using branes and conjecture that D4-branes with a boundary describes a supersymmetric version of Kaplan's theory of chiral fermions.
NTIS
Chirality ; Fermions ; Supersymmetry ; Field Theory (Physics)

20020012316 Stanford Linear Accelerator Center , Menlo Park, CA USA
Mediating Supersymmetry Breaking in D-brane Models
Brodie, J. H. ; Jul. 25, 2001 ; 34p ; In English
Report No.(s): DE2001-784959 ; SLAC-PUB-8706 ; No Copyright ; Avail: Department of Energy Information Bridge
We consider the 3+1 visible sector to live on a Hanay-Witten D-brane construction in type IIA string theory. The messenger sector consists of stretched strings from the visible brane to a hidden D6-brane in the extra spatial dimensions. In the open string channel supersymmetry is broken by gauge mediation while in the closed string channel supersymmetry is broken by gravity mediation. Hence, we call this kind of mediation 'string mediation.' We propose an extension of the Dimopoulos-Georgi theorem

to brane models: only detached probe branes can break supersymmetry without generating a tachyon. Fermion masses are generated at one loop if the branes break a sufficient amount of the ten dimensional Lorentz group while scalar potentials are generated if there is a force between the visible brane and the hidden brane. Scalars can be lifted at two loops through a combination of brane bending and brane forces. We find a large class of stable non-supersymmetric brane configurations of ten dimensional string theory.
NTIS
Supersymmetry ; String Theory ; Fermions ; Gravitation

20020012317 Stanford Linear Accelerator Center , Menlo Park, CA USA
How Bob Laughlin Tamed the Giant Graviton from Taub-NUT Space
Brodie, J. H. ; Jul. 25, 2001 ; 28p ; In English
Report No.(s): DE2001-784958 ; SLAC-PUB-8657 ; No Copyright ; Avail: Department of Energy Information Bridge
In this paper we show how two dimensional electron systems can be modeled by strings interacting with D-branes. The dualities of string theories allow several descriptions of the system. These include descriptions in terms of solitons in the near horizon D6-brane theory, non-commutative gauge theory on a D2-brane, the Matrix Theory of D0-branes and finally as a giant graviton in M-theory. The soliton can be described as a D2-brane with an incompressible fluid of D0-branes and charged string-ends moving on it. Including an NS5 brane in the system allows for the existence of an edge with the characteristic massless chiral edge states of the Quantum Hall system.
NTIS
Gravitons ; Incompressible Flow ; Incompressible Fluids ; Gauge Theory ; Chirality

20020012348 Stanford Linear Accelerator Center , Menlo Park, CA USA
Single-Particle Quantum Dynamics in a Magnetic Lattice
Venturini, M. ; Feb. 01, 2001 ; 10p ; In English
Report No.(s): DE2001-784871 ; SLAC-PUB-8764 ; No Copyright ; Avail: Department of Energy Information Bridge
We study the quantum dynamics of a spinless charged-particle propagating through a magnetic lattice in a transport line or storage ring. Starting from the Klein-Gordon equation and by applying the paraxial approximation, we derive a Schrodinger-like equation for the betatron motion. A suitable unitary transformation reduces the problem to that of a simple harmonic oscillator. As a result we are able to find a explicit expression for the particle wavefunction.
NTIS
Charged Particles ; Quantum Electrodynamics ; Klein-Gordon Equation ; Storage Rings (Particle Accelerators)

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20020010589 NASA Ames Research Center , Moffett Field, CA USA
Bringing ”Scientific Expeditions” into the Schools
Watson, Val , NASA Ames Research Center , USA ; Jul. 24, 1994 ; 2p ; In English
Contract(s)/Grant(s): RTOP 505-59-53 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Schools can obtain scientific information over the information superhighway. However, information suppliers use formats that permit access and analysis by the ”least common denominator” tools for access and analysis. The result: most sources of dynamic representations of science are in the format of flat movies. We can shorten the time to get the ”scientific expeditions” into schools and provide a unifying focus to vendors and information suppliers by establishing a target and goals for the ”least common denominator” for tools to be used to access and analyze information over the information superhighway.
Author
Education ; Space Exploration ; World Wide Web

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020005969 Federal Energy Technology Center , Morgantown, WV USA
Hemispheric center for environmental technology. News Highlights, March 1999
Ebadian, M. A. ; Mar. 30, 1999 ; 86p ; In English
Report No.(s): DE2001-772519 ; DE-FG01-95EW55094-67 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A vendor was selected for the diamond wire technology demonstration scheduled for this summer at Princeton Plasma Physics Laboratory (PPPL).A team consisting of personnel from FIU-HCET, PPPL, and AEA Technology reviewed the submitted bids. FIU-HCET will contract this vendor. At the SRS Ninth ICT teleconference, the ICT team discussed the status of the following demonstrations: LRAD; x-ray, K-edge; Strippable Coatings; Thermal Spray Vitrification; Cutting/Shearing/ Dismantlement/Size Reduction; and Electrets. The LRAD demo is complete, and the x-ray/K-edge, Strippable Coatings, and Electrets demos are ongoing. The Asbestos and Thermal Spray Vitrification demos require more laboratory testing. The Cutting/Shearing/ Dismantlement/Size Reduction demo is undergoing procurement. Five FIU-HCET staff members took the 1S0 14000 environmental auditor training course February 22-26, 1999, given by ASC. The test plan for the Facility Dismantlement Technology Assessment is finished and ready for internal review.
NTIS
Technology Assessment ; Wire ; Plasma Physics ; Project Management

20020005976 NASA Ames Research Center , Moffett Field, CA USA
Teamwork in the Real World
Foyle, David C. , NASA Ames Research Center , USA ; Shafto, Michael G. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English
Contract(s)/Grant(s): RTOP 538-04-13 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The National Aeronautics and Space Administration (NASA) is well known for its roles in the space program and in aeronautics. Because teamwork is essential for most NASA missions, NASA has experience in both research on teamwork and implementation of team projects. The purpose of this chapter is not to summarize research results on teamwork. This chapter will summarize our insight into teamwork as it applies to the large institutions and organizations with which we have been associated: University academic systems, Navy research laboratories, and NASA. These organizations represent a variety of systems in which teamwork is commonplace.
Author
Aeronautical Engineering ; NASA Space Programs ; Education

20020006944 NASA Ames Research Center , Moffett Field, CA USA
Batch Scheduling a Fresh Approach
Cardo, Nicholas P. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Cray User Group , 13-17 Mar. 1995 , Denver, CO , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The Network Queueing System (NQS) was designed to schedule jobs based on limits within queues. As systems obtain more memory, the number of queues increased to take advantage of the added memory resource. The problem now becomes too many queues. Having a large number of queues provides users with the capability to gain an unfair advantage over other users by tailoring their job to fit in an empty queue. Additionally, the large number of queues becomes confusing to the user community. The High Speed Processors group at the Numerical Aerodynamics Simulation (NAS) Facility at NASA Ames Research Center developed a new approach to batch job scheduling. This new method reduces the number of queues required by eliminating the need for queues based on resource limits. The scheduler examines each request for necessary resources before initiating the job. Also additional user limits at the complex level were added to provide a fairness to all users. Additional tools which include user job reordering are under development to work with the new scheduler. This paper discusses the objectives, design and implementation results of this new scheduler
Author
Queueing Theory ; Scheduling ; Systems Engineering

20020009510 Army Communications-Electronics Command , Fort Monmouth, NJ USA

Operational Planning, Plan Monitoring and the Phoenix Architecture

Powell, Gerald M. ; Cohen, Paul R. ; October 1989 ; 80p ; In English

Report No.(s): AD-A395979 ; CECOM-TR-01-9 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche

The principal topic of this report is the dynamic behavior of military organizations. In particular we address issues associated with characterizing the ebb and flow of battle such as how to assess progress being made by our forces. The report describes a representation mechanism for monitoring plans as they are executed which supports communication between plan elements as well as plan modification in light of revisions to objectives and changing battlefield conditions. The overall planning model presented here, within which the plan-execution monitoring capability is embedded, is perhaps the first system in the artificial intelligence literature to achieve real-time planning and monitoring, and it will soon be capable of real-time planning during execution. The cornerstone of the model is the concept of envelopes which are data structures designed to measure progress and facilitate communication within an organization in dynamic environments.

DTIC

Dynamic Characteristics ; Operational Problems ; Planning ; Command and Control ; Military Operations

20020009683 Army Communications-Electronics Command , Fort Monmouth, NJ USA

Acquiring Expertise in Operational Planning: A Beginning

Loberg, Gary ; Powell, Gerald M. ; August 1986 ; 27p ; In English

Report No.(s): AD-A395983 ; CECOM-TR-01-10 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This paper presents the results of a series of knowledge-acquisition sessions conducted to characterize the practice of operations planning at the corps command level. The sessions were successful in developing an initial understanding of the function of a Course-of-Action. This understanding was then employed to develop a structure for a Course-of-Action which incorporated the desired functionality. Following this, the sessions concentrated on developing the knowledge structures required for creation of the Scheme of maneuver, the principal element of the Course-of-Action structure.

DTIC

Command and Control ; Military Technology ; Planning

20020010232 Los Alamos National Lab. , NM USA

Laboratory Directed Research and Development FY 1998 Progress Report

Vigil, J. ; Wheeler, K. ; Apr. 01, 1999 ; 314p ; In English

Report No.(s): DE2001-9451 ; LA-13595-PR ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This is the FY 1998 Progress Report for the Laboratory Directed Research and Development (LDRD) Program at Los Alamos National Laboratory. It gives an overview of the LDRD Program, summarizes work done on individual research projects, relates the projects to major Laboratory program sponsors, and provides an index to the principle investigators. Project summaries are grouped by their LDRD component: Competency Development, Program Development, and Individual Projects. Within each component, they are further grouped into nine technical categories: (1) materials science, (2) chemistry, (3) mathematics and computational science, (4) atomic, molecular, optical, and plasma physics, fluids, and particle beams, (5) engineering science, (6) instrumentation and diagnostics, (7) geoscience, space science, and astrophysics, (8) nuclear and particle physics, and (9) bioscience.

NTIS

Chemistry ; Particle Beams ; Nuclear Particles ; Geophysics ; Plasma Physics

20020010920 Lawrence Livermore National Lab. , Livermore, CA USA

Engineering Annual Summary 1998

Dimolitsas, S. ; May 01, 1999 ; 28p ; In English

Report No.(s): DE2001-9129 ; UCRL-ID-131278-98 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Unlike most research and development laboratories, Lawrence Livermore National Laboratory (LLNL) is responsible for delivering production-ready designs. Unlike most industry, LLNL is responsible for R and D that must significantly increase the nation’s security. This rare combination of production engineering expertise and national R and D agenda identifies LLNL as one of the few organizations today that conducts cutting-edge engineering on grand-scale problems, while facing enormous technical risk and undergoing diligent scrutiny of its budget, schedule, and performance. On the grand scale, cutting-edge technologies are emerging from our recent ventures into ”Xtreme Engineering(trademark).” Basically, we must integrate and extend technologies concurrently and then push them to their extreme, such as building very large structures but aligning them with extreme precision.

As we extend these technologies, we push the boundaries of engineering capabilities at both poles: microscale and ultrascale. Today, in the ultrascale realm, we are building NIF, the world's largest laser, which demands one of the world's most complex operating systems with 9000 motors integrated through over 500 computers to control 60,000 points for every laser shot. On the other pole, we have fabricated the world's smallest surgical tools and the smallest instruments for detecting biological and chemical agents used by antiterrorists. Later in this Annual Summary, we highlight some of our recent innovations in the area of Xtreme Engineering, including large-scale computer simulations of massive structures such as major bridges to prepare retrofitting designs to withstand earthquakes. Another feature is our conceptual breakthrough in developing the world's fastest airplane, HyperSoar, which can reach anywhere in the planet in two hours at speeds of 6700 mph. In the last few years, Engineering has significantly pushed the technology in structural mechanics and micro-instrumentation. For example, our DYNA code is widely used both by government and industry to model the behavior of structures under large deformation conditions, such as automobile and aircraft collisions. Today, our codes have expanded to run on the world's most powerful Tflop/s class computer, in the massively parallel, coupled/-multi-physics domain. More recently, in microtechnology, we have been designing and fabricating unique microinstruments using lithographic processing. Building on Engineering's pioneering work in precision engineering, we are now able to fabricate complete biomedical and biochemical instruments, often at far less than one-tenth size, with improved performance over current 'state-of-the-art' laboratory instruments. These developments are helping us make unique contributions in the fields of proximal and remote sensing related to nonproliferation and counterproliferation of weapons of mass destruction (such as nuclear, chemical, and biological weapons) and in biotechnology, where we actively support LLNL's significant involvement in human genome sequencing.
NTIS
Research and Development ; Technology Utilization

20020011175 Department of Energy , Office of Scientific and Technical Information , Oak Ridge, TN USA
Oak Ridge Technical Information Center: A trailblazer in federal documentation
Vaden, W. M. ; Aug. 01, 1992 ; 389p ; In English
Report No.(s): DE2001-10162043 ; DOE/OSTI-11673 ; ISBN 0-87079-596-1 ; No Copyright ; Avail: Department of Energy Information Bridge
This document attempts to record the history of US AEC's Technical Information Center, from its conception (1947) to 1977. This organization centralizes and manages the issues related to control and dissemination of technical information, to fulfill the provisions of the Atomic Energy Act of 1946. TIC tried to search out and install efficient and economical systems for servicing the various technical information programs. It coordinated a direct organization-to-organization information exchange program, and it also participated in official bilateral exchange programs and in developing information systems for IAEA and Euratom. The work, planning, and strategies employed to achieve goals are chronicled in this document, with 18 chapters arranged into four sections according to different presidential administrations.
NTIS
Information Dissemination ; Information Transfer ; Information Resources Management

20020011239 Atomic Energy Commission , Idaho Falls, ID USA
Technology Assessment Tool: An Application of Systems Engineering to USDOE Technology Proposals
Rynearson, M. A. ; Jun. 01, 1999 ; 9p ; In English
Report No.(s): DE2001-9817 ; INEEL/CON-99-00261 ; No Copyright ; Avail: Department of Energy Information Bridge
This paper discusses the system design of a Technology Assessment (TA) tool that can be used to quantitatively evaluate new and advanced technologies, products, or processes. Key features of the tool include organization of information in an indentured hierarchy; questions and categories derived from the decomposition of technology performance; segregation of life-cycle issues into six assessment categories; and scoring, relative impact, and sensitivity analysis capability. An advantage of the tool's use is its ability to provide decision analysis data, based on incomplete or complete data.
NTIS
Systems Engineering ; Technology Assessment ; Design Analysis ; Optimization

20020011853 National Defence Research Establishment , Div. of Defence Analysis , Stockholm, Sweden
Lessons Learned in the Navy *Lessons Learned i Marinen*
Hoestbeck, L. ; Thorslund, O. ; Nov. 2000 ; 34p ; In Swedish
Report No.(s): PB2001-108160 ; FOA-R-00-01647-201-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

Lessons Learned is a internationally well known concept for dealing with experiences from operations and exercises. A Lesson Learned can treat any subject, i.e., materiel or tactics. The definition of a Lesson Learned varies between organizations, as does the routines for handling Lessons Learned. The report is written by the Operation Analysis Team at the Swedish Naval Command. The aim is to describe methods and routines for implementing a Lessons Learned concept for the Swedish naval forces. The description is given in the context of the present process for development of tactics within the navy. A concept of a 'Learning organization' is introduced and from that a method of handling Lessons Learned is suggested that will facilitate the management of knowledge in the Navy. The process that is suggested consists of Lessons Learned Report, LLR, that can be written at any level in the organization and then handed upwards in the chain of command. The LLR:s are collected locally by the flotillas/brigades and validated. The LLR:s that pass validation will make up the local Lessons Learned Database, Local LLDB. The Lessons Learned that are of common interest is forwarded to the Naval command, where they make up the central LLDB. Periodically the central LLDB is distributed to every unit in the organization, thus spreading the knowledge that is of common interest to all parties concerned.
NTIS
Navy ; Personnel ; Data Bases ; Education

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20020006048 Defense Modeling and Simulation Office , Alexandria, VA USA
Data Provisioning Using Authoritative Data Sources
Sheehan, Jack ; May 16, 2001 ; 46p ; In English ; Original contains color images ; Proceedings from 3rd Simulation Based Acquisition conference, 15-17 May 2001, sponsored by NDIA. --Original contains color plates: All DTIC reproductions will be in black and white. Contains Viewgraphs Only
Report No.(s): AD-A394766 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This Data Provisioning report consists of 46 presentation slides from the Proceedings of the 3rd Simulation Based Acquisition conference, held on 15-17 May 2001. The conference was sponsored by NDIA. The original document contains color images.
DTIC
Conferences ; Provisioning ; Data Management ; Computerized Simulation ; Digital Simulation

20020006150 Department of Energy , Richland, WA USA
Environmental Restoration Contractor Environmental Information Systems Software Configuration Management Plan
Harshberger, S. L. ; Dec. 06, 2000 ; 17p ; In English
Report No.(s): DE2001-773240 ; BHI-01434-Rev-0 ; No Copyright ; Avail: Department of Energy Information Bridge
This document presents the Environmental Restoration Contractor's software configuration management plan for use by the Environmental Information Systems group to manage all software configuration management activities for configuration items within the group.
NTIS
Computer Systems Programs ; Management Planning ; Environmental Surveys

20020006184 NASA Ames Research Center , Moffett Field, CA USA
Reducing Backups by Utilizing DMF
Cardo, Nicholas P. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Cray User Group , 13-17 Mar. 1995 , Denver, CO , USA
Contract(s)/Grant(s): NAS2-13619 ; RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
Although a filesystem may be migratable, for a period of time the data blocks are on disk only. When performing system dumps, these data blocks are backed up to tape. If the data blocks are offline or dual resident, then only the inode is backed up. If all online files are made dual resident prior to performing system dumps, the dump time and the amount of resources required can be significantly reduced. The High Speed Processors group at the Numerical Aerodynamics Simulation (NAS) Facility at NASA Ames Research Center developed a tool to make all online files dual resident. The result is that a file whose data blocks are on DMF tape and still assigned to the original inode. Our 150GB filesystem used to take 8 to 12 hours to backup and used 50

to 60 tapes. Now the backup is typically under 10 tapes and completes in under 2 hours. This paper discusses this new tool and advantages gained by using it.
Author
File Maintenance (Computers) ; Computer Techniques ; Software Development Tools ; On-Line Systems

20020006223 General Accounting Office , Washington, DC USA
Report to Senator Robert F. Bennett, Ranking Minority Member, Joint Economic Committee, Congress of the USA. Information Sharing: Practices That Can Benefit Critical Infrastructure Protection
Oct. 2001 ; 39p ; In English
Report No.(s): AD-A395396 ; GAO-02-24 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report responds to your May 2001 request that we study the practices of organizations that successfully share sensitive or time-critical information. Information sharing and coordination are key elements in developing comprehensive and practical approaches to defending against computer-based, or cyber, attacks, which could threaten the national welfare. Such attacks could severely disrupt computer-supported operations, compromise the confidentiality of sensitive information, and diminish the integrity of critical data. Computer-based incidents, such as the ILOVEYOU virus in May 2000 and the recent Code Red, SirCam, and Nimda attacks, have caused significant disruptions and damage. In addition, the terrorist attacks of September 11 illustrate the importance of having timely information from others on threats and possible precursors to an attack.
DTIC
Computer Information Security ; Computer Networks ; Information Transfer ; Information Management

20020006227 Booz-Allen and Hamilton, Inc. , McLean, VA USA
A Goal VPN Protection Profile for Protecting Sensitive Information
Jul. 10, 2000 ; 191p ; In English
Report No.(s): AD-A395376 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A02 , Microfiche
This protection profile specifies the Department of Defense's (DoD) goal security requirements for protecting its own sensitive information. However, VPN technology may be used in many environments, both public and private. For instance, in the US DoD an example of sensitive information is unclassified data that affect Mission Support operations, which are important to support deployed or contingency forces. Such data requires a medium level of robustness and security. However, without the inclusion of additional layers of security integrated to provide for defense-in-depth, mechanisms specified by this protection profile are not sufficient for supporting a high level of robustness. This should also be true for non-DoD organization's sensitive information. Such material is any information deemed important to the organization, the loss of which might cause financial difficulties, schedule impacts, or affects the well being of employees.
DTIC
Data Processing ; Computer Information Security

20020006504 Air Command and Staff Coll. , Maxwell AFB, AL USA
Air Command and Staff College (ACSC) Academic Year (AY) 1999 Multimedia Yearbook
Coombs, Christopher M. ; Apr. 1999 ; 22p ; In English
Report No.(s): AD-A395805 ; AU/ACSC/020A/1999-04 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This technology project will be the first software-based yearbook for Air Command and Staff College (ACSC). A multimedia yearbook is a software-based application that incorporates still photos, video clips and audio clips into a single software package. This yearbook version will be similar to the hard copy version of the ACSC AY99 Yearbook. This multimedia yearbook project will rely on the multimedia capabilities of Hyper Text Markup Language, or HTML code, a web page publishing formatting language. This code will allow the maximizing of computer capabilities in creating dynamic, lively web pages and published on a Compact Disc, Read Only Memory or CD-ROM. The CDROM will contain both audio and video clips from activities (Division and Seminar parties, sports activities, class activities, etc.) and special events (Distinguished Guest Speakers, Gathering of Eagles, etc.) which occurred during the academic year The academic memorabilia gathered throughout the year will be divided into logical sections or modules for easy grouping and access by the application users. The first module will contain pictures representing the Air Command and Staff College's chain of command from Brigadier General (Select) John Rosa, Jr. up to, and including, the President of the USA. The second module, Shining Moments, will consist of key ACSC activities and world events that occurred throughout the academic year. These activities and events will include excerpts from the various ACSC curriculum, formal events like the Navy Ball and Marine Corps Ball, family activities like the Halloween party and Winterfest and finally, our Distinguished

Visitors. The third module, Faculty and Staff will include photographs and names of each ACSC department. The fourth module, Mugshots, will include official photographs of all the 1998-1999 ACSC students.
DTIC
Applications Programs (Computers) ; Multimedia ; Universities

20020006514 Department of Defense , Office of the Inspector General , Arlington, VA USA
Armed Services Blood Program Defense Blood Standard System
Oct. 22, 2001 ; 76p ; In English
Report No.(s): AD-A395846 ; IG/DOD-D-2002-010 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
This report is the second in a series regarding the Armed Services Blood Program. The mission of the Armed Services Blood Program is to provide quality blood products, blood substitutes, and services for all worldwide DoD customers in peacetime, in wartime, and during contingency operations. The Defense Blood Standard System (DBSS) is the automated information system used by Blood Program Organizations to maintain and track blood donations and blood product inventories. It provides blood product management for fresh and frozen blood products during blood collection, processing, testing, shipping, and storage. It also provides transfusion service management and system administration. DBSS is unique because it is the only automated information system within the Military Health System that is regulated by the Food and Drug Administration as a Class II Medical Device. The Class II Medical Device designation gives the Food and Drug Administration the authority to inspect the development and use of DBSS. The DBSS Project Office, under the Clinical Information Technology Program Office, Office of the Assistant Secretary of Defense (Health Affairs), is responsible for managing the system. Management and support costs for DBSS for FYs 1991 through 2000 totaled $70.1 million. Projected costs for FYs 2001 through 2007 are $43.8 million.
DTIC
Military Operations ; Blood ; Medical Services ; Information Systems ; Management Systems

20020006516 National Academy of Sciences - National Research Council , Washington, DC USA
Maximizing U.S. Interests in Science and Technology Relations With Japan. Committee on Japan Framework Statement and Report of the Competitiveness Task Force
Jan. 1997 ; 148p ; In English
Report No.(s): AD-A395855 ; No Copyright ; Avail: CASI ; A07 , Hardcopy ; A02 , Microfiche
Since 1985 the National Academy of Sciences and the National Academy of Engineering have engaged in a series of high-level discussions on advanced technology and the international environment with a counterpart group of Japanese scientists, engineers, and industrialists. One outcome of these discussions was a deepened understanding of the importance of promoting a more balanced two-way flow of people and information between the research and development systems in the two countries. Another result was a broader recognition of the need to address the science and technology policy issues increasingly central to a changing U.S.-Japan relationship. In 1987 the National Research Council, the operating arm of both the National Academy of Sciences and the National Academy of Engineering, authorized first-year funding for the Office of Japan Affairs (OJA). This program element of the Office of International Affairs was formally established in the spring of 1988. The primary objectives of OJA are to provide a resource to the Academy complex and the broader U.S. science and engineering communities for information on Japanese science and technology, to promote better working relationships between the technical communities in the two countries by developing a process of deepened dialogue on issues of mutual concern, and to address policy issues surrounding a changing U.S.-Japan science and technology relationship.
DTIC
USA ; Japan ; International Relations ; Research and Development ; Technologies

20020006809 Air Force Inst. of Tech. , Wright-Patterson AFB, OH USA
Style Guide for Theses and Dissertations
Jun. 1997 ; 105p ; In English
Report No.(s): AD-A395648 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
The AFIT Style Guide for Theses and Dissertations contains guidance for preparing AFIT theses and dissertations; these documents are an important part of the Institute's graduate degree requirements. In this guide you will find detailed information about such topics as the systems of documentation used at AFIT, the formats of graphics and equations to convey technical information, the formats of AFIT theses and dissertations, and the steps necessary to prepare and submit these documents. As you prepare your thesis, you should realize that there are a number of aspects of format and features that are to be followed. Illustrations and equations must be presented in a consistent and standardized format. The appearance of chapter titles and subheadings within chapters is also standardized. Tables of Contents and Lists of Illustrations are required. These prefatory items are also presented

in a standard format. This guide will help you establish the correct formats for these features. We strongly recommend that you learn and adopt the preferred formats early in the thesis-writing process; following preferred formats from the beginning will save you time preparing your report in the long run.
DTIC
Theses ; Technical Writing ; Manuals ; Format

20020006886 Modeling and Simulation Information Analysis Center , Alexandria, VA USA
Modeling & Simulation for Information Assurance State-of-the-Art Report (SOAR)
Waag, Gary L. ; Heist, R. K. ; Feinberg, Jerry M. ; Painchaud, Lesley J. ; Jan. 01, 2000 ; 28p ; In English
Report No.(s): AD-A395431 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Provides a summary of the Modeling & Simulation for Information Assurance State-of-the-Art Report (SOAR) created by IATAC and MSIAC.
DTIC
Simulation ; Information Systems ; Mathematical Models

20020006918 NASA Ames Research Center , Moffett Field, CA USA
Backing up DMF Databases
Cardo, Nicholas P. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Cray User Group , 13-17 Mar. 1995 , Denver, CO , USA
Contract(s)/Grant(s): RTOP 536-01-11 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
A complete backup of the Cray Data Migration Facility (DMF) databases should include the data migration databases, all media specific process' (MSP's) databases, and the journal file. The backup should be able to accomplished without impacting users or stopping DMF. The High Speed Processors group at the Numerical Aerodynamics Simulation (NAS) Facility at NASA Ames Research Center undertook the task of finding an effective and efficient way to backup all DMF databases. This has been accomplished by taking advantage of new features introduced in DMF 2.0 and adding a minor modification to the dmdaemon. This paper discusses the investigation and the changes necessary to implement these enhancements.
Author
Data Bases ; Cray Computers ; Data Storage

20020008144 Brookhaven National Lab. , Upton, NY USA
Vision of a smart city
Hall, R. E. ; Bowerman, B. ; Braverman, J. ; Taylor, J. ; Todosow, H. ; Sep. 28, 2000 ; 7p ; In English
Report No.(s): DE2001-773961 ; BNL-67902 ; No Copyright ; Avail: Department of Energy Information Bridge
The vision of 'Smart Cities' is the urban center of the future, made safe, secure environmentally green, and efficient because all structures, whether for power, water, transportation, etc. are designed, constructed, and maintained making use of advanced, integrated materials, sensors, electronics, and networks which are interfaced with computerized systems comprised of databases, tracking, and decision-making algorithms. This paper discusses a current initiative being led by the Brookhaven National Laboratory to create a research, development and deployment agenda that advances this vision. This is anchored in the application of new technology to current urban center issues while looking 20 years into the future and conceptualizing a city framework that may exist.
NTIS
Urban Planning ; Technology Utilization ; Cities

20020008232 Army Tank-Automotive and Armaments Command , Warren, MI USA
TACOM Technical Report Writing Style Manual ***Interim Report , Oct. 1982-Sep. 1984***
Boblenz, James N. ; Calhoun, Alice A. ; Sep. 1984 ; 96p ; In English
Report No.(s): AD-A395891 ; TACOM-12680 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
This first revision of the style manual has been produced to assist authors, editors and production personnel in preparation of scientific and technical reports. Guidelines have been designed to provide specific instructions to different groups who write, edit, type and lay out copy for the U.S. Army Print Plant or to conform to GPO printing requirements. This report consists of two main parts. Part I will be of interest to the author as it addresses standards of style, grammar, word usage, spelling aids, verbiage reduction tips and so on. Part II is of particular interest to production personnel as it describes and illustrates the mechanical aspects

of report preparation in terms of format, treatment of tables and figures, pagination, numbering, cover format, organization, classification markings and proper referencing.
DTIC
Printing ; Technical Writing ; Manuals ; Defense Program

20020008233 Army Tank-Automotive and Armaments Command , Warren, MI USA
TACOM Technical Report Writing Style Manual ***Final Report , Oct. 1982-Jul. 1985***
Boblenz, James N. ; Calhoun, Alice A. ; Oct. 1982 ; 104p ; In English
Report No.(s): AD-A395890 ; TACOM-12680 ; No Copyright ; Avail: CASI ; A06 , Hardcopy ; A02 , Microfiche
This second revision of the style manual has been produced to assist authors, editors, and production personnel in preparing scientific and technical reports. Guidelines have been designed to provide specific instructions to different groups who write, edit, type, and lay out copy for the U.S. Army Print Plant or to conform to the Government Printing Office's requirements. This report consists of two main parts. Part I is of interest to the author as it addresses standards of style, grammar, word usage, spelling aids, verbiage reduction tips, and so on. Part II is of particular interest to production personnel as it describes and illustrates the mechanical aspects of report preparation in terms of format, treatment of tables and figures, pagination, numbering, cover format, organization, classification markings, and proper referencing.
DTIC
Technical Writing ; Armed Forces (USA) ; Manuals ; Printing

20020008322 Norwegian Defence Research Establishment , Kjeller, Norway
Vulnerabilities in the Information Systems of the Electric Power Supply ***Sarbarhet i Kraftforsyningens Drifts-og Styringssystemer***
Rodal, Siv Kjersti , Norwegian Defence Research Establishment , Norway ; Dec. 04, 2001 ; 30p ; In Norwegian ; Original contains color illustrations
Contract(s)/Grant(s): FFISYS Proj. 769/204.0
Report No.(s): FFI/RAPPORT-2001/04278 ; ISBN 82-464-0560-8 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report presents a short overview of the results from the study of the vulnerability of the information systems in the Norwegian electric power system to physical, electromagnetic and logical threats. Generally, centralized management, with remote control of generation and distribution of power, is performed from system control centers. The operations are supported by SCADA (Supervisory Control and Data Acquisition) systems. The study shows that the information systems are vulnerable to a multitude of physical, electromagnetic and logical threats, both natural and man-made. Thus, computer failure may lead to short-term local disruptions in the power supply. However, to achieve long-term outages, simultaneous attacks have to be executed at the power infrastructure and at the information systems. The report contains a scenario, describing the growing dependency on information systems until 2010. A possible large scale implementation of electronic components in the grid, increased dependency on centralized management and a predicted shortness of skilled personnel are key factors in this scenario. This may lead to a more unreliable and vulnerable power system, prone to frequent failures and disruptions.
Author
Vulnerability ; Information Systems ; Electric Power Supplies ; Data Acquisition

20020009578 Brookhaven National Lab. , Upton, NY USA
Implementation of the star data acquisition system using a myrinet network
Landgraf, ; Adler, ; Levine, ; Ljubicic, ; Oct. 15, 2000 ; 5p ; In English
Report No.(s): DE2001-780776 ; BNL-68203 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
We will present results from the first year of operation of the STAR DAQ system using a Myrinet Network. STAR is one of four experiments to have been commissioned at the Relativistic Heavy Ion Collider (RHIC) at BNL during 1999 and 2000. The DAQ system is fully integrated with a Level 3 Trigger. The combined system currently consists of 33 Myrinet Nodes which run in a mixed environment of MVME processors running VxWorks, DEC Alpha workstations running Linux, and SUN Solaris machines. The network will eventually contain up to 150 nodes for the expected final size of the L3 processor farm. Myrinet is a switched, high speed, low latency network produced by Myricom and available for PCI and PMC on a wide variety of platforms. The STAR DAQ system uses the Myrinet network for messaging, L3 processing, and event building. After the events are built, they are sent via Gigabit Ethernet to the RHIC computing facility and stored to tape using HPSS. The combined DAQ/L3 system

processes 160 MB events at 100 Hz, compresses each event to (approximately)20 MB, and performs tracking on the events to implement a physics-based filter to reduce the data storage rate to 20 MB/sec.
NTIS
Data Reduction ; Data Storage ; Data Acquisition

20020009602 Sandia National Labs. , Albuquerque, NM USA
Acme algorithms for contact in a multiphysics environment api version 0.3a
Brown, K. H. ; Glass, M. W. ; Gullerud, A. S. ; Heinstein, M. W. ; Jones, R. E. ; Apr. 01, 2001 ; 86p ; In English
Report No.(s): DE2001-780315 ; SAND2001-0913 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
An effort is underway at Sandia National Laboratories to develop a library of algorithms to search for potential interactions between surfaces represented by analytic and discretized topological entities. This effort is also developing algorithms to determine forces due to these interactions for transient dynamics applications. This document describes the Application Programming Interface (API) for the ACME (Algorithms for Contact in a Multiphysics Environment) library.
NTIS
Algorithms ; Information Retrieval ; Libraries ; Surface Reactions ; Environment Models

20020009677 Army Research Inst. for the Behavioral and Social Sciences , Alexandria, VA USA
Manprint Findings from the Investigative Operational Assessment of the Joint Tactical Information Distribution System
Avery, Larry ; Piaper, William J. ; March 1988 ; 68p ; In English
Contract(s)/Grant(s): MDA903-83-C-0033
Report No.(s): AD-A396042 ; ARI-WP-FH-8807 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche
The Joint Tactical Information Display System (JTIDS) is a multiservice acquisition program being led by the US Air Force. JTIDS is designed to provide secure transmission of position, target track, and voice data between host terminals in a manner that is transparent to the user. The user or host terminal is any system which originates or receives digitized tactical information transmitted over the JTIDS secure radio links. The system was originally designed to provide communication between F-15 and Advance Warning and Control System (AWACS) aircraft and Combat Reporting Centers (CRC). The US Army recognized the potential for improved communication between Air Force and Army Air Defense Artillery (ADA) units, and within ADA units, and became part of the program well into the development process. The Army host terminals were to be TSQ-73s at the brigade and battalion levels for the HAWK fire units, the Platoon Command P9st (PCP) at the batteries, and the PATRIOT missile system.
DTIC
Air Defense ; Display Devices ; Information Systems

20020010230 Los Alamos National Lab. , NM USA
Suite of Criticality Benchmarks for Validating Nuclear Data
Frankle, S. C. ; Apr. 01, 1999 ; 103p ; In English
Report No.(s): DE2001-9404 ; LA-13594 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The continuous-energy neutron data library ENDF60 for use with MCNP(trademark) was released in the fall of 1994, and was based on ENDF/B-Vl evaluations through Release 2. As part of the data validation process for this library, a number of criticality benchmark calculations were performed. The original suite of nine criticality benchmarks used to test ENDF60 has now been expanded to 86 benchmarks. This report documents the specifications for the suite of 86 criticality benchmarks that have been developed for validating nuclear data.
NTIS
Critical Point ; Data Collection Platforms

20020010239 Sandia National Labs. , Albuquerque, NM USA
Applications Analysis: Principles and Examples from Various Distributed Computer Applications at Sandia National Laboratories New Mexico
Bateman, D. ; Evans, D. ; Jensen, D. ; Nelson, S. ; Aug. 01, 1999 ; 26p ; In English
Report No.(s): DE2001-9467 ; SAND99-2001 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
As information systems have become distributed over many computers within the enterprise, managing those applications has become increasingly important. This is an emerging area of work, recognized as such by many large organizations as well as many start-up companies. In this report, we present a summary of the move to distributed applications, some of the problems

that came along for the ride, and some specific examples of the tools and techniques we have used to analyze distributed applications and gain some insight into the mechanics and politics of distributed computing.
NTIS
Applications Programs (Computers) ; Information Systems ; Computer Techniques

20020010242 DYNACS Engineering Co., Inc. , Cocoa Beach, FL USA
An Overview of Advanced Data Acquisition System (ADAS)
Mata, Carlos T. , DYNACS Engineering Co., Inc. , USA ; [2001] ; 19p ; In English ; ISA 2001 , 10-13 Sep. 2001 , Houston, TX , USA
Contract(s)/Grant(s): NAS10-98001 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The paper discusses the following: 1. Historical background. 2. What is ADAS? 3. R and D status. 4. Reliability/cost examples (1, 2, and 3). 5. What's new? 6. Technical advantages. 7. NASA relevance. 8. NASA plans/options. 9. Remaining R and D. 10. Applications. 11. Product benefits. 11. Commercial advantages. 12. intellectual property. Aerospace industry requires highly reliable data acquisition systems. Traditional Acquisition systems employ end-to-end hardware and software redundancy. Typically, redundancy adds weight, cost, power consumption, and complexity.
Derived from text
Computer Programs ; Aerospace Industry ; Data Acquisition

20020010949 Fermi National Accelerator Lab. , Batavia, IL USA
Distributed Data Access and Resource Management in the D0 SAM System
Terekhov, I. V. ; Pordes, R. ; White, V. ; Jun. 26, 2001 ; 12p ; In English
Report No.(s): DE2001-781989 ; FERMILAB-CONF-01/101 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
SAM (Sequential Access through Meta-data) is the data access and job management system for the D0 high energy physics experiment at Fermilab. The SAM system is being developed and used to handle the Petabyte-scale experiment data, accessed by hundreds of D0 collaborators scattered around the world. In this paper, we present solutions to some of the distributed data processing problems from the perspective of real experience dealing with mission-critical data. We concentrate on the distributed disk caching, resource management and job control. The system has elements of the Grid Computing and has features applicable to data-intensive computing in general.
NTIS
Data Management ; Management Systems ; Resources Management

20020011157 Lawrence Livermore National Lab. , Livermore, CA USA
New browser for the visualization of equation of state data
MacFarland, L. H. ; Streletz, G. ; Jun. 25, 1999 ; 7p ; In English
Report No.(s): DE2001-9883 ; UCRL-JC-134856 ; No Copyright ; Avail: Department of Energy Information Bridge
A prototype equation of state (EOS) browser application has been developed at LLNL. This browser provides an interactive, graphical user interface that allows EOS data to be analyzed, visualized, and compared with experimental data. The user can view our EOS table data in both tabular and graphical form, can obtain lists of table ranges, and can view material information. In addition, the browser allows the user to utilize the interpolation routines of our EOS package to produce the same interpolated EOS data that would be passed to a simulation code, and to analyze this data in many different ways. Interpolated data can be obtained through use of a query function, and lists of interpolated data over various ranges can be produced. Analysis functions include the calculation and display of isotherms, isochores, isobars, adiabats, and shock Hugoniots. Moreover, experimental data can be overlaid onto these plots in order to establish confidence in particular EOS tables. It is expected that this browser environment will be a valuable tool for scientists who use large simulation codes that access equation of state data.
NTIS
Equations of State ; Computerized Simulation ; Prototypes

20020011215 Lawrence Livermore National Lab. , Livermore, CA USA
LLNL perspective on ASCI data mining and pattern recognition requirements
Baldwin, C. ; Kamath, C. ; Musick, R. ; Jan. 01, 1999 ; 10p ; In English
Report No.(s): DE2001-9659 ; UCRL-ID-132850 ; REPT-99-ERI-010 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The working document has been put together by the members of the Sapphire project at LLNL. The goal of Sapphire is to apply and extend techniques from data mining and pattern recognition in order to detect automatically the areas of interest in very large data sets. The intent is to help scientists address the problem of data overload by providing them effective and efficient ways of exploring and analyzing massive data sets. One of the key areas where they expect this technology to be used is in the analysis of the output from ASCI simulations. It is expected that a simulation running on the 100 Tflop ASCI machine in the year 2004 will produce data at the rate of 12TB/hour. Given the difficulties they currently have in analyzing and visualizing a terabyte of data, it is imperative that they start planning now for ways that will make the analysis of petabyte data sets feasible. This document focuses on the relevance of data mining and pattern recognition to ASCI, discusses potential applications of these techniques in ASCI, and identifies research issues that arise as they apply the algorithms in these areas to massive data sets.
NTIS
Algorithms ; Data Mining ; Pattern Recognition

20020011601 National Defence Research Establishment , Div. of Sensor Technology , Linkoeping, Sweden
Collaboration in Camouflage Assessment between Sweden and Austria ***Final Report Slutrapport Oever Samarbetet Inom Kamouflagevaerdering Mellan Sverige och Oesterrike***
Nyberg, S. ; Bohman, L. ; Sep. 1999 ; 28p ; In English
Report No.(s): PB2001-108149 ; FOA-R-99-01239-615-SE ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
This report summarizes and describes from a Swedish perspective the results from a collaboration between FOA and BMLV in Austria in the area of camouflage assessment. The collaboration has formally been set up for three years but started with informal contacts 1995. The main part of the job in Austria is been done by the research institute Joanneum Research in Graz. The goals decided on have in principle been reach. Each group now has a software based tool, able to participate in the process of assessing different signature reduction measures in the optical area. The tools will only be part of the assessment process. Absolute results are difficult to reach. However, comparisons can be made between different alternatives. The collaboration has resulted in an extensive exchange of ideas, reports, software and image data sets together with various kinds of results. The collaboration has been very fruitful and implied big advantages for FOA work within the research area.
NTIS
Camouflage ; Alternatives ; Tasks ; Signatures

20020011604 NASA Ames Research Center , Moffett Field, CA USA
NASA's Information Power Grid: Large Scale Distributed Computing and Data Management
Johnston, William E. , NASA Ames Research Center , USA ; Vaziri, Arsi , NASA Ames Research Center , USA ; Hinke, Tom , NASA Ames Research Center , USA ; Tanner, Leigh Ann , NASA Ames Research Center , USA ; Feiereisen, William J. , NASA Ames Research Center , USA ; Thigpen, William , NASA Ames Research Center , USA ; [2001] ; 50p ; In English ; Global Grid Forum 2 , 15-18 Jul. 2001 , Vienna, VA , USA
Contract(s)/Grant(s): NAS2-14303 ; RTOP 704-40-00 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Large-scale science and engineering are done through the interaction of people, heterogeneous computing resources, information systems, and instruments, all of which are geographically and organizationally dispersed. The overall motivation for Grids is to facilitate the routine interactions of these resources in order to support large-scale science and engineering. Multi-disciplinary simulations provide a good example of a class of applications that are very likely to require aggregation of widely distributed computing, data, and intellectual resources. Such simulations - e.g. whole system aircraft simulation and whole system living cell simulation - require integrating applications and data that are developed by different teams of researchers frequently in different locations. The research team's are the only ones that have the expertise to maintain and improve the simulation code and/or the body of experimental data that drives the simulations. This results in an inherently distributed computing and data management environment.
Derived from text
Data Management ; Human-Computer Interface ; Resources Management ; Computerized Simulation

20020011641 NASA Ames Research Center , Moffett Field, CA USA
A Metadata Action Language
Golden, Keith , NASA Ames Research Center , USA ; May 03, 2001 ; 14p ; In English ; ISIRAS Conference , Montreal , Canada ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
The data management problem comprises data processing and data tracking. Data processing is the creation of new data based on existing data sources. Data tracking consists of storing metadata descriptions of available data. This paper addresses the data management problem by casting it as an AI planning problem. Actions are data-processing commands, plans are dataflow

programs and goals are metadata descriptions of desired data products. Data manipulation is simply plan generation and execution, and a key component of data tracking is inferring the effects of an observed plan. We introduce a new action language for data management domains, called ADILM. We discuss the connection between data processing and information integration and show how a language for the latter must be modified to support the former. The paper also discusses information gathering within a data-processing framework, and show how ADILM metadata expressions are a generalization of Local Completeness.
Author
Data Management ; Data Processing ; Programming Languages

20020011875 Corporation for National Service , Washington, DC USA
National Service Guide to Using the Internet, Third Edition, Draft
Geoghegan, B. ; Zelson, J. ; Spitale, N. ; April 2001 ; 76p ; In English
Report No.(s): PB2002-100634 ; No Copyright ; Avail: CASI ; A05 , Hardcopy ; A01 , Microfiche
The contents include: Introduction; What is the Internet; Getting Online; Communication Resources; The World Wide Web (WWW); Developing a Telecommunications Plan; Creating a Presence on the Internet; Cyber Service; Cyber Tools; The Online World and Appendixes.
NTIS
Internets ; Telecommunication ; Computer Networks ; On-Line Systems

20020012253 National Aerospace Lab. , Space Div. , Amsterdam, Netherlands
Use of Remote Sensing Imagery for Fast Generation of Military Maps and Simulator Databases ***Final Report***
vanPersie, M. ; Noorbergen, H. H. S. ; vandenBroek, A. C. ; Dekker, R. J. ; Jul. 27, 2000 ; 16p ; In English
Report No.(s): PB2001-108717 ; NLR-TP-2000-397 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Contents include the following: Introduction; Military applications and their information requirements; Test area and dataset; Data product and generation; Evaluation and Conclusions; Acknowledgements and References.
NTIS
Military Technology ; Command and Control

20020012256 National Aerospace Lab. , Amsterdam, Netherlands
Reducing Conception Times and Promoting the Use of Distributed Resources in Space System Design ***Final Report***
Kos, J. ; tenDam, A. A. ; May 2000 ; 22p ; In English
Report No.(s): PB2001-108707 ; NLR-TP-2000-257 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
Know-how and know-why of an enterprise is embodied in application programs, data, documents, and personal skills. Time and budget constraints, and an increased multidisciplinary approach result in the necessity to accommodate simulation programs and simulation tools. to be competitive, these programs and tools must be made available with minimal overhead. For this, NLR (Netherlands National Aerospace Laboratory) has made a number of working environments (depending on the application) to combine know-how, know-why and tools to support teams in realizing project goals on time and on budget. Each working environment hides the distributed NLR computer infrastructure, which contains several servers that are located at two sites with a distance of 100 km, for the users. The present paper highlights the use of the ISMuS (Information System for Multi-body Systems Simulation) working environment for space system design and development. Special attention is paid to ISMuS features for knowledge transfer using distributed resources through which conception times are reduced.
NTIS
Robotics ; Computer Aided Design ; Distributed Processing ; Systems Simulation

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20020011371 National Defence Research Establishment , Div. of Defence Analysis , Stockholm, Sweden
Rules of Engagement during exercise SAMMARIN 2000: 'Operation Southern Light' ***Rules of Engagement under Oevning SAMMARIN 2000 'Operation Southern Light'***
Berg, A. L. ; Dec. 2000 ; 38p ; In Swedish
Report No.(s): PB2001-108159 ; FOA-R-00-01669-201-SE ; No Copyright ; Avail: National Technical Information Service (NTIS)

The naval forces conducted in September 2000 the annual exercise SAMMARIN. One of the moments was the Peace Support Operation named 'Operation Southern Light.' During the exercise Rules of Engagement (ROE) were used. This report describes the methods used to evaluate the use of ROE. The report also contains results and recommendations for further work with ROE.
NTIS
Navy ; Physical Exercise ; Peacetime ; International Law

20020012229 Lawrence Livermore National Lab. , Livermore, CA USA
Second line of defense program
Cantut, L. ; Thomas, L. L. ; Jul. 15, 1999 ; 6p ; In English
Report No.(s): DE2001-13759 ; UCRL-JC-135067 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Since the collapse of the Soviet Union, the prospect of nuclear materials entering the world market has become an ever-increasing threat. The Second Line of Defense (SLD) program was developed by the U.S. Department of Energy's (DOE) Nuclear Transfer and Supplier Policy Division (NN-43) to assist the Russian Federation State Customs Committee (RFSCC) in strengthening its capability to prevent illicit trafficking of nuclear materials across Russia's borders. The SLD program is a natural complement to the Material Protection Control and Accounting (MPC&A) program, which represents a first line of defense against the theft and diversion of nuclear materials. The SLD program is the first U.S.-Russian cooperative program to combat the illicit trafficking of nuclear and nuclear-related materials to would-be proliferators across Russia's borders.
NTIS
Fissionable Materials ; Nuclear Weapons ; Defense Program

20020012233 Lawrence Livermore National Lab. , Livermore, CA USA
Prioritizing like nuclear smugglers
Erickson, S. A. ; Jul. 01, 1999 ; 10p ; In English
Report No.(s): DE2001-13755 ; UCRL-JC-135071 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
An individual or group attempting to smuggle nuclear material out of a country has a choice of what border crossing to use and how to do it. If it is possible to think like a smuggler and determine what preferences one would have, then we could protect those smuggler-preferred border crossings first. Thinking like a smuggler requires that one understand a host of things: who is likely to smuggle and what might they have obtained, where they might have gotten it, and where they would like to deliver or sell it, how they will attempt to pass customs, how they might travel on both sides of the border, and what influences they might have on customs officials. After collecting data on criminology, geography, and much else, it is necessary to paste the data together into scenarios to ensure that self-consistent smuggling plans are created. These lead to counter-smuggling opportunities. Smuggling by amateurs turns out to be of a different class than professional smuggling, and needs to be countered differently. This work also assists in formulating key policy questions useful to guide counter-smuggling efforts. This methodology was developed for DOE/NN-43 for assistance with prioritization within the Second Line of Defense program.
NTIS
Defense Program ; Security ; Nuclear Devices

20020012239 Oak Ridge National Lab. , TN USA
Disposition Options for Uranium-233
Beahm, E. C. ; Dole, L. R. ; Forsberg, C. W. ; Icenhour, A. S. ; Storch, S. N. ; Jun. 01, 1999 ; 226p ; In English
Report No.(s): DE2001-13417 ; ORNL/TM-13553 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The U.S. Department of Energy (DOE) Fissile Materials Disposition Program (MD), in support of the U.S. arms-control and nonproliferation policies, has initiated a program to disposition surplus weapons-usable fissile material by making it inaccessible and unattractive for use in nuclear weapons. Weapons-usable fissile materials include plutonium, high-enriched uranium (HEU), and uranium-233 (U-233). In support of this program, Oak Ridge National Laboratory led DOE's contractor efforts to identify and characterize options for the long-term storage and disposal of excess U-233. Five storage and 17 disposal options were identified and are described herein.
NTIS
Uranium 233 ; Radioactive Wastes ; Waste Disposal ; Fissionable Materials

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20020008402 NASA , Washington, DC USA
NASA IVHM Technology Experiment for X-vehicles (NITEX)
Sandra, Hayden , NASA , USA ; Bajwa, Anupa , NASA , USA ; [2001] ; 4p ; In English ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

The purpose of the NASA IVHM Technology Experiment for X-vehicles (NITEX) is to advance the development of selected IVHM technologies in a flight environment and to demonstrate the potential for reusable launch vehicle ground processing savings. The technologies to be developed and demonstrated include system-level and detailed diagnostics for real-time fault detection and isolation, prognostics for fault prediction, automated maintenance planning based on diagnostic and prognostic results, and a microelectronics hardware platform. Complete flight The Evolution of Flexible Insulation as IVHM consists of advanced sensors, distributed data acquisition, data processing that includes model-based diagnostics, prognostics and vehicle autonomy for control or suggested action, and advanced data storage. Complete ground IVHM consists of evolved control room architectures, advanced applications including automated maintenance planning and automated ground support equipment. This experiment will advance the development of a subset of complete IVHM.
Derived from text
Reusable Launch Vehicles ; Diagnosis ; Distributed Processing ; Fault Detection ; Ground Based Control ; Real Time Operation ; Technology Assessment

20020009543 NASA Ames Research Center , Moffett Field, CA USA
The Use of Microwave Incineration to Process Biological Wastes
Sun, Sidney C. , NASA Ames Research Center , USA ; Srinivasan, Venkatesh , Bionetics Corp. , USA ; [1994] ; 1p ; In English ; Technology 2004 , 8-10 Nov. 1994 , Washington, DC , USA
Contract(s)/Grant(s): RTOP 199-61-12 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The handling and disposal of solid waste matter that has biological or biohazardous components is a difficult issue for hospitals, research laboratories, and industry. NASA faces the same challenge as it is developing regenerative systems that will process waste materials into materials that can be used to sustain humans living in space for extended durations. Plants provide critical functions in such a regenerative life support scheme in that they photosynthesize carbon dioxide and water into glucose and oxygen. The edible portions of the plant provide a food source for the crew. Inedible portions can be processed into materials that are more recyclable. The Advanced Life Support Division at NASA Ames Research Center has been evaluating a microwave incinerator that will oxidize inedible plant matter into carbon dioxide and water. The commercially available microwave incinerator is produced by Matsushita Electronic Instruments Corporation of Japan. Microwave incineration is a technology that is simple, safe, and compact enough for home use. It also has potential applications for institutions that produce biological or biohazardous waste. The incinerator produces a sterile ash that has only 13% of the mass of the original waste. The authors have run several sets of tests with the incinerator to establish its viability in processing biological material. One goal of the tests is to show that the incinerator does not generate toxic compounds as a byproduct of the combustion process. This paper will describe the results of the tests, including analyses of the resulting ash and exhaust gases. The significance of the results and their implications on commercial applications of the technology will also be discussed.
Author
Waste Disposal ; Toxicity ; Solid Wastes ; Microwaves ; By-Products ; Carbon Dioxide

20020009610 Sandia National Labs. , Albuquerque, NM USA
Technology Transfer from Sandia National Laboratories and Technology Commercialization by MODE/Emcore
Clark, K. S. ; Romig, ; Andranovich, G. ; Apr. 01, 2001 ; 38p ; In English
Report No.(s): DE2001-780298 ; SAND2001-0642 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

This case study describes a success in technology transfer out of Sandia National Laboratories that resulted in commercialization supporting both the laboratories' national security mission and economic development. This case exemplifies how the process of technology innovation stretches from national legislation to laboratory management to entrepreneurs, and then out into the community where the technology must be developed and commercialized if innovation is to occur. Two things

emerged from the research for this case study that have implications for technology transfer and commercialization from other national laboratories and may also be relevant to technology commercialization out of other federal laboratories and universities. The first is the very clear theme that partnerships were critical to the ultimate successful commercialization of the technology--partnerships between public and private research groups as well as between business development groups. The second involves identifiable factors that played a role in moving the process forward to successful commercialization. All of the factors, with two significant exceptions, focused on technology and business development directly related to creating research and business partnerships. The two exceptions, a technology with significant market applications, and entrepreneurs willing and able to take the risks and accomplish the hard work of technology innovation, were initiating requirements for the process.
NTIS
Commercialization ; Technology Transfer ; Laboratories ; Law (Jurisprudence)

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in Space Sciences see categories 89 through 93.

20020009756 NASA Ames Research Center , Moffett Field, CA USA
Jim Pollack's Contributions to Planetary Science
Haberle, Robert M. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; DPS Meeting , 26 Oct. - 1 Nov. 1994 , Washington, DC , USA
Contract(s)/Grant(s): RTOP 154-95-80-05 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Jim Pollack was an extraordinary scientist. Since receiving his Ph.D. from Harvard in 1965, he published hundreds of papers in scientific journals, encyclopedias, popular magazines, and books. The sheer volume of this kind of productivity is impressive enough, but when considering the diversity and detail of his work, these accomplishments seem almost superhuman. Jim studied and wrote about every planet in the solar system. For, this he was perhaps the most distinguished planetary scientist of his generation. He successfully identified the composition of Saturn's rings and Venus's clouds. With his collaborators, he created the first detailed models for the formation of the outer planets, and the general circulation of the Martian atmosphere. His interest in Mars dust storms provided a foundation for the "nuclear winter" theory that ultimately helped shape foreign policy in the cold war era. Jim's creative talents brought him many awards including the Kuiper Award of the Division of Planetary Sciences, the Leo Szilard Award of the American Physical Society, H. Julian Allen award of the Ames Research Center, and several NASA medals for exceptional scientific achievement.
Author
Solar System ; Planetary Evolution ; Dust Storms

89
ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20020005975 Communications Research Lab. , Japan
Space VLBI Mission: VSOP
Murata, Yasuhiro , Communications Research Lab. , Japan ; Hirabayashi, Hisashi , Communications Research Lab. , Japan ; Kobayashi, Hideyuki , Communications Research Lab. , Japan ; Shibata, Katsunori M. , Communications Research Lab. , Japan ; Umemoto, Tomofumi , Communications Research Lab. , Japan ; Edwards, P. G. , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 41-46 ; In Japanese ; Copyright ; Avail: Issuing Activity

We succeeded in performing space VLBI observations using the VLBI satellite HALCA (VSOP satellite), launched in February, 1997 aboard the first M-V rocket developed by ISAS. The mission is led by ISAS and NAO, with the collaborations from CRL, NASA, NRAO, and other institutes and observatories in Europe, Australia, Canada, South-Africa, and China, We succeeded to make a lot of observations and to get the new features from the active galaxies, the cosmic jets, and other astronomical objects.
Author
Very Long Base Interferometry ; Active Galaxies ; Observation

20020006054 Communications Research Lab. , Japan
Development of Dicke-Type Radiometer for 22 GHz Band
Okubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 73-81 ; In Japanese ; Copyright ; Avail: Issuing Activity
For radio astronomy observations, 22GHz is an important observation frequency band because of the H2O maser-line-spectrum emissions from the active regions in galaxies. But, for continuous-wave observations, use of the 22GHz band has distinct disadvantages. Non-thermal emissions generally become weaker in the higher range of microwave frequencies and the larger water vapor atmospheric absorption and emission causes a decrease of signals from radio sources and increases of antenna noise. That results in the erasure of the weak signal from the radio source. Consequently, 22GHz continuous wave observation is more difficult than lower frequency observation. For single-dish observations of continuous-wave radio sources, we have been developing a Dicke-type switching radiometer. In this paper, we report the system configuration and results of experiment observations using a reference radio source.
Author
Spectral Emission ; Radio Astronomy ; Radiometers ; Fabrication ; Water Masers ; Thermal Emission ; Active Galaxies

20020006097 Los Alamos National Lab. , NM USA
Gravitational waves from stellar collapse
Fryer, C. L. ; Jan. 01, 2001 ; 13p ; In English
Report No.(s): DE2001-773830 ; LA-UR-01-438 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
Stellar core-collapse plays an important role in nearly all facets of astronomy: cosmology (as standard candles), formation of compact objects, nucleosynthesis and energy deposition in galaxies. In addition, they release energy in powerful explosions of light over a range of energies, neutrinos, and the subject of this meeting, gravitational waves. Because of this broad range of importance, astronomers have discovered a number of constraints which can be used to help them understand the importance of stellar core-collapse as gravitational wave sources.
NTIS
Cosmology ; Gravitational Waves ; Stellar Activity ; Astrophysics

20020006102 Los Alamos National Lab. , NM USA
Combined analysis of thorium and fast neutron data at the lunar surface
Gasnault, O. ; Feldman, W. ; Jan. 01, 2001 ; 3p ; In English
Report No.(s): DE2001-773347 ; LA-UR-01-251 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The global distribution of the radioactive elements (U, K, Th) at the lunar surface is an important parameter for an understanding of lunar evolution, because they have provided continuous heat over the lifetime of the Moon. Today, only the thorium distribution is available for the whole lunar surface (1). Another key parameter that characterize the surface of the Moon is the presence of mare basalts. These basalts are concentrated on the nearside and are represented by materials with high-Fe content, sometimes associated with high-Ti. We demonstrated elsewhere that the fast neutron measurement made by Lunar Prospector is representative of the average soil atomic mass (2) is primarily dominated by Fe and Ti in basaltic terranes, and therefore the map of the fast neutrons provides a good delineation of mare basalts. We focus here on the correlated variations of thorium abundances and fast neutron fluxes averaged over areas of 360 km in diameter, in an attempt to provide a better understanding of the thorium emplacement on the surface of the Moon.
NTIS
Abundance ; Fast Neutrons ; Lunar Surface ; Moon ; Radioactive Isotopes ; Thorium ; Soils

20020006103 Los Alamos National Lab. , NM USA

First lunar map of the average soil atomic mass

Gasnault, O. ; Feldman, W. ; Jan. 01, 2001 ; 3p ; In English

Report No.(s): DE2001-773346 ; LA-UR-01-250 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

Measurements of indexes of lunar surface composition were successfully made during Lunar Prospector (LP) mission, using the Neutron Spectrometers (NS) (1). This capability is demonstrated for fast neutrons in Plates 1 of Maurice et al. (2) (similar to Figure 2 here). Inspection shows a clear distinction between mare basalt (bright) and highland terranes (2). Fast neutron simulations demonstrate the sensitivity of the fast neutron leakage flux to the presence of iron and titanium in the soil (3). The dependence of the flux to a third element (calcium or aluminum) was also suspected (4). We expand our previous work in this study by estimating fast neutron leakage fluxes for a more comprehensive set of assumed lunar compositions. We find a strong relationship between the fast neutron fluxes and the average soil atomic mass: This relation can be inverted to provide a map from the measured map of fast neutrons from the Moon.

NTIS

Composition (Property) ; Lunar Maps ; Lunar Surface ; Geochemistry ; Soils ; Moon

20020006181 NASA Ames Research Center , Moffett Field, CA USA

Search for Outer Satellites of Saturn to V=22.5

Cruikshank, Dale P. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Astronomical Society of the Pacific Meeting , 28-30 Jun. 1994 , Flagstaff, AZ , USA ; Sponsored by Astronomical Society of the Pacific , USA

Contract(s)/Grant(s): RTOP 196-41-67-03 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A wide-field, prime-focus photographic search of most of the dynamically permitted satellite space of Saturn and Uranus to limiting magnitude 22.5 revealed no new outer satellites. This search is approximately 2.5 mag deeper than previous surveys. For bodies of geometric albedo 0.04, the search would have revealed outer satellites of Saturn with diameter 20 km and greater, and outer satellites of Uranus with diameter 70 km and greater. This work was carried out with the Canada-France-Hawaii 3.6-m telescope on Mauna Kea.

Author

Saturn (Planet) ; Saturn Satellites ; Uranus (Planet) ; Telescopes

20020006308 Communications Research Lab. , Japan

Water Vapor Maser Survey by Using the Kashima 34m Radio Telescope

Takaba, Hiroshi , Communications Research Lab. , Japan ; Iwata, Takahiro , Communications Research Lab. , Japan ; Miyaji, Takeshi , Communications Research Lab. , Japan ; Deguchi, Shuji , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 107-136 ; In Japanese ; Copyright ; Avail: Issuing Activity

We carried out an H2O maser survey by using the 34-m radio telescope at the Kashima Space Research Center, CRL in Japan. Sources were selected from the IRAS point-source catalogue by their position on the two-color diagram; most of all known H2O maser sources associated with late-type stars and proto-stellar objects were included. of the 842 H2O maser candidates surveyed, 265 sources had H2O maser emissions, and 44 sources were newly detected.

Author

Water Vapor ; Water Masers ; Surveys ; Late Stars

20020006318 Communications Research Lab. , Japan

GALAXY: Real-Time VLBI for Radio Astronomy Observations

Fujisawa, Kenta ; Kawaguchi, Noriyuki ; Kobayashi, Hideyuki ; Iguchi, Satoru ; Miyaji, Takeshi ; Sorai, Kazuo ; Kondo, Tetsuro ; Koyama, Yasuhiro ; Nakajima, Junichi ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 47-57 ; In Japanese ; Copyright ; Avail: Issuing Activity

GALAXY is a research project on advanced VLBI technology, jointly conducted by CRL, NAO, and NTT. The testbed of the project is a 2.5-Gb/s ultra-high speed network using Asynchronous Transfer Mode (ATM). One of the aims of this project is to achieve high-sensitivity VLBI observation with this gigabit class network. GALAXY network consists of KSP and OLIVE networks provided by NTT and spans 200km range. The sensitivity achieved in our current observation system is comparable to the world-highest class (approx. 10mJy) using conventional VLBI samplers. This short baseline and high sensitivity make GALAXY a unique VLBI network for astronomy in the world. Here we describe the properties of GALAXY network and

observations focusing on some unique results that can be achieved with the capability of GALAXY. Developments of new networking technology such as Internet Protocol UP) with GALAXY network are also presented,
Author
Galaxies ; Observation ; Radio Astronomy ; Very Long Base Interferometry

20020006324 Communications Research Lab. , Japan
Structure Model Analysis of the Kashima 34m Telescope
Nakajima, Junichi , Communications Research Lab. , Japan ; Nakamura, Toshio , Communications Research Lab. , Japan ; Saita, Takeshi , Communications Research Lab. , Japan ; Horiguchi, Junji , Communications Research Lab. , Japan ; Yuge, Kouhei , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 83-89 ; In Japanese ; Copyright ; Avail: Issuing Activity

Deformation analysis of the Kashima 34-m radio telescope is performed. Although the telescope has a large aperture and accurate reflector panels, the dish support structures determine the high-frequency performance. Especially in millimeter wavelength, deformations above 1-mm affect the telescope efficiency seriously. We have modeled 34-m telescopes into elements and used a finite element method FEM to simulate accurate telescope deformations. The first results we obtained agreed well with the realistic deformation. Future analysis and telescope evaluations based on computer simulations are possible with this FEM model.
Author
Computerized Simulation ; Deformation ; Radio Telescopes ; Millimeter Waves

20020006331 Los Alamos National Lab. , NM USA
Stratified composition effects on planetary neutron flux
Gasnault, O. ; Jan. 01, 2001 ; 3p ; In English
Report No.(s): DE2001-773324 ; LA-UR-01-114 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

All the bodies of the solar system that are directly irradiated by the galactic cosmic rays, emit enough neutrons to allow a measurement from space. These leakage neutron fluxes are indexes of the surface composition, depending on the energy of the neutrons (1). Recent work propose geochemical interpretations of these fluxes: the thermal energy range is sensitive to iron, titanium, rare earth elements and thorium (2, 3), the epithermal energy range is sensitive to hydrogen, samarium and gadolinium (2) and the fast energy range is representative of the average soil atomic mass (4). Nevertheless these studies make the hypothesis of a composition uniform within the footprint of the spectrometer and independent of depth. We show in this abstract that a stratified composition could change significantly the flux intensity and complicate the interpretation of the measurements. The neutron leakage flux is a competition between production effects (sensitive at high energy) and diffusion-capture effects (mostly sensitive at low energy). On one hand, it happens to be that the elements which produce the higher number of neutrons in typical lunar compositions are iron and titanium, which have also large cross section of absorption with the neutrons. On the other hand, the maximum of neutron intensity does not occur at the surface but at about 180 g cm(sup (minus)2) in depth. Therefore, if we have an iron- and/or titanium-rich soil (important production of neutrons) with a top layer having less iron and/or titanium (i.e. more transparent to the neutrons), we can expect an enhancement of the flux compared to a uniform composition.
NTIS
Geochemistry ; Planets ; Neutron Emission ; Flux (Rate)

20020007929 Los Alamos National Lab. , NM USA
Rapid spindown of sgr 900+14 following its superburst
Palmer, D. ; Mar. 01, 2001 ; 7p ; In English
Report No.(s): DE2001-776134 ; LA-UR-01-1444 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

SGR 1900+14 had a brief episode of exceedingly rapid spindown immediately following its 1998 Aug. 27 superburst. On a timescale of hours, it increased its period by a part in 10(sup 4). The corresponding P (approximately) 10(sup (minus)8) is orders of magnitude higher than the typical quiescent rate of P (approximately) 6 x 10(sup (minus)11).
NTIS
Neutron Stars ; Variable Stars

20020009009 Smithsonian Astrophysical Observatory , Cambridge, MA USA
Spectroscopy of Low Mass X-Ray Binaries: New Insights into Accretion ***Annual Report , 1 Nov. 2000 - 31 Oct. 2001***
DilVrtilek, Saeqa , Smithsonian Astrophysical Observatory , USA ; November 2001 ; 3p ; In English
Contract(s)/Grant(s): NAG5-10070 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This project is to observe two low mass X-ray binaries, chosen for their X-ray brightness, low column density, and diversity of accretion behavior. The high spectral resolution of the RGS, the broad energy range and tremendous collecting power of EPIC, and simultaneous optical monitoring with the OM are particularly well-suited to these studies. observation of one of the two objects has taken place and the data were received in late November. The second object is yet to be observed. Over the next year we will: investigate the physical conditions of the emitting gas using emission and recombination line diagnostics to determine temperatures, densities, elemental abundances, and ionization structure; study the behavior of emission features as a function of binary orbit; and test and improve models of X-ray line emission developed by us over the past decade. We will gain insight on both the geometry of the accretion flow and on the evolutionary history of LMXBs.
Author
Spectroscopy ; X Ray Binaries

20020009013 NASA Goddard Space Flight Center , Greenbelt, MD USA
Small-Scale Spatial Fluctuations in the Soft X-Ray Background
Kuntz, K. D. , NASA Goddard Space Flight Center , USA ; February 2001 ; 284p ; In English
Contract(s)/Grant(s): RTOP 662-00-00
Report No.(s): NASA/TM-2001-209981 ; Rept-2001-01596-0 ; NAS 1.15:209981 ; No Copyright ; Avail: CASI ; A13 , Hardcopy ; A03 , Microfiche

In order to isolate the diffuse extragalactic component of the soft X-ray background, we have used a combination of ROSAT All-Sky Survey and IRAS 100 micron data to separate the soft X-ray background into five components. We find a Local Hot Bubble similar to that described by Snowden et al (1998). We make a first calculation of the contribution by unresolved Galactic stars to the diffuse background. We constrain the normalization of the Extragalactic Power Law (the contribution of the unresolved extragalactic point sources such as AGN, QSO'S, and normal galaxies) to 9.5 +/- 0.9 keV/(sq cm s sr keV), assuming a power-law index of 1.46. We show that the remaining emission, which is some combination of Galactic halo emission and the putative diffuse extragalactic emission, must be composed of at least two components which we have characterized by thermal spectra. The softer component has log T - 6.08 and a patchy distribution; thus it is most probably part of the Galactic halo. The harder component has log T - 6.46 and is nearly isotropic; some portion may be due to the Galactic halo and some portion may be due to the diffuse extragalactic emission. The maximum upper limit to the strength of the emission by the diffuse extragalactic component is the total of the hard component, approx. 7.4 +/- 1.0 keV/(sq cm s sr keV) in the 3/4 keV band. We have made the first direct measure of the fluctuations due to the diffuse extragalactic emission in the 3/4 keV band. Physical arguments suggest that small angular scale (approx. 10') fluctuations in the Local Hot Bubble or the Galactic halo will have very short dissipation times (about 10(exp 5) years). Therefore, the fluctuation spectrum of the soft X-ray background should measure the distribution of the diffuse extragalactic emission. Using mosaics of deep, overlapping PSPC pointings, we find an autocorrelation function value of approx. 0.0025 for 10' is less than theta is less than 20', and a value consistent with zero on larger scales. Measurement of the fluctuations with a delta I/I method produces consistent results.
Author
Background Radiation ; X Rays ; Sky Surveys (Astronomy)

20020009530 Communications Research Lab. , Tokyo, Japan
Observing Electromagnetic Radiation by Leonid Impacts on the Moon
Osaki, Hiro , Communications Research Lab. , Japan ; Okubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 159-163 ; In English ; Copyright ; Avail: Issuing Activity

The observation of the electromagnetic radiation associated with Leonid meteorite collision on the moon was attempted around the 1999 Leonid maximum on November 18. The Kashima 34 m radio telescope was pointed at the moon and X-band signals were recorded on November 15, 16, and 18. Optical "flash" events caused by meteorite impacts were observed during this Leonid maximum. Although the data around the flash events was studied, none of the events were accompanied by X-band radiation. The reason why no radiation was observed is thought to be that the antenna observed the lunar center, whereas the flash events were observed near the edge of the moon. This result suggests that we may have to wait for a better observational chance when the lunar shadow region is bombarded by meteorites during the Leonid maximum. It is also advisable to track the lunar shadow region where flashes are expected to be observed, instead of the lunar center.
Author
Electromagnetic Radiation ; Meteorite Collisions ; Moon ; Impact

20020009533 Communications Research Lab. , Tokyo, Japan

Space VLBI Mission: VSOP

Murata, Yasuhiro , Institute of Space and Astronautical Science , Japan ; Hirabayashi, Hisashi , Institute of Space and Astronautical Science , Japan ; Kobayashi, Hideyuki , Institute of Space and Astronautical Science , Japan ; Shibata, Katsunori M. , Institute of Space and Astronautical Science , Japan ; Umemoto, Tomofumi , Institute of Space and Astronautical Science , Japan ; Edwards, Philip G. , Institute of Space and Astronautical Science , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 41-46 ; In English ; Copyright ; Avail: Issuing Activity

We have successfully performed space VLBI observations using the HALCA satellite of the VLBI Space Observatory Programme (VSOP) launched in February 1997 by the M-V-1 rocket developed by the Institute of Space and Astronautical Science (ISAS). The mission is led by ISAS and the National Astronomical Observatory (NAO) in collaboration with the Communications Research Laboratory (CRL), National Aeronautics and Space Administration (NASA), National Radio Astronomy Observatory (NRAO), and other institutes and observatories in Europe, Australia, Canada, South Africa, and China. Through the course of this mission, we have made a large number of observations revealing new features of active galaxies, cosmic jets, and other astronomical objects.

Author

Very Long Base Interferometry ; Active Galaxies ; Cosmic Gases ; Cosmic Dust ; Galaxies

20020009534 Communications Research Lab. , Tokyo, Japan

Operations and Results of J-Net (Japanese Domestic VLBI Network)

Omodaka, Toshihiro , Kagoshima Univ. , Japan ; Kameya, Osamu , National Astronomical Observatory , Japan ; Miyoshi, Makoto , National Astronomical Observatory , Japan ; Miyaji, Takeshi , National Astronomical Observatory , Japan ; Sasao, Tetsuo , National Astronomical Observatory , Japan ; Kondo, Tetsuor , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 23-29 ; In English ; Copyright ; Avail: Issuing Activity

J-Net (Japanese VLBI Network) is the only VLBI network available for common use in Japan. It consists of three antennas belonging to the National Astronomical Observatory (NAO) of Japan (45-m antenna at Nobeyama Radio Observatory, 10-m antenna at Mizusawa Astrogeodynamics Observatory, and 6-m antenna at Kagoshima) and one antenna of the Communications Research Laboratory (34-m antenna at the Kashima Space Research Center) that participates as a base for joint research with NAO. The J-Net started common-use observations in the 22-GHz band in 1994. It has been used mainly for imaging VLBI observations of water vapor masers in star-forming regions and late-type stars with resolutions of several milliarcseconds, The contributions of J-Net to Japanese VLBI activity have been extensive.

Author

Very Long Base Interferometry ; Water Vapor ; Imaging Techniques

20020009535 Communications Research Lab. , Tokyo, Japan

Geodetic Results from Domestic VLBI Observations

Koyama, Yasuhiro , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 13-16 ; In English ; Copyright ; Avail: Issuing Activity

Both the 34-m and 26-m antenna systems at Kashima Space Research Center have played important roles in the history of domestic VLBI observations for geodesy in Japan. They have also contributed to the research and development of observation systems, data processing systems, and data analysis systems. This paper reviews the results and achievements of domestic VLBI observations.

Author

Antenna Design ; Geodesy ; Observation ; Very Long Base Interferometry

20020009539 Communications Research Lab. , Tokyo, Japan

GALAXY: Real-Time VLBI for Radio Astronomy Observations

Fujisawa, Kenta , National Astronomical Observatory , Japan ; Kawaguchi, Noriyuki , National Astronomical Observatory , Japan ; Kobayashi, Hideyuki , National Astronomical Observatory , Japan ; Iguchi, Satoru , National Astronomical Observatory , Japan ; Miyaji, Takeshi , National Astronomical Observatory , Japan ; Sorai, Kazuo , Nobeyama Radio Observatory , Japan ; Kondo,

Tetsuro , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 47-58 ; In English ; Copyright ; Avail: Issuing Activity

GALAXY is a research project on advanced VLBI technology, jointly conducted by CRL, NAO, and NTT. The testbed of the project is a 2.5-Gb/s ultra-high speed network using Asynchronous Transfer Mode (ATM). One of the aims of this project is to achieve high-sensitivity VLBI observation with this gigabit class network. GALAXY network consists of KSP and OLIVE networks provided by NTT and spans 200 km range. The sensitivity achieved in our current observation system is comparable to the world-highest class (approx. 10mJy) using conventional VLBI samplers. This short baseline and high-sensitivity make GALAXY a unique VLBI network for astronomy in the world. Here we describe the properties of GALAXY network and observations focusing on some unique results that can be achieved with the capability of GALAXY. Developments of new networking technology such as Internet Protocol (IP) with GALAXY network are also presented.

Author

Real Time Operation ; Very Long Base Interferometry ; Radio Astronomy

20020009540 Communications Research Lab. , Tokyo, Japan

Geodetic VLBI Activities at GSI

Fukuzaki, Yoshihiro , Geological Survey of Japan , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 17-22 ; In English ; Copyright ; Avail: Issuing Activity

The Geographical Survey Institute (GSI) has been performing geodetic VLBI observations to correct the positions of geodetic control points in Japan and to detect plate motion and crustal deformation around Japan. In 1981, GSI began development of a mobile VLBI system in cooperation with the Communications Research Laboratory, and used this system from 1986 to 1993 in the VLBI Experiment for Geodetic Application (VEGA) project. The most remarkable achievement of the VEGA project was the first detection of motion of the Philippine Sea plate. The GSI also carried out VLBI observations between Japan and Korea in 1995 by transporting a mobile system with a 3.8-m antenna to Korea. In 1994, ownership of the Kashima 26-m antenna was transferred from CRL to GSI, and with this antenna, GSI started to participate in international global observations, The coordinates of the Kashima 26-m antenna in the International Terrestrial Reference Frame (ITRF) have become the primary point of a new Japanese Geodetic Datum, At present, GSI's VLBI network in Japan consists of five stations that are used to perform regular VLBI observations. More than 30 years have passed, however, since the construction of the Kashima 26-m antenna, and its role has been passed on to the Tsukuba station, which will now participate in international global observations and act as the key station of the Japanese VLBI network.

Author

Very Long Base Interferometry ; Crustal Fractures ; Geodetic Coordinates ; Geodesy

20020009541 Communications Research Lab. , Tokyo, Japan

VLBI Observation Results: International VLBI Experiments

Kondo, Tetsuro , Communications Research Lab. , Japan ; Yoshino, Taizoh , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 3-11 ; In English ; Copyright ; Avail: Issuing Activity

A 26-m antenna and 34-m antenna at the Kashima Space Research Center have played major roles in advancing both Japanese radio astronomy and worldwide geodetic VLBI. Achievements include the first successful VLBI measurement in history of Pacific-plate motion in 1985 and participation in an international experiment to make precise measurements of Earth rotation parameters in parallel. The Kashima Space Research Center has since participated in many international VLBI experiments and has contributed to the construction of a terrestrial reference frame (TRF) and celestial reference frame (CRF). Our activities at Kashima associated with international VLBI are reviewed.

Author

Very Long Base Interferometry ; Antennas ; Earth Rotation ; Geodesy

20020009759 Communications Research Lab. , Tokyo, Japan

Water Vapor Maser Survey by Using the Kashima 34m Radio Telescope

Takaba, Hiroshi , Gifu Univ. , Japan ; Iwata, Takahiro , National Space Development Agency , Japan ; Miyaji, Takeshi , National Astronomical Observatory , Japan ; Deguchi, Shuji , National Astronomical Observatory , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN

0914-9260 ; Volume 48 , No. 1 , pp. 105-134 ; In English ; Copyright ; Avail: Issuing Activity

We carried out an H2O maser survey by using the 34 m radio telescope at Kashima Space Research Center, CRL in Japan. Sources were selected from the IRAS point source catalogue according to their position on the two-color diagram, and included most of the known H2O maser sources associated with late-type stars and proto-stellar objects. From a total of 842 H2O maser candidates, 265 were found to produce H2O maser emissions, and 44 of these constitute new detections.

Author

Water Vapor ; Masers ; Radio Telescopes ; Water Masers

20020009760 Communications Research Lab. , Tokyo, Japan

Development of Dicke-Type Radiometer for 22 GHz Band

Okubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 73-81 ; In English ; Copyright ; Avail: Issuing Activity

For radio astronomy observations, the 22-GHz band is important as an observation frequency band for H2O maser-line spectrum emission from active regions in galaxies. For continuum-emission observations, however, 22 GHz has some disadvantages. In general, non-thermal emission becomes weaker at high microwave frequency bands, and water-vapor atmospheric absorption and emission degrades signals from the radio source and increases antenna noise. Consequently, 22-GHz continuum-emission observations are more difficult than observations at lower frequencies. In response to this problem, we have been developing a Dicke-type switching radiometer for single dish observation of continuum-emission sources. In this paper, we report on the configuration of this system and results of experimental observations using a reference radio source.

Author

Water Masers ; High Frequencies ; Observation ; Radio Astronomy ; Dicke Radiometers

20020009764 Communications Research Lab. , Tokyo, Japan

Evaluation of GPS-Based Ionospheric TEC Estimation and Application to Pulsar VLBI Observation

Sekido, Mamoru , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Hanado, Yuko , Communications Research Lab. , Japan ; Imae, Michito , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 151-158 ; In English ; Copyright ; Avail: Issuing Activity

We evaluated the accuracy of GPS-based TEC measurements by comparing the results with S/X dual frequency VLBI experimental data. The Global Ionosphere Maps (GIMs) generated by CODE (Center for Orbit Determination in Europe) is one of the most accurate and freely available GPS-derived ionosphere maps, so we evaluated the accuracy of the GIM/CODE maps. Sekido et al. have demonstrated that ionospheric group delays computed from GIM/CODE agree with the ionospheric TEC measured by VLBI to an accuracy of 3-10% of the total contribution of TEC to the VLBI observation. Following on this research, this paper presents a comparison between the phase delay rate calculated from the GIM/CODE and phase delay rate measured by VLBI observations. The correlation between the ionospheric phase delay rates obtained from VLBI observation and those obtained from the GIM/CODE data were not as high as in the case of group delay. The main reason for the lower coincidence is that the GIM/CODE data does not contain short period variation components in the temporal and spatial domains. Using the GIM/CODE data, we have applied ionospheric delay correction to single-band astrometric VLBI data. This resulted in improved consistency between the group delay and observed phase delay rate, and estimated pulsar coordinate solutions that were more stable than those obtained without ionosphere correction. The proper motion obtained from this ionospheric-delay-corrected VLBI data agrees well with the other proper motion measurements.

Author

Evaluation ; Global Positioning System ; Ionospheric Electron Density ; Electron Counters ; Accuracy

20020011039 Atmospheric and Environmental Research, Inc. , Lexington, MA USA

An Integrated Modeling Study for Coordinated Observations of H, O, OH, and H2O(+) Emissions in the Coma and Ion Tail of the Comet Hale-Bopp ***Final Report , 2 Nov. 1998 - 1 Nov. 2001***

Smyth, William H. , Atmospheric and Environmental Research, Inc. , USA ; [2001] ; 72p ; In English ; Original contains color illustrations

Contract(s)/Grant(s): NASW-97020 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

This project has two overall objectives. One objective is to advance our general understanding of both the comet neutral atmosphere and the cometary plasma in the atmosphere and ion tall. The other objective is to obtain specific key information about comet Hale-Bopp that is generally important for Hale-Bopp studies. The primary emphasis in this project is to analyze, in a self-consistent manner, excellent quality high resolution image and line profile observations obtained by the University of Wisconsin for H, O, OH, and H2O+ emissions from the inner coma, outer coma, and ion tail of Hale-Bopp. The information on the spatial and velocity distributions of H2O neutral and ionized photo-products in the inner coma, outer coma, and in the H2O+ ion tail is of substantial and direct importance in the development of an integrated understanding of the complex structure and dynamics of the neutral and plasma species in the atmosphere of Hale-Bopp in particular and comets in general. The H2O production rate of Hale-Bopp is determined and, together with the other information related to the structure and dynamics of the neutral and plasma atmospheres obtained in this study, provide critical information important for a wide variety of research conducted by other groups.
Author
Hale-Bopp Comet ; Comet Heads ; Comet Tails ; Cometary Atmospheres

20020012350 Smithsonian Astrophysical Observatory , Cambridge, MA USA
Multi-Epoch XMM Observations of NGC4258 ***Annual Report , 1 Jan. - 31 Dec. 2001***
Greenhill, Lincoln J. , Smithsonian Astrophysical Observatory , USA ; November 2001 ; 1p ; In English
Contract(s)/Grant(s): NAG5-10194 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The goal of this project is to better understand whether the well known, warped accretion disk around the supermassive black hole in NGC4258 is responsible for the observed X-ray absorbing column of gas. The active galactic nuclei (AGN) paradigm suggests that doughnut-like tori obscure black holes, not warped disks. Using radio interferometry, we have mapped the disk and its orientation. Through time monitoring radio observations we are following the rotation and variability in the disk structure. The disk crosses the line of sight to the black hole, if it is clumpy, then we will observe variations in the X-ray spectrum of NGC4258 on month to year time scales. We have reduced 14 epochs of very long base interferometry (VLBI) observations that we use to characterize the structure of the maser-laden accretion disk and its evolution. Five epochs of data remain to be reduced in the next year. We have received distributions of data for two of our four intended epochs of X-ray Multimirror Mission (XMM) observation. Because the first two epochs are relatively close in time, and because community understanding of how to calibrate XMM data has until recently been relatively immature, we are waiting until we receive the third epoch of data before we reduce the several datasets. Delivery of the third epoch should take place late this year. The last epoch of XMM observation will take place in mid-2002. In the next year, we will begin to combine constraints on disk clumpiness with estimates of X-ray variability observed by XMM.
Author
Accretion Disks ; Active Galactic Nuclei ; Radio Observation ; Variability ; X Ray Astronomy

20020012433 Smithsonian Astrophysical Observatory , Cambridge, MA USA
Research on Spectroscopy, Opacity, and Atmospheres ***Final Report , 15 Feb. 1998 - 14 Aug. 2001***
Kurucz, Robert L. , Smithsonian Astrophysical Observatory , USA ; December 2001 ; 1p ; In English
Contract(s)/Grant(s): NAG5-7014 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche

With this funding I produced a web site kurucz.harvard.edu that can also be accessed by FTP. it has a 73GB disk that holds all of my atomic and diatomic molecular data, my tables of distribution function opacities, my grids of model atmospheres, colors, fluxes, etc., my programs that are ready for distribution, and most of my recent papers. Atlases and computed spectra will be added as they are completed. New atomic and molecular calculations will be added as they are completed.
Derived from text
Atmospheric Models ; Opacity ; Websites

20020012549 Oak Ridge National Lab. , TN USA
Bigfoot Field Manual , 2.1
Campbell, J. L. ; Burrows, S. ; Gower, S. T. ; Cohen, W. B. ; Sep. 01, 1999 ; 119p ; In English
Report No.(s): DE2001-13418 ; ORNL/TM-1999/216 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The BigFoot Project is funded by the Earth Science Enterprise to collect and organize data to be used in the EOS Validation Program. The data collected by the BigFoot Project are unique in being ground-based observations coincident with satellite overpasses. In addition to collecting data, the BigFoot project will develop and test new algorithms for scaling point measurements to the same spatial scales as the EOS satellite products. This BigFoot Field Manual Mill be used to achieve completeness and

consistency of data collected at four initial BigFoot sites and at future sites that may collect similar validation data. Therefore, validation datasets submitted to the ORNL DAAC that have been compiled in a manner consistent with the field manual will be especially valuable in the validation program.
NTIS
Earth Observing System (EOS) ; Ground Tests

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20020005963 Los Alamos National Lab. , NM USA
Driving g-mode pulsations in gamma doradus variables
Guzik, J. ; Kaye, A. ; Oct. 10, 2000 ; 7p ; In English
Report No.(s): DE2001-772941 ; LA-UR-99-5667 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The (gamma) Doradus stars are a newly-discovered class of gravity-mode pulsators which lie just at or beyond the red edge of the (delta) Scuti instability strip. We present the results of calculations which predict pulsation instability of high-order g-modes with periods between 0.4 and 3 days, as observed in these stars. The pulsations are driven by the modulation of radiative flux by convection at the base of a deep envelope convection zone. Pulsation instability is predicted only for models with temperatures at the convection zone base between (approximately)200,000 and (approximately)480,000 K. The estimated shear dissipation due to turbulent viscosity within the convection zone, or in an overshoot region below the convection zone, can be comparable to or even exceed the predicted driving, and is likely to reduce the number of unstable modes, or possibly to quench the instability. Additional refinements in the pulsation modeling are required to determine the outcome. A few Doradus stars have been observed that also pulsate in (delta) Scuti-type p-modes, and at least two others have been identified as chemically peculiar. Since our calculated driving region is relatively deep, Doradus pulsations are not necessarily incompatible with surface abundance peculiarities or with (delta) Scuti p-mode pulsations driven by the H and He-ionization (kappa) effect. Such stars will provide useful observational constraints on the proposed Doradus pulsation mechanism.
NTIS
Pulsars ; Unsteady Flow

20020006051 Communications Research Lab. , Japan
Evaluation of GPS-Based Ionospheric TEC Estimation and Application to Pulsar VLBI Observation
Sekido, Mamoru , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Kawai, Eiji , Communications Research Lab. , Japan ; Hanado, Yuko , Communications Research Lab. , Japan ; Imae, Michito , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 155-162 ; In Japanese ; Copyright ; Avail: Issuing Activity
GPS-based TEC measurement accuracy was evaluated by comparison with the S/X dual frequency VLBI experiment data. The global ionosphere map (GIM) generated by the Center for Orbit Determination in Europe (CODE) is one of the most accurate GPS derived ionosphere map available, thus we used this GIM/CODE for the evaluation. Sekido et al., demonstrated that ionospheric group delays computed from the GIM/CODE agree with the ionospheric TEC measured by VLBI with an accuracy of 3-10% of the total TEC included in the VLBI observation. A comparison between the phase-delay rate calculated from the GIM/CODE and a counterpart of the VLBI observation is presented in this paper. The correlation of the ionospheric phase-delay rates between VLBI observation and the GIM/CODE data was not so high, as in the case of the group delay. The main reason for the lower coincidence is that the GIM/CODE data do not contain high-frequency components in both the time and space domains. Application of ionospheric delay correction to single-band astrometric VLBI data using the GIM/CODE data was performed. Consequently, the consistency of the observable group-delay and phase-delay rate was improved and the estimated pulsar coordinates solutions were stabilized compared to the cases of no ionosphere correction. Proper motion obtained from the ionospheric-delay corrected VLBI data agreed well with other proper motion measurement results.
Author
Evaluation ; Global Positioning System ; Ionospheric Currents ; Electron Density (Concentration)

20020006059 NASA Ames Research Center , Moffett Field, CA USA

Disintegration of Dust Aggregates in Interstellar Shocks and the Lifetime of Dust Grains in the ISM

Dominik, C. , NASA Ames Research Center , USA ; Jones, A. P. , California Univ. , USA ; Tielens, A. G. G. M. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Shocks in AP , 8-12 Jan. 1995 , Manchester , UK

Contract(s)/Grant(s): RTOP 399-20-10-27 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Interstellar grains are destroyed by shock waves moving through the ISM. In fact, the destruction of grains may be so effective that it is difficult to explain the observed abundance of dust in the ISM as a steady state between input of grains from stellar sources and destruction of grains in shocks. This is especially a problem for the larger grains. Therefore, the dust grains must be protected in some way. Jones et al. have already considered coatings and the increased post-shock drag effects for low density grains. In molecular clouds and dense clouds, coagulation of grains is an important process, and the largest interstellar grains may indeed be aggregates of smaller grains rather than homogeneous particles. This may provide a means to protect the larger grains, in that, in moderate velocity grain-grain collisions in a shock the aggregates may disintegrate rather than be vaporized. The released small particles are more resilient to shock destruction (except in fast shocks) and may reform larger grains later, recovering the observed size distribution. We have developed a model for the binding forces in grain aggregates and apply this model to the collisions between an aggregate and fast small grains. We discuss the results in the light of statistical collision probabilities and grain life times.

Author

Aggregates ; Coagulation ; Collisions ; Cosmic Dust ; Disintegration ; Interstellar Gas ; Shock Waves

20020006060 NASA Ames Research Center , Moffett Field, CA USA

Impacts with the Earth and Jupiter

Morrison, David , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 26th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society , 30 Oct. 1994 , Bethesda, MD , USA ; Sponsored by American Astronomical Society , USA

Contract(s)/Grant(s): RTOP 196-41-67-06 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The Earth has been subject to impacts from comets and asteroids since its formation, and such impacts have played an important role in the evolution of life on our planet. We now recognize not only the historical role of impacts, but the contemporary hazard posed by such events. In the absence of a complete census of potentially threatening Earth-crossing asteroids or comets (called collectively Near Earth Objects, or NEOs), or even of a comprehensive current search program to identify NEOs, we can consider the hazard only from a probabilistic perspective. In general, the larger the object the greater the hazard, even when allowance is made for the infrequency of large impacts. Most of the danger to human life is associated with impacts by objects roughly 2 km or larger (energy greater than 1 million megatons), which can inject sufficient submicrometer dust into the atmosphere to produce a severe short-term global cooling with subsequent loss of crops, leading to starvation. Hazard estimates suggest that the chance of such an event occurring during a human lifetime is about 1:5000, and the global probability of death from such impacts is of the order of 1:20000, values that can be compared with risks associated with other natural hazards such as earthquakes, volcanic eruptions, and severe storms. The widely-observed impact of Comet Shoemaker-Levy 9 with Jupiter in July 1994 provides a graphic example of such an interplanetary collision and is stimulating worldwide interest in protecting our planet against cosmic impact catastrophes.

Author

Asteroids ; Collisions ; Comets ; Estimates ; Near Earth Objects ; Probability Theory

20020006125 Oak Ridge National Lab. , TN USA

General Relativistic Simulations of Stellar Core Collapse and Postbounce Evolution with Boltzmann Neutrino Transport

Liebendoerfer, M. ; Feb. 28, 2001 ; 6p ; In English

Report No.(s): DE2001-776209 ; P01-110142 ; No Copyright ; Avail: Department of Energy Information Bridge

We present self-consistent general relativistic simulations of stellar core collapse, bounce, and postbounce evolution for 13, 15, and 20 solar mass progenitors in spherical symmetry. Our simulations implement three-flavor Boltzmann neutrino transport and standard nuclear physics. The results are compared to our corresponding simulations with Newtonian hydrodynamics and O(v/c) Boltzmann transport.

NTIS

Boltzmann Transport Equation ; Stellar Mass ; Neutrinos ; Astrophysics ; Gravitational Collapse ; Stellar Evolution ; Relativistic Theory

20020006309 NASA Ames Research Center , Moffett Field, CA USA

The End of Comet Shoemaker-Levy 9

Zahnle, K. J. , NASA Ames Research Center , USA ; MacLow, M.-M. , Chicago Univ. , USA ; [1994] ; 1p ; In English ; 1994 America Geophysical Union Meeting , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The pieces of the former Comet Shoemaker-Levy 9 struck Jupiter during the week of July 16-22 1994. We divide the general impact phenomena into four phases: (1) Atmospheric entry should have been accompanied by an entry flash, probably only detectable by the Galileo spacecraft. (2) Aerodynamic forces cause the impactor to explode. We show that the apparent altitude of the explosions is consistent with the analytical model proposed by Zahnle and Chyba et al, with numerical models calculated by Mac Low and Zahnle and Yabe et al., and with dynamically-based estimates of fragment masses Suggested by Scotti and Melosh and Asphaug and Benz. (3) The explosion produces a fireball that propagates most quickly up the wake, as predicted by Takata et al. and Crawford et al. The fireball's luminosity fades over a timescale of 30-60 seconds. (4) Each explosion produced a plume that reached thousands of kilometers above the cloud-tops. The plumes appear to have been dusty and SO illuminated when they reached sunlight. The plumes rose and fell over a period of ten or twenty minutes, governed by the simple laws of ballistics. When plume material (dust) fell back on the atmosphere it was reheated and glowed brightly in the thermal infrared for a period of order ten to twenty minutes; a large fraction of the impact energy was spent thus. Geometry introduces additional factors that complicate interpretation of the observed light curves.

Author

Shoemaker-Levy 9 Comet ; Atmospheric Entry ; Cloud Height Indicators ; Dust ; Estimates

20020006322 Communications Research Lab. , Japan

Observing Electromagnetic Radiation by Leonid Impacts on the Moon

Osaki, Hiro , Communications Research Lab. , Japan ; Okubo, Hiroshi , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 163-167 ; In Japanese ; Copyright ; Avail: Issuing Activity

An observation of the electromagnetic radiation associated with Leonid meteorite collisions with the moon was attempted around the 1999 Leonid maximum on November 18. The Kashima 34-m radio telescope was pointed at the moon and the x-band signal was recorded on November 15, 16, and 18. Optical "flash" events caused by the meteorite impacts were observed during this Leonid maximum. Al-though the data around the flash events were studied, none of the events was accompanied by x-band radiation. The reason why radiation was not observed is supposedly that the antenna was observing the lunar center, though the flash events were observed near the edge of the moon. This result suggests that we may have to wait for another such good observational chance, as the lunar-shadow region was bombarded by meteorites when the Leonid reached its maximum. It is also advisable to track the lunar-shadow region where the flashes are expected to be observable, instead of the lunar center.

Author

Electromagnetic Radiation ; Observation ; Moon ; Meteorite Collisions

20020006323 Communications Research Lab. , Japan

Radar Observations of Near Earth Asteroids 6489 Golevka and 4197 (1982 TA)

Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Yoshikawa, Makoto , Communications Research Lab. , Japan ; Nakamura, Akiko M. , Communications Research Lab. , Japan ; Hirabayashi, Hisashi , Communications Research Lab. , Japan ; Okada, Tatsuaki , Communications Research Lab. , Japan ; Abe, Masanao , Communications Research Lab. , Japan ; Nishibori, Toshiyuki , Communications Research Lab. , Japan ; Fuse, Tetsuharu , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 145-153 ; In Japanese ; Copyright ; Avail: Issuing Activity

Radar observations of two near-Earth asteroids were performed using a bi-static radar technique with Kashima 34-m antenna and Usuda 64-m antenna as receiving stations and Goldstone 70-m antenna as a transmitting station. The asteroid 6489 Golevka was observed on June 15, 1995 when its distance from the Earth became 0.048 AU and the radar echo from the asteroid was detected from the data observed with Kashima 34-m antenna. The success of the trans-continental bistatic radar observations became the first detection of a radar echo from a solar system object beyond Moon in Japan. The asteroid 4197 (1982 TA) was observed on October 24, 1996 when its distance to the Earth became 0.086 AU. The radar echo signal from the asteroid was

detected from both of the data observed at Kashima and at Usuda. The received signal was coherently sampled and recorded at both stations. by using these data, interferometric data analysis was examined.
Author
Radar Tracking ; Observation ; Radar Echoes

20020006326 Communications Research Lab. , Japan
Stellar Evolution and Water Maser Emission
Imai, Hiroshi , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 31-39 ; In Japanese ; Copyright ; Avail: Issuing Activity

Cosmic-maser emission from water vapor has been observed at an early stage of birth and at the final stage of death in stellar evolution. We have observed such water masers using the Japanese domestic VLBI network for astronomy (J-Net), and revealed in detail the kinematics of them around protostars and evolved stars: (1) Systematic radial-velocity drifts of water-maser features in time were found around the semiregular variable star RT Vir. This phenomenon, discovered for the first time, indicates acceleration motions of a mass-loss flow around the star. (2) Rotation-infall motions around the protostar IRAS 16923-2422 in the solar-system scale were revealed with water masers. These motions indicated dynamical infalls of material on to the protostar in a scale down to a few tens of AU. (3) A large number of proper motions of water-maser features have been measured in the massive-star forming region W51 North. We found 3-D kinematics of an outflow from W51 North and estimated directly a distance to W51 North as 6.7 +/- 2.1 kpc. and (4) We started study of the high precision astrometry of maser sources to develop stellar astrophysics. The phase-referencing technique using the fast antenna-switching method has been applied to a pair of water masers around the supergiant star S Per and the continuum source KR 143. Although an accuracy of relative astrometry for the maser sources was limited to 1 mas at the present work, the fringe-phase fluctuation due to the atmosphere has been compensated effectively at the relatively high frequency band of 22.2GHz.
Author
Emission Spectra ; Water Vapor ; Stellar Evolution ; Interstellar Masers ; Massive Stars

20020006532 Los Alamos National Lab. , NM USA
Host galaxies as gamma-ray burst distance indicators
Band, D. ; Jan. 01, 2001 ; 4p ; In English
Report No.(s): DE2001-774338 ; LA-UR-01-655 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We calculate the distributions of the total burst energy, the peak luminosity and the X-ray afterglow energy using burst observations and distances to the associated host galaxies. to expand the sample, we include redshift estimates for host galaxies without spectroscopic redshifts. The methodology requires a model of the host galaxy population; we find that in the best model the burst rate is proportional to the host galaxy luminosity at the time of the burst.
NTIS
X Rays ; Galaxies ; Luminosity ; Afterglows ; Gamma Rays

20020006943 NASA Ames Research Center , Moffett Field, CA USA
Occultation Predictions Using CCD Strip-Scanning Astrometry
Dunham, Edward W. , NASA Ames Research Center , USA ; Ford, C. H. , Search for Extraterrestrial Intelligence Inst. , USA ; Stone, R. P. S. , Lick Observatory , USA ; McDonald, S. W. , Massachusetts Inst. of Tech. , USA ; Olkin, C. B. , Massachusetts Inst. of Tech. , USA ; Elliot, J. L. , Massachusetts Inst. of Tech. , USA ; [1994] ; 1p ; In English ; Division for Planetary Sciences Meeting , Oct. 1994 , Washington, DC , USA ; Sponsored by Lunar and Planetary Inst. , USA
Contract(s)/Grant(s): RTOP 352-02-03 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We are developing the method of CCD strip-scanning astrometry for the purpose of deriving reliable advance predictions for occultations involving small objects in the outer solar system. We are using a camera system based on a Ford/Loral 2Kx2K CCD with the Crossley telescope at Lick Observatory for this work. The columns of die CCD are aligned East-West, the telescope drive is stopped, and the CCD is clocked at the same rate that the stars drift across it. In this way we obtain arbitrary length strip images 20 arcmin wide with 0.58” pixels. Since planets move mainly in RA, it is possible to obtain images of the planet and star to be occulted on the same strip well before the occultation occurs. The strip-to-strip precision (i.e. reproducibility) of positions is limited by atmospheric image motion to about 0.1” rms per strip. However, for objects that are nearby in R.A., the image motion is highly correlated and their relative positions are good to 0.02” rms per strip. We will show that the effects of atmospheric image motion on a given strip can be removed if a sufficient number of strips of a given area have been obtained. Thus, it is possible to reach an rms precision of 0.02” per strip, corresponding to about 0.3 of Pluto or Triton’s angular radius. The ultimate accuracy of a prediction based on strip-scanning astrometry is currently limited by the accuracy of the positions of the stars in the astrometric

network used and by systematic errors most likely due to the optical system. We will show the results of . the prediction of some recent occultations as examples of the current capabilities and limitations of this technique.
Author
Occultation ; Charge Coupled Devices ; Scanning ; Astrometry ; Predictions

20020008132 Oak Ridge National Lab. , TN USA
Nuclear Reaction Rate Uncertainties and Their Effects on Nova Nucleosynthesis Modeling
Hix, W. R. ; Jan. 16, 2001 ; 7p ; In English ; 2nd ; 2nd Chicago Conference on Astrophysical Explosions
Contract(s)/Grant(s): AC05-96OR22464
Report No.(s): DE2001-774670 ; P00-109406 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The nucleosynthesis and other observable consequences of a nova outburst depend sensitively on the details of the thermonuclear runaway which initiates the outburst. One important source of uncertainty in our current models is the nuclear reaction data used as input for the evolutionary calculations. We present preliminary results of the first analyses of the impact on nova nucleosynthesis of all reaction rate uncertainties considered simultaneously.
NTIS
Nuclear Fusion ; Reaction Kinetics ; Thermonuclear Reactions

20020009011 Smithsonian Astrophysical Observatory , Cambridge, MA USA
The Physics of Accretion in X-Ray Binaries ***Annual Report , 1 Jan. - 31 Dec. 2001***
Vrtilek, S. , Smithsonian Astrophysical Observatory , USA ; December 2001 ; 3p ; In English
Contract(s)/Grant(s): NAG5-6711 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
This project consists of several related investigations directed to the study of mass transfer processes in X-ray binaries. Models developed over several years incorporating highly detailed physics will be tested on a balanced mix of existing data and planned observations with both ground and space-based observatories. The extended time coverage of the observations and the existence of simultaneous X-ray, ultraviolet, and optical observations will be particularly beneficial for studying the accretion flows. These investigations, which take as detailed a look at the accretion process in X-ray binaries as is now possible, test current models to their limits, and force us to extend them. We now have the ability to do simultaneous ultraviolet/X-ray/optical spectroscopy with HST, Chandra, XMM, and ground-based observatories. The rich spectroscopy that these observations give us must be interpreted principally by reference to detailed models, the development of which is already well underway; tests of these essential interpretive tools are an important product of the proposed investigations.
Author
X Ray Binaries ; Mass Transfer

20020009112 Los Alamos National Lab. , NM USA
Estimation of Relativistic Accretion Disk Parameters from Iron Line Emission
Pariev, V. ; Bromley, B. ; Miller, W. ; Mar. 01, 2001 ; 31p ; In e
Report No.(s): DE2001-776173 ; LA-UR-01-1415 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche
The observed iron K(alpha) fluorescence lines in Seyfert 1 galaxies provide strong evidence for an accretion disk near a supermassive black hole as a source of the emission. Here we present an analysis of the geometrical and kinematic properties of the disk based on the extreme frequency shifts of a line profile as determined by measurable flux in both the red and blue wings. The edges of the line are insensitive to the distribution of the X-ray flux over the disk, and hence provide a robust alternative to profile fitting of disk parameters. Our approach yields new, strong bounds on the inclination angle of the disk and the location of the emitting region. We apply our method to interpret observational data from MCG-6-30-15 and find that the commonly assumed inclination 30 deg for the accretion disk in MCG-6-30-15 is inconsistent with the position of the blue edge of the line at a 3(sigma) level. A thick turbulent disk model or the presence of highly ionized iron may reconcile the bounds on inclination from the line edges with the full line profile fits based on simple, geometrically thin disk models. The bounds on the innermost radius of disk emission indicate that the black hole in MCG-6-30-15 is rotating faster than 30% of theoretical maximum. When applied to data from NGC 4151, our method gives bounds on the inclination angle of the X-ray emitting inner disk of 50 +/- 10 deg, consistent with the presence of an ionization cone grazing the disk as proposed by Pedlar et al. The frequency extrema analysis also provides limits to the innermost disk radius in another Seyfert 1 galaxy, NGC 3516, and is suggestive of a thick disk model.
NTIS
Accretion Disks ; Black Holes (Astronomy) ; Edges ; Kinematics ; Seyfert Galaxies ; X Ray Astronomy

20020009119 Lawrence Livermore National Lab. , Livermore, CA USA

Cosmic microwave background after MAXIMA and BOOMERANG

Richards, P. L. ; Dec. 01, 2000 ; 8p ; In English

Report No.(s): DE2001-775177 ; LBNL-47276 ; No Copyright ; Avail: Department of Energy Information Bridge

The first release of data from the MAXIMA and BOOMERANG experiments has introduced a new era of precision cosmology. The two data sets are essentially independent, consistent and complementary. In a joint effort by the two teams, the two data sets were combined and then used to test cosmological models and determine values of cosmological constants. These results are available because of the success of bolometric detection techniques. The experimental approach is described with references to the MAXIMA-1 experiment. Important new cosmological experiments at far infrared and millimeter wavelengths require major improvements in bolometric techniques. A new technology, the voltage-biased superconducting bolometer, promises to provide the required experimental power.

NTIS

Cosmology ; Astronomical Models ; Superconductivity ; Cosmic Microwave Background Radiation ; Radiation Measuring Instruments

20020009531 Communications Research Lab. , Tokyo, Japan

Radar Observations of Near Earth Asteroids 6489 Golevka and 4197 (1982 TA)

Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Yoshikawa, Makoto , Institute of Space and Astronautical Science , Japan ; Nakamura, Akiko M. , Kobe Univ. , Japan ; Hirabayashi, Hisahi , Institute of Space and Astronautical Science , Japan ; Okada, Tatsuaki , Institute of Space and Astronautical Science , Japan ; Abe, Masanao , Institute of Space and Astronautical Science , Japan ; Nishibori, Toshiyuki , National Space Development Agency , Japan ; Fuse, Tetsuharau , National Astronomical Observatory , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 143-150 ; In English ; Copyright ; Avail: Issuing Activity

Radar observations of two near-Earth asteroids were performed using a bi-static radar technique with Kashima 34-m antenna and Usuda 64-m antenna as receiving stations and Goldstone 70-m antenna as a transmitting station. The asteroid 6489 Golevka was observed on June 15, 1995 when its distance from the Earth became 0.048 AU and the radar echo from the asteroid was detected from the data observed with Kashima 34-m antenna. The success of the trans-continental bistatic radar observations became the first detection of a radar echo from a solar system object beyond Moon in Japan. The asteroid 4197 (1982 TA) was observed on October 24, 1996 when its distance to the Earth became 0.086 AU. The radar echo signal from the asteroid was detected from both of the data observed at Kashima and at Usuda. The received signal was coherently sampled and recorded at both stations. by using these data, interferometric data analysis was examined.

Author

Asteroids ; Observation ; Radar Tracking

20020009697 Brookhaven National Lab. , Upton, NY USA

Kaon condensation in neutron stars

Ramos, ; Schaffner-Bielich, ; Wambach, ; Apr. 24, 2001 ; 28p ; In English

Report No.(s): DE2001-781132 ; BNL-68240 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

We discuss the kaon-nucleon interaction and its consequences for the change of the properties of the kaon in the medium. The onset of kaon condensation in neutron stars under various scenarios as well its effects for neutron star properties are reviewed.

NTIS

Neutron Stars ; Kaon Production ; Nucleons

20020009698 Brookhaven National Lab. , Upton, NY USA

Strange dibaryons in neutron stars and in heavy-ion collisons

Schaffner-Bielich, ; Apr. 25, 2001 ; 8p ; In English

Report No.(s): DE2001-781131 ; BNL-68241 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The formation of dibaryons with strangeness are discussed for the interior of neutron stars and for central relativistic heavy-ion collisions. We derive limits for the properties of H-dibaryons from pulsar data. Signals for the formation of possible

bound states with hyperons at BNL's Relativistic Heavy-Ion Collider (RHIC) are investigated by studying their weak decay patterns and production rates.
NTIS
Neutron Stars ; Baryons ; Hyperons

20020009751 NASA Ames Research Center , Moffett Field, CA USA
Grain Properties of Comet C/1995 O1 (Hale-Bopp) Deduced Through Computational Techniques
Harker, David E. , NASA Ames Research Center , USA ; Wooden, Diane H. , Minnesota Univ. , USA ; Woodward, Charles E. , Minnesota Univ. , USA ; Lisse, Carey M. , Maryland Univ. , USA ; [2001] ; 1p ; In English
Contract(s)/Grant(s): RTOP 344-37-22-07 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

We present the computational analysis of the 7.6 - 13.2 micrometer infrared (IR) spectrophotometry (R approximately equal to 120) of comet C/1995 O1 (Hale-Bopp) in conjunction with concurrent observations which extend the spectral energy distribution from the near-infrared to far-infrared wavelengths. The observations include temporal epochs pre-perihelion, (1996 October UT and 1997 February UT), near perihelion (1997 April UT), and postperihelion (1997 June UT). Through the computational modeling of small amorphous carbon, and crystalline and amorphous silicate grains in Hale-Bopp's coma, we find that as the comet approached perihelion, the grain size distribution (the Hanner modified power law) steepened (N = 3.4 pre-perihelion, to N = 3.7 near and post-perihelion) along with an increase in the fractal porosity of larger (greater than 1 micrometer) grains. The peak of the grain size distribution remained constant (ap = 0.2 micrometer) at each epoch. We attribute the emergence of the 9.3 micrometer peak near perihelion to crystalline orthopyroxeno grains released from inside the nucleus. Crystalline silicates (olivine and orthopyroxene) make up about 30% (by mass) of the submicron sized (less than 1 micrometer) dust grains in Hale-Bopp's coma during each epoch.
Author
Hale-Bopp Comet ; Infrared Spectrophotometers ; Grain Size ; Amorphous Materials ; Analysis (Mathematics)

20020009766 Communications Research Lab. , Tokyo, Japan
Stellar Evolution and Water Maser Emission
Imai, Hiroshi , National Astronomical Observatory , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 31-40 ; In English ; Copyright ; Avail: Issuing Activity

Cosmic maser emission from water vapors has been observed at an early stage of birth and at the final stage of death in stellar evolution. We have observed such water masers using the Japanese domestic VLBI network for astronomy (J-Net) and revealed in detail the kinematics of water masers around protostars and evolved stars. The results of these observations are summarized as follows. (1) Systematic radial-velocity drifts of water maser features with time were found around the semiregular variable star RT Vir. This phenomenon, first discovered here, indicates acceleration motion of mass-loss flow around the star. (2) Rotation-infall motions around the protostar IRAS 16923-2422 were revealed on a solar-system scale with water masers. These motions indicate a dynamical infall of materials onto the protostar on a scale down to a few tens of AU. (3) A large number of proper motions of water maser features were measured in the massive-star forming region W51 North. The 3D kinematics of an outflow from W51 North was determined and the distance to W51 North was estimated directly as 6.7+2.1 kpc. (4) A study of high precision astrometry for maser sources was begun to advance stellar astrophysics. In this study, the phase-referencing technique by a fast antenna-switching method was applied to water masers around the supergiant star S Per and the continuum source KR 143. Although the accuracy of relative astrometry for the maser sources is limited to 1 mas at present, fringe-phase fluctuation due to the atmosphere can be compensated effectively in a relatively high frequency band of 22.2 GHz.
Author
Stellar Evolution ; Water Masers ; Emission ; Cosmic Rays

20020010896 NASA Ames Research Center , Moffett Field, CA USA
The FU Orionis Outburst as a Thermal Disk Accretion Event: Detailed Calculations and Comparison to Observations
Bell, K. R. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; Disks, Outflows and Star Formation Conference , 28 Nov. - 2 Dec. 1994 , Cozumel , Mexico ; Sponsored by Universidad Nacional Autonoma de Mexico , Mexico
Contract(s)/Grant(s): RTOP 399-20-10-12 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

FU Orionis outbursts are temporary large increases in luminosity: x(40-250) thought to occur repeatedly in all low mass young stellar systems. We discuss detailed calculations of viscous accretion disks suggesting that FU Ori events signify the existence of a protostellar disk transporting mass at a rate of (1-10) x 10(exp -6) Solar Mass/yr, in agreement with theoretical and observational estimates of molecular cloud core collapse rates. Accretion through the inner edge of disks subject to outburst is

self-regulated through the thermal ionization instability such that long periods (approximately 1000 yrs) of low mass flux: (1-10) x 10(exp -8) Solar Mass/yr, are punctuated by short periods (approximately 100 yrs) of high mass flux: (1-10) x 10(exp -5) Solar Mass/yr. The unstable region of the disk extends radially only to a distance of approximately 1/4 AU. Beyond this region matter is transported stably at the infall rate. In systems for which M = 1 Solar Mass, with an inner disk edge of 3 Solar Radius, the critical rate for outbursts is 5 x 10(exp -7) Solar Mass/yr independent of the magnitude of the viscous alpha parameter consistent with estimates of boundary layer mass flux in T Tauri stars. We use timescales of observed outbursts to constrain the magnitude of the alpha parameter to be 10(exp -4) where hydrogen is neutral and 10(exp -3) where ionized. Light curves of V1515 Cyg, FU Ori, and V1057 Cyg are reproduced; the latter two require application of a small perturbation in surface density to produce observed rapid rise times. Detailed reply is made to objections to the accretion disk model for outbursts. Comparison to observations are made of time dependent spectral energy distributions, colors, and line-width velocity evolution.
Author
Stellar Luminosity ; Accretion Disks ; Stellar Mass Accretion ; Stellar Mass ; Stellar Systems ; Pre-Main Sequence Stars

20020011012 NASA Ames Research Center , Moffett Field, CA USA
Turbulent Diffusion and Concentration of "Chondrules" in the Protoplanetary Nebula
Cuzzi, Jeffrey N. , NASA Ames Research Center , USA ; Dobrovolskis, Anthony R. , California Univ. , USA ; Hogan, Robert C. , Synernet Corp. , USA ; [1994] ; 2p ; In English , 31 Oct. - 4 Nov. 1994 , Washington, DC , USA
Contract(s)/Grant(s): RTOP 151-01-60-07 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Turbulence is known to possess structure on many scales. The largest or integral scale L is usually taken to be the largest relevant dimension of the system; for the nebula as a whole, it would be on the order of a vertical gas scale height H approximately 0.1R where R is the distance from the sun. Turbulent kinetic energy cascades towards smaller scales; for fully developed, homogeneous turbulence, the turbulent kinetic energy peaks at the integral scale and is distributed within its "inertial range" according to the Kolmogorov energy spectrum dE(k) = E(sub 0)(kL)(sup -5/3)dk where k is the wavenumber or inverse wavelength. The smallest scale in a turbulent regime is the Kolmogorov scale (n)(sometimes referred to as the inner scale). On this scale, molecular viscosity can dissipate turbulent kinetic energy . Turbulent flows are characterized by their Reynolds number Re = UL/v, where U is a characteristic velocity scale and v is molecular viscosity. More energetic (higher Re) flows drive turbulence to smaller Kolmogorov scales: n = LRe(sup -3/4). Two different turbulent regimes are likely to be of importance; early stage convective turbulence in a hot nebula probably extends over the entire nebula scale height, and probably has typical eddy frequency comparable to the orbit frequency. At a later stage, midplane shear layer turbulence can be driven by the presence of a differentially rotating, densely settled particle layer, with different length and time scales.
Author
Turbulent Diffusion ; Chondrule ; Protoplanets ; Nebulae ; Turbulent Flow

20020011214 Lawrence Livermore National Lab. , Livermore, CA USA
Temperature of Formation of Carbonate in Martian Meteorite ALH84001: Constraints from Cation Diffusion
Hutcheon, I. D. ; Kent, A. ; Phinney, D. L. ; Ryerson, F. J. ; Aug. 13, 1999 ; 4p ; In English
Report No.(s): DE2001-9657 ; UCRL-JC-133070 ; REPT-98-ERD-046 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

An important test of the hypothesis that Martian meteorite ALH84001 contains fossil remnants of an ancient Martian biota is the thermal history of the carbonate rosettes associated with the proposed biomarkers. If carbonates formed at temperatures over approximately 110 C (the limit for terrestrial life), it is unlikely that these minerals are associated with a terrestrial-like biota.
NTIS
Carbonates ; Diffusion ; SNC Meteorites ; Fossils

20020011605 NASA Ames Research Center , Moffett Field, CA USA
Vorticity and Wave Motion in a Compressible Protoplanetary Disk
Davis, Sanford S. , NASA Ames Research Center , USA ; [2001] ; 26p ; In English
Contract(s)/Grant(s): RTOP 274-52-00-50 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

The impact of an isolated vortex in a compressible Keplerian disk is examined using higher order numerical solutions of the Euler and entropy-conserving Energy equations. The vortex is stretched by the background shear flow with longer lasting anticyclonic vortices persisting for about 10 vortex revolutions. Simultaneously, the vortex emits transient radial waves consisting mainly of axisymmetrical weak shock waves and a slower, nonaxisymmetric Rossby wave. These waves may contribute to certain

transient events in protoplanetary disks. The vortex stretching and waves were found to have little long-term feedback on the baseline 'standard solar nebula' disk structure and confirm the extremely stable structure of non self-gravitating disks.
Author
Computerized Simulation ; Protoplanetary Disks ; Vortices ; Vorticity ; Equilibrium Flow

20020011606 Smithsonian Astrophysical Observatory , Cambridge, MA USA
The NASA Education Forum at SAO on the Structure and Evolution of the Universe ***Annual Report , 15 Jan. 2001 - 14 Jan. 2002***
Gould, Roy , Smithsonian Astrophysical Observatory , USA ; November 2001 ; 14p ; In English
Contract(s)/Grant(s): NCC5-261 ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche
During the past year the SEU Forum has made significant progress on a number of fronts: (1) the Forum has brought several large education projects close to completion; (2) we have greatly expanded our relationship with the SEU missions and programs; and (3) we have started a significant program to better involve space scientists in education and outreach activities. Among our accomplishments for the past year: (1) completed planning and design for Cosmic Questions, a national traveling exhibition on SEU themes; (2) launched the informal Science Education Resource Directory; (3) Coordinating with the SEU and Origins missions; and (4) promoted scientist-educator partnerships.
Derived from text
Cosmology ; Education ; Public Relations

20020011680 California Inst. of Tech. , Lindhurst Lab. of Experimental Geophysics , Pasadena, CA USA
Impact Cratering Calculations ***Final Report , 1 Oct. 1999 - 30 Sep. 2000***
Ahrens, Thomas J. , California Inst. of Tech. , USA ; Dec. 17, 2001 ; 4p ; In English
Contract(s)/Grant(s): NAG5-8915
Report No.(s): CIT-TJA.00005-1-NASA.000026 ; No Copyright ; Avail: CASI ; A01 , Hardcopy ; A01 , Microfiche
We examined the von Mises and Mohr-Coulomb strength models with and without damage effects and developed a model for dilatancy. The models and results are given in O'Keefe et al. We found that by incorporating damage into the models that we could in a single integrated impact calculation, starting with the bolide in the atmosphere produce final crater profiles having the major features found in the field measurements. These features included a central uplift, an inner ring, circular terracing and faulting. This was accomplished with undamaged surface strengths of approximately 0.1 GPa and at depth strengths of approximately 1.0 GPa. We modeled the damage in geologic materials using a phenomenological approach, which coupled the Johnson-Cook damage model with the CTH code geologic strength model. The objective here was not to determine the distribution of fragment sizes, but rather to determine the effect of brecciated and comminuted material on the crater evolution, fault production, ejecta distribution, and final crater morphology.
Author
Meteorite Craters ; Meteoritic Damage ; Geomorphology ; Models ; Breccia ; Ejecta

20020011723 Stanford Linear Accelerator Center , Menlo Park, CA USA
Generalized Uncertainty Principle and Black Hole Remnants
Chen, P. ; Jun. 01, 2001 ; 11p ; In English
Report No.(s): DE2001-784935 ; SLAC-PUB-8853 ; No Copyright ; Avail: Department of Energy Information Bridge
In the current standard viewpoint small black holes are believed to emit black body radiation at the Hawking temperature, at least until they approach Plan size, after which their fate is open to conjecture. A cogent argument against the existence of remnants is that, since no evident quantum number prevents it, black holes should radiate completely away to photons and other ordinary stable particles and vacuum, like any unstable quantum system. Here we argue the contrary, that the generalized uncertainty principle may prevent their total evaporation in exactly the same way that the uncertainty principle prevents the hydrogen atom from total collapse: the collapse is prevented, not by symmetry, but by dynamics, as a minimum size and mass are approached.
NTIS
Black Body Radiation ; Black Holes (Astronomy) ; Binary Stars ; Quantum Mechanics ; Protons

20020012215 Colorado Univ. , USA
Chromospheric Structure and Wind Acceleration in Zeta Aur Stars ***Final Report***
Bennett, Philip D. , Colorado Univ. , USA ; Nov. 07, 2001 ; 1p ; In English
Contract(s)/Grant(s): NAG5-6901 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

This NASA grant supported an analysis of the variability of the wind of the supergiant primary star (K4 Ib) in the eclipsing binary Zeta Aurigae (Zeta Aur). In the ultraviolet, the main-sequence companion star (B5 V) dominates the observed flux, and therefore serves as a convenient probe of the cool supergiant's wind. This study utilized the extensive set of (100+) ultraviolet spectroscopic observations obtained with the International Ultraviolet Explorer (IUE) satellite over its operational lifetime of 1978-1995. Although the resolution of IUE is limited (about 25 km/s), it is adequate to resolve variability in the wind features in Zeta Aur's ultraviolet spectrum, which are blueshifted 70 km/s from line center. Our analysis used the tau-v technique of Cardelli and Savage, which makes full use of the available line profile information. We find that the wind column densities vary by up to an order of magnitude over time. These results are being written up for submission to the Astrophysical Journal as the third paper of a series on the chromosphere and wind of Zeta Aurigae. The first two papers report on the construction of mean chromosphere and wind models respectively, based on HST/GHRS observations and funded by STScI. The third paper - this research - reports on variability of the Zeta Aur wind as determined from our analysis of the long IUE time series. This paper will be completed within the next three months; the delay in publication was to allow the completion of Papers 1 and 2, which logically precede the present work. Therefore, an additional no-cost extension was requested in order to ensure budgeted funds remain available for publication of this work. Unfortunately, this request was denied, and so I am forced to write this final report before publication of Paper 3. Regardless, this paper will be submitted for publication within the next three months.
Author
Chromosphere ; Zeta Aurigae Star ; Supergiant Stars ; Variability ; Stellar Structure ; Stellar Winds

20020012330 Stanford Linear Accelerator Center , Menlo Park, CA USA
Standard Model Parameters and the Cosmological Constant
Bjorken, J. ; Mar. 30, 2001 ; 9p ; In English
Report No.(s): DE2001-784897 ; SLAC-PUB-8794 ; No Copyright ; Avail: Department of Energy Information Bridge
Simple functional relations amongst standard model couplings, including gravitational, are conjectured. Possible implications for cosmology and future theory are discussed.
NTIS
Cosmology ; Standards ; Models ; Constants

20020012335 Stanford Linear Accelerator Center , Menlo Park, CA USA
Observational Evidence for Two Cosmological Predictions Made by Bit-String Physics
Noyes, H. P. ; Mar. 16, 2001 ; 16p ; In English
Report No.(s): DE2001-784886 ; SLAC-PUB-8779 ; No Copyright ; Avail: Department of Energy Information Bridge
This research program has a long history, starting with the discovery of the combinatorial hierarchy by A.F. Parker-Rhodes in 1961, but has not attracted much attention in the mainstream literature. One difficulty, according to several of our critics, is that although BSP has produced approximate values for well known physical parameters it has not led to quantitative predictions prior to observation. Here we meet this difficulty in an unexpected manner by showing that recent cosmological observations support two predictions made about a decade ago when there was no available way to compare them with observation.
NTIS
Models ; Cosmology ; Combinatorial Analysis ; Strings

20020012425 Smithsonian Astrophysical Observatory , Cambridge, MA USA
Solar-System Tests of Gravitational Theories ***Annual Report , 1 Jan. - 31 Dec. 2001***
Shapiro, Irwin I. , Smithsonian Astrophysical Observatory , USA ; November 2001 ; 2p ; In English
Contract(s)/Grant(s): NAG5-6832 ; No Copyright ; Avail: Issuing Activity ; Abstract Only
We are engaged in testing gravitational theory, primarily using observations of objects in the solar system and primarily on that scale. Our goal is either to detect departures from the standard model (general relativity) - if any exist within the level of sensitivity of our data - or to place tighter bounds on such departures. For this project, we have analyzed a combination of observational data with our model of the solar system, including mostly planetary radar ranging, lunar laser ranging, and spacecraft tracking, but also including both pulsar timing and pulsar very long base interferometry (VLBI) measurements. This year, we have extended our model of Earth nutation with adjustable correction terms at the principal frequencies. We also refined our model of tidal drag on the Moon's orbit. We believe these changes will make no substantial changes in the results, but we are now repeating the analysis of the whole set of data to verify that belief. Additional information is contained in the original extended abstract.
Author
Relativity ; Orbit Perturbation ; Gravitation Theory ; Laser Ranging

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20020005974 Communications Research Lab. , Japan
Observations of Short Term Variation of Jovian Synchrotron Radiation
Miyoshi, Yoshizumi , Communications Research Lab. , Japan ; Misawa, Hiroaki , Communications Research Lab. , Japan ; Morioka, Akira , Communications Research Lab. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 169-177 ; In Japanese ; Copyright ; Avail: Issuing Activity

The detailed observation of Jovian decimetric radiation (DIM) from relativistic electrons in the Jovian radiation belt has been carried out using the Kashima 34-m antenna to seek the existence of its short-term variation. In the observation, the terrestrial atmospheric extinction effect was corrected using the sky-tipping method. Moreover, the background confusion, which was the serious problem of the past observations, was also evaluated. As a result, the DIM flux enhancement having lasting a few days in November 1996 was identified. The data also showed the changes of the magnetic latitude beaming curves during the flux enhancement. These results showed that the relativistic electrons in the Jovian radiation belt, which had been thought to be stable, have short-term variations.
Author
Observation ; Short Wave Radiation ; Atmospheric Effects ; Planetary Magnetospheres ; Radiation Belts

20020006066 NASA Ames Research Center , Moffett Field, CA USA
Escape, Impacts, and Volatile Budgets
Zahnle, K. J. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; 1994 America Geophysical Union Meeting , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The atmospheres of the terrestrial planets and satellites are generally quite thin, much thinner than might be expected given their relatively high abundances of geochemical volatiles and popular estimates of the available mass of volatile-rich impactors. In some cases a specific deficiency (e.g., water on Venus) implies a specific loss process (a runaway greenhouse effect that promoted irreversible hydrogen escape; same planet). But more generally the absence of atmophiles is broadbased and so argues for broad-based volatile loss. This talk will address the hypothesis that extant planetary atmospheres represent the small residue left between relatively large rates of supply and escape.
Author
Geochemistry ; Greenhouse Effect ; Hydrogen ; Impactors ; Planetary Atmospheres

20020006327 NASA Ames Research Center , Moffett Field, CA USA
Planetary Ringmoon Systems
Cuzzi, J. N. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English , 7 Jun. 1994 , Pasadena, CA , USA ; Sponsored by Jet Propulsion Lab., California Inst. of Tech. , USA
Contract(s)/Grant(s): RTOP 151-01-60-07 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The last decade has seen an avalanche of observations of planetary ring systems, both from spacecraft and from Earth. Much of the structure revealed was thoroughly puzzling and fired the imagination of workers in a variety of disciplines. Consequently, we have also seen steady progress in our understanding of these systems as our intuitions (and our computers) catch up with the myriad ways in which gravity, fluid and statistical mechanics, and electromagnetism can combine to shape the distribution of the submicron to-several-meter size particles which comprise ring systems (refs 1-5). The now-complete reconnaissance of the gas giant planets by spacecraft has revealed that ring systems and families of regular satellites are invariably found together, and there is an emerging perspective that they are not only physically but causally linked. There is also mounting evidence that many features or aspects of all planetary ring systems, if not the ring systems themselves, are considerably younger than the solar system.
Author
Planetary Rings ; Earth (Planet) ; Solar System ; Gas Giant Planets ; Electromagnetism

20020006935 NASA Ames Research Center , Moffett Field, CA USA

Light-Hydrocarbon Bearing Solids on Planetesimal 5145 Pholus

Cruikshank, Dale P. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; International Conference on Dust, Molecules and Backgrounds: From Lab. to Space , 12-15 Sep. 1994 , Capri , Italy

Contract(s)/Grant(s): RTOP 196-41-67-03 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Object 5145 Pholus (=1992 AD) is a planetesimal in an orbit that crosses those of Saturn, Uranus, and Neptune (period 92.7 years). It is particularly notable because of its extreme red color, corroborated by several observing teams. A spectrum of Pholus obtained in 1992 shows a strong absorption band with a characteristic shape at 2.27 micrometers, plus a weaker band at 1.7 micrometers. A better spectrum of the 2.0-2.5 micrometer region in 1993 confirms the position and shape of the 2.27-micrometer band. The color and spectral bands are identified with the aliphatic-rich and high H/C organic solid called asphaltite, which in a terrestrial setting originates from thermal processing of products of biological activity. In Pholus, this material is attributed to formation from radiation processing of ices on grains in the interstellar medium. Laboratory spectra of asphaltite and related materials have been published by Moroz et al., while Cloutis showed similar bands in comparable materials and identified them as the overtone and combination bands of C-H stretching and bending modes in CH2 and CH3 groups. Asphaltites, kerites, and anthraxolites are solid non-graphite members of a sequence ranging from oil to graphite; diffuse reflectance spectra of suites of these intermediate materials show color characteristics similar to those of the low-albedo asteroids (C,P,D), although specific identifications have not been made because of the lack of distinct absorption bands in the spectra of most low-albedo solar system bodies. In the case of Pholus, however, the primary band is strong; its wavelength and its shape, plus the match of the extremely red color, leads us to the identification of aliphatic-rich, asphaltite-like organic solid. The C, P, and D-type asteroids vary in degree of ”redness”, but are all less red than Pholus. Pholus and the Ctype asteroids are the end members of a sequence that represents the radiation processing of hydrocarbons, with Pholus being the least processed. Solar irradiation processes and heating reduce the H/C and aliphatic content of hydrocarbons preserved from the interstellar medium, and in the end produce opaque solids of neutral reflectance, including the kerogens (similar to anthraxolites) found in profusion in the carbonaceous meteorites.

Author

Protoplanets ; Color ; Spectral Bands ; Absorption Spectra

20020009536 Communications Research Lab. , Tokyo, Japan

Observations of Short Term Variation of Jovian Synchrotron Radiation

Miyoshi, Yoshizumi , Tohoku Univ. , Japan ; Misawa, Hiroaki , Tohoku Univ. , Japan ; Morioka, Akira , Tohoku Univ. , Japan ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Koyama, Yasuhiro , Communications Research Lab. , Japan ; Nakajima, Junichi , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 165-172 ; In English ; Copyright ; Avail: Issuing Activity

We have made detailed observations of Jovian decimetric radiation (DIM) from relativistic electrons in the Jovian radiation belt by using the Kashima 34 in antenna to seek the existence of DIM short-term variations. In these observations, the sky tipping method was used to correct the terrestrial atmospheric extinction effect. We also evaluated the background radio sources noise, which has caused serious problems in previous observations. As a result we showed for the first time that the Jovian synchrotron radiation has variations in intensity over a period of a few days. We then developed a model of Jovian synchrotron radiation based on the empirical models of Jovian magnetic field and the distribution of particles in the Jovian radiation belt derived from direct measurements made by past spacecraft. by comparing this model with the results of observations, we clarified that when the Jovian synchrotron radiation intensity is increasing, the spatial distribution of electrons in the Jovian radiation belt changes in such a way that the electrons concentrate at Jupiter’s magnetic equatorial plane. Next, we developed and numerically tested a computer code relating to the transport of particles in the Jovian radiation belt. We showed that the observed flux increase of Jovian synchrotron radiation for a few days can be explained by a scenario in which the radial diffusion coefficient of electrons in the radiation belt increases. Furthermore, we performed a comparative analysis with the solar F10.7 observed on the earth during the same period, and we showed the possibility that this increase in the radial diffusion coefficient arises from heating of the Jovian ionosphere by solar UV/EUV radiation during the observation period.

Author

Radiation Belts ; Atmospheric Effects ; Extreme Ultraviolet Radiation ; High Energy Electrons ; Jupiter Atmosphere ; Planetary Magnetospheres

20020011219 Argonne National Lab. , IL USA

Mars to orbit with pumped hydrazine

Whitehead, J. C. ; Apr. 27, 1999 ; 13p ; In English

Report No.(s): DE2001-9665 ; UCRL-JC-132328 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A propulsion point design is presented for lifting geological samples from Mars. Vehicle complexity is kept low by choosing a monopropellant single stage. Little new development is needed, as miniature pump fed hydrazine has been demonstrated. Loading the propellant just prior to operation avoids structural, thermal, and safety constraints otherwise imposed by earlier mission phases. Hardware mass and engineering effort are thereby diminished. The Mars liftoff mass is 7/8 hydrazine, less than 5% propulsion hardware, and greater than 3% each for the payload and guidance.

NTIS

Propulsion System Configurations ; Mars Sample Return Missions

20020011361 Lawrence Livermore National Lab. , Livermore, CA USA

Precision flyer initiator

Frank, A. ; Apr. 19, 1999 ; 10p ; In English

Report No.(s): DE2001-9664 ; UCRL-JC-132115 ; DP0102032 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

A propulsion point design is presented for lifting geological samples from Mars. Vehicle complexity is kept low by choosing a monopropellant single stage. Little new development is needed, as miniature pump fed hydrazine has been demonstrated. Loading the propellant just prior to operation avoids structural, thermal, and safety constraints otherwise imposed by earlier mission phases. hardware mass and engineering effort are thereby diminished. The Mars liftoff mass is 7/8 hydrazine, 5% propulsion hardware, and 3% each for the payload and guidance.

NTIS

Propulsion System Configurations ; Mars Sample Return Missions

20020012349 NASA Ames Research Center , Moffett Field, CA USA

The Mineralogy of Martian Dust: Design and Analysis Considerations for an X-Ray Diffraction/X-Ray Fluorescence (XRD/XRF) Instrument for Exobiological Studies

Blake, David , NASA Ames Research Center , USA ; Vaniman, David , Los Alamos National Lab. , USA ; Bish, David , Los Alamos National Lab. , USA ; [1994} ; 1p ; In English ; Mars Surveyor Science Objectives/Measurement Requirements Workshop , 10-12 May 1994 , Pasadena, CA , USA

Contract(s)/Grant(s): RTOP 307-57-42-25 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

A principal objective of Mars exploration is the search for evidence of past life which may have existed during an earlier clement period of Mars history. We would like to investigate the history of surface water activity (which is a requirement for all known forms of life) by identifying and documenting the distribution of minerals which require water for their formation or distribution. A knowledge of the mineralogy of the present Martian surface would help to identify areas which, due to the early activity of water, might have harbored ancient life. It would be desirable to establish the presence and characterize the distribution of hydrated minerals such as clays, and of minerals which are primarily of sedimentary origin such as carbonates, silica and evaporites. Mineralogy, which is more critical to exobiological exploration than is simple chemical analysis (absent the detection of organics), will remain unknown or will at best be imprecisely constrained unless a technique sensitive to mineral structure such as powder X-ray diffraction (XRD) is employed. Additional information is contained in the original extended abstract.

Author

Exobiology ; Mars (Planet) ; Mars Surface ; Mineralogy ; X Ray Diffraction ; X Ray Fluorescence ; Spacecraft Instruments

20020012431 NASA Glenn Research Center , Cleveland, OH USA

”Real World” Connections Through Videoconferences

Kolecki, Joseph , NASA Glenn Research Center , USA ; Petersen, Ruth , Integral Systems, Inc. , USA ; November 2001 ; 60p ; In English ; Japan 2001 Science, Creativity and the Young Mind Workshop , 22-30 Jul. 2001 , Bristol , UK ; Sponsored by Asahi , Japan

Contract(s)/Grant(s): RTOP 332-41-00

Report No.(s): NASA/TM-2001-211300 ; NAS 1.15:211300 ; E-13104 ; No Copyright ; Avail: CASI ; A04 , Hardcopy ; A01 , Microfiche

During the week of July 23, 2001, a workshop called ’Japan 2001 Science, Creativity and the Young Mind’ took place at Bristol University in Bristol, England. Coordinated under the direction of Dr. Eric Albone, Clifton Scientific Trust, it brought

together 60 British and Japanese students and provided them with a forum for learning and interacting. We at the NASA Glenn Research Center (GRC) in Cleveland, Ohio, had the good fortune to participate with six of those students and their team leaders in a Space Science Workshop. The Space Science Team was led by two Bristol University people from the Earth Sciences Department - Carsten Riedel and Stuart Stansfield - under the direction of Professor Steve Sparks, FRS. The Team was assisted by Lawrence Williams, Director of Studies, Holy Cross School, UK. Funding was provided by the Daiwa Anglo-Japanese Foundation, the Great Britain SASakawa Foundation, and Japan 2001. This report is a compilation of correspondence via e-mail that took place before, during, and immediately after the workshop. A final report from the students on their findings is now in production and will be made available from Clifton Scientific Trust.
Author
Teleconferencing ; Video Communication ; Mars (Planet)

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20020006321 NASA Marshall Space Flight Center , Huntsville, AL USA
Exploration of Solar Wind Acceleration Region Using Interplanetary Scintillation of Water Vapor Maser Source and Quasars
Tokumaru, Munetoshi , Communications Research Lab. , Japan ; Yamauchi, Yohei , NASA Marshall Space Flight Center , USA ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 179-201 ; In Japanese ; Copyright ; Avail: Issuing Activity

Single-station observations of interplanetary scintillation UPS) at three microwave frequencies 2, 8, and 22GHz, were carried out between 1989 and 1998 using a large (34-micro farad) radio telescope at the Kashima Space Research Center of the Communications Research Laboratory. The aim of these observations was to explore the near-sun solar wind, which is the key region for the study of the solar wind acceleration mechanism. Strong quasars, 3C279 and 3C273B, were used for the Kashima IPS observations at 2 and 8GHz, and a water-vapor maser source, IRC20431, was used for the IPS observations at 22GHz. Solar wind speeds derived from Kashima IPS data suggest that the solar wind acceleration takes place at radial distances between 10 and 30 solar radii (Rs) from the sun. The properties of the turbulence spectrum (e.g. anisotropy, spectral index, inner scale) inferred from the Kashima data were found to change systematically in the solar wind acceleration region. While the solar wind in the maximum phase appears to be dominated by the slow wind, fast and rarefied winds associated with the coronal holes were found to develop significantly at high latitudes as the solar activity declined. Nevertheless, the Kashima data suggests that the location of the acceleration region is stable throughout the solar cycle.
Author
Solar Wind ; Interplanetary Space ; Microwave Frequencies ; Solar Activity ; Water Masers

20020008318 NASA Ames Research Center , Moffett Field, CA USA
An Approximate Solution for the Circumsolar Flow Field of a Sun Moving Through the Local Interstellar Medium (LISM)
Ratkiewicz, Romana E. , NASA Ames Research Center , USA ; Scherer, Klaus , University of Southern California , USA ; Fahr, Hans J. , Bonn Univ. , Germany ; [1994] ; 1p ; In English ; 1994 Fall American Geophysical Union Meeting , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA
Report No.(s): AGU-001402749 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

The solar system is in relative motion with respect to the ambient interstellar medium. The supersonic solar wind is expected to pass through the termination shock, thus the solar wind plasma eventually has to enter into an asymptotic outflow geometry appropriately adopted to this counterflow situation. Many attempts have been done to simulate the interaction between the solar wind and the LISM numerically. In this paper we generalize a Parker type analytical solution of the counterflow. The idea is to introduce a special kind of compressibility of the solar wind flow. With the assumption that only a transversal component of the density gradient normal to the flow lines exists we are able to calculate a full set of hydrodynamical quantities describing the circumsolar flow field of a Sun moving through the LISM. The equations governing the velocity and density fields lead to analytical solutions which can be taken as good approximations to the more general case of compressible plasma flows.
Author
Approximation ; Flow Distribution ; Solar Wind ; Interstellar Matter ; Plasma Interactions

20020008675 Los Alamos National Lab. , NM USA

High latitude Ulysses observations of the H/He intensity ratio under solar minimum and solar maximum conditions

Gosling, J. ; Lario, D. ; Mar. 01, 2001 ; 7p ; In English

Report No.(s): DE2001-776689 ; LA-UR-01-1698 ; No Copyright ; Avail: Department of Energy Information Bridge

We analyze measurements of the 0.5-1.0 MeV/nucleon H/He intensity ratio from the Ulysses spacecraft during its first (1992-94) and second (1999-2000) ascent to southern high latitude regions of the heliosphere. These cover a broad range of heliocentric distances (from 5.2 to 2.0 AU) and out-of-ecliptic latitudes (from 18(degree)S to 80(degree)S). During Ulysses' first southern pass, the HI-SCALE instrument measured a series of enhanced particle fluxes associated with the passage of a recurrent corotating interaction region (CIR). Low values ((approximately)6) of the H/He ratio were observed in these recurrent corotating events, with a clear minimum following the passage of the corotating reverse shock. When Ulysses reached high southern latitudes (greater than (degree)S), the H/He ratio always remained below (approximately)10 except during two transient solar events that brought the ratio to high (greater than 20) values. Ulysses' second southern pass was characterized by a higher average value of the H/He ratio. No recurrent pattern was observed in the energetic ion intensity which was dominated by the occurrence of transient events of solar origin. Numerous CIRs, many of which were bounded by forward and reverse shock pairs, were still observed in the solar wind and magnetic field data. The arrival of those CIRs at Ulysses did not always result in a decrease of the H/He ratio; on the contrary, many CIRs showed a higher H/He ratio than some transient events. Within a CIR, however, the H/He ratio usually increased around the forward shock and decreased towards the reverse shock. Throughout the second ascent to southern heliolatitudes, the H/He ratio seldom decreased below (approximately)10 even at high latitudes (greater than 40(degree)S). We interpret these higher values of the H/He ratio in terms of the increasing level of solar activity together with the poor definition and short life that corotating solar wind structures have under solar maximum conditions. The global filling of the heliosphere by transient solar events and the fact that in 1999-2000 Ulysses observed only intermediate (less than 650 km/s) solar wind speed (whose contents in pick-up He is less energetic than in the fast solar wind streams observed in 1992-1994) favored the protons with respect to alpha particles. Hence the fact that the average values of the H/He ratio observed by Ulysses during the rising phase of the solar cycle (1999-2000) were higher than those observed during the declining phase (1992-1994).

NTIS

Solar Activity ; Ulysses Mission ; Hydrogen ; Helium ; Solar Activity Effects

20020010112 Smithsonian Astrophysical Observatory , Cambridge, MA USA

Properties of Minor Ions in the Solar Wind and Implications for the Background Solar Wind Plasma ***Final Report , 1 Mar. 1998 - 31 Aug. 2001***

Esser, Ruth , Smithsonian Astrophysical Observatory , USA ; November 2001 ; 7p ; In English ; Original contains color illustrations

Contract(s)/Grant(s): NAG5-7055 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

Ion charge states measured in situ in interplanetary space carry information on the properties of the solar wind plasma in the inner corona where these ion charge states are formed. The goal of the proposed research was to determine solar wind models and coronal observations that are necessary tools for the interpretation of the ion charge state observations made in situ in the solar wind.

Author

Solar Wind ; Plasma Interactions ; Ion Charge ; Ions

20020010155 NASA Ames Research Center , Moffett Field, CA USA

Aerosol Optical Depth Determinations for BOREAS

Wrigley, R. C. , NASA Ames Research Center , USA ; Livingston, J. M. , NASA Ames Research Center , USA ; Russell, P. B. , NASA Ames Research Center , USA ; Guzman, R. P. , NASA Ames Research Center , USA ; Ried, D. , NASA Ames Research Center , USA ; Lobitz, B. , NASA Ames Research Center , USA ; [1994] ; 1p ; In English ; American Geological Union Fall Meeting , 5-9 Dec. 1994 , San Francisco, CA , USA ; Sponsored by American Geophysical Union , USA

Contract(s)/Grant(s): RTOP 462-33-05 ; No Copyright ; Avail: Issuing Activity ; Abstract Only

Automated tracking sun photometers were deployed by NASA/Ames Research Center aboard the NASA C-130 aircraft and at a ground site for all three Intensive Field Campaigns (IFCs) of the Boreal Ecosystem-Atmosphere Study (BOREAS) in central SASkatchewan, Canada during the summer of 1994. The sun photometer data were used to derive aerosol optical depths for the total atmospheric column above each instrument. The airborne tracking sun photometer obtained data in both the southern and northern study areas at the surface prior to takeoff, along low altitude runs near the ground tracking sun photometer, during ascents to 6-8 km msl, along remote sensing flightlines at altitude, during descents to the surface, and at the surface after landing. The ground sun photometer obtained data from the shore of Candle Lake in the southern area for all cloud-free times. During the first

IFC in May-June ascents and descents of the airborne tracking sun photometer indicated the aerosol optical depths decreased steadily from the surface to 3.5 kni where they leveled out at approximately 0.05 (at 525 nm), well below levels caused by the eruption of Mt. Pinatubo. On a very clear day, May 31st, surface optical depths measured by either the airborne or ground sun photometers approached those levels (0.06-0.08 at 525 nm), but surface optical depths were often several times higher. On June 4th they increased from 0.12 in the morning to 0.20 in the afternoon with some evidence of brief episodes of pollen bursts. During the second IFC surface aerosol optical depths were variable in the extreme due to smoke from western forest fires. On July 20th the aerosol optical depth at 525 nm decreased from 0.5 in the morning to 0.2 in the afternoon; they decreased still further the next day to 0.05 and remained consistently low throughout the day to provide excellent conditions for several remote sensing missions flown that day. Smoke was heavy for the early morning of July 24th but cleared partially by 10:30 local time and cleared fully by 11:30. Heavy smoke characterized the rest of the IFC in both study areas.
Author
Aerosols ; Optical Thickness ; SASkatchewan ; Remote Sensing

20020011026 NASA Marshall Space Flight Center , Huntsville, AL USA
Exploration of Solar Wind Acceleration Region Using Interplanetary Scintillation of Water Vapor Maser Source and Quasars
Tokumaru, Munetoshi , Nagoya Univ. , Japan ; Yamauchi, Yohei , NASA Marshall Space Flight Center , USA ; Kondo, Tetsuro , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 173-195 ; In English ; Copyright ; Avail: Issuing Activity ; Available from CASI only as part of the entire parent document

Single-station observations of interplanetary scintillation (IPS) at three microwave frequencies; 2 GHz, 8 GHz and 22 GHz have been carried out between 1989 and 1998 using a large (34 m farad) radio telescope at the Kashima Space Research Center of the Communications Research Laboratory. The aim of these observations is to explore the near-sun solar wind, which is the key region for the study of the solar wind acceleration mechanism. Strong quasars; 3C279 and 3C273B were used for Kashima IPS observations at 2 GHz and 8 GHz, and a water vapor maser source, IRC20431 was used for the IPS observations at 22 GHz. Solar wind velocities derived from Kashima IPS data suggest that the solar wind acceleration takes place at radial distances between 10 and 30 solar radii (R(sub s)) from the sun. Properties of the turbulence spectrum (e.g. anisotropy, spectral index, inner scale) inferred from Kashima data are found to change systematically in the solar wind acceleration region. While the solar wind in the maximum phase appears to be dominated by the slow wind, fast and rarefied winds associated with coronal holes are found to develop significantly at high latitudes as the solar activity declines. Nevertheless, Kashima data suggests that the location of the acceleration region is stable throughout the solar cycle.
Author
Solar Wind ; Acceleration Measurement ; Water Vapor ; Masers ; Quasars ; Coronal Holes ; Interplanetary Space ; Wind Velocity

20020012279 Smithsonian Astrophysical Observatory , Cambridge, MA USA
SOHO Ultraviolet Coronagraph Spectrometer (UVCS) Mission Operations and Data Analysis ***Final Report , 1 Dec. 2000 - 30 Nov. 2001***
Kohl, John L. , Smithsonian Astrophysical Observatory , USA ; December 2001 ; 8p ; In English
Contract(s)/Grant(s): NAG5-10093 ; No Copyright ; Avail: CASI ; A02 , Hardcopy ; A01 , Microfiche

The scientific goal of Ultraviolet Coronagraph Spectrometer (UVCS) is to obtain detailed empirical descriptions of the extended solar corona as it evolves through the solar activity cycle and to use those descriptions to identify and understand the physical processes responsible for coronal heating, solar wind acceleration, coronal mass ejections (CMEs), and the phenomena that establish the plasma properties of the solar wind as measured by 'in situ' solar wind instruments. The UVCS on the Solar and Heliospheric Observatory (SOHO) has made major advances in identifying the physical processes responsible for solar wind acceleration, and it has made the first high resolution ultraviolet spectroscopic measurements of CMEs. The UVCS has resulted in over 220 scientific publications.
Author
Solar Corona ; Solar Wind ; Stellar Mass Ejection ; In Situ Measurement ; Coronal Holes ; Ultraviolet Spectrometers

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20020006317 Communications Research Lab. , Japan
Millisecond Pulsar Timing Observations at CRL
Hanado, Yuko , Communications Research Lab. , Japan ; Shibuya, Yasuhisa , Communications Research Lab. , Japan ; Hosokawa, Mizuhiko , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Imae, Michito , Communications Research Lab. , Japan ; Review of the Communications Research Laboratory ; March 2001 ; ISSN 0914-9279 ; Volume 47 , No. 1 , pp. 137-144 ; In Japanese ; Copyright ; Avail: Issuing Activity

Millisecond pulsars are attractive for use as future reference clocks because of their highly stable pulse timing. Communications Research Laboratory (CRL) aims to apply millisecond pulsars to the construction of a new time scale, and has developed a millisecond pulsar observation system using the 34-m antenna at Kashima Space Research Center. This system uses an acousto-optic spectrometer (AOS) for wide-band observation and a special digital processor for the numerous pulse integration tasks in real-time. Using this system, we started in November 1997 weekly observations of PSR1937+21 using the 34-m antenna in the S-band. The residuals of pulse phases over two years show some drift, and more precise timing analysis is required. Current observation precision is 2.9 microns for oneday's observation, which shows that the 34-m antenna's performance is sufficient for the highly precise timing measurement for the quite weak pulse signals of millisecond pulsars.
Author
Acousto-Optics ; Clocks ; Construction ; Digital Systems ; Pulsars ; Real Time Operation ; Time Measurement

20020009537 Communications Research Lab. , Tokyo, Japan
Millisecond Pulsar Timing Observations at CRL
Hanado, Yuko , Communications Research Lab. , Japan ; Shibuya, Yasuhisa , Communications Research Lab. , Japan ; Hosokawa, Mizuhiko , Communications Research Lab. , Japan ; Sekido, Mamoru , Communications Research Lab. , Japan ; Imae, Michito , Communications Research Lab. , Japan ; Journal of the Communications Research Laboratory. Special Issue: Large Aperture Radio Telescopes at Kashima Space Research Center ; March 2001 ; ISSN 0914-9260 ; Volume 48 , No. 1 , pp. 135-142 ; In English ; Copyright ; Avail: Issuing Activity

Millisecond pulsars are attractive as future reference clocks, because of their highly stable pulse timing. Communications Research Laboratory (CRL) aims to apply millisecond pulsars to the construction of a new time scale, and have developed a millisecond pulsar observation system using the 34 in antenna at Kashima Space Research Center. Since the 34 in antenna is rather small for the receiving of weak signals from millisecond pulsars, we had to develop a highly sensitive observation system. This system is equipped with an acousto-optic spectrometer (AOS) for wide-band observations, and a special digital processor for performing numerous pulse integrations in real time. Using this system, we have started weekly observation of PSR1937+21 at the 34 m antenna in S-band since November 1997. The residuals of pulse phases for two years show some drift, and more precise timing analysis is required. Current observation precision is 2.9 microns for one day's observation, which shows that the 34 in antenna's performance is enough for the highly precise timing measurement of the weak pulse signals from millisecond pulsars.
Author
Pulsars ; Clocks ; Digital Systems ; Ultrahigh Frequencies ; Spectrometers ; Real Time Operation

20020009583 Brookhaven National Lab. , Upton, NY USA
Star level-3 trigger system
Lange, J. S. ; Adler, C. ; Berger, J. ; Demello, M. ; Flierl, D. ; Nov. 15, 1999 ; 8p ; In English
Report No.(s): DE2001-780684 ; BNL-68204 ; No Copyright ; Avail: Department of Energy Information Bridge , Microfiche

The STAR level-3 trigger is a MYRINET interconnected ALPHA processor farm, performing online tracking of N(sub track) (ge) 8000 particles (N(sub point) (le) 45 per track) with a design input rate of R=100 Hz. A large scale prototype system was tested in 12/99 with laser and cosmic particle events.
NTIS
Cosmic Rays ; Beam Interactions

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20020006509 Army Command and General Staff Coll. , Fort Leavenworth, KS USA
The War Film: Historical Perspective or Simple Entertainment
Sheffield, Clayton O. ; Jun. 01, 2001 ; 191p ; In English
Report No.(s): AD-A395813 ; No Copyright ; Avail: CASI ; A09 , Hardcopy ; A02 , Microfiche

This thesis studies the depiction of military life and actions in war movies. The public's perception of the military is shaped through a variety of means, one of which is the feature film showing at the local theater. The increase in population and the decrease in the size of the military have greatly enlarged the percent of the population that are not associated with a serviceperson or a veteran of one of the services. Their only means of obtaining information on the status and professionalism of the military is through what they are fed via the media. The movies produced by filmmakers within the United States affect the recruiting and public perception of the military through their portrayal of events, missions, and personnel. It is important for the Department of Defense and those serving to understand the significance that these films can have on the audience. Films are studied for historical accuracy, the making of the film to include Department of Defense assistance and input, and the portrayal of the soldiers, both officers and enlisted. This thesis concludes that war movies follow historical accuracy as closely as possible within resource constraints as long as the historical content is a good story.

DTIC
Defense Program ; Motion Pictures ; Warfare

20020010575 NASA Goddard Space Flight Center , Greenbelt, MD USA
NASA E3 Y2K Activities
Dyer, Ted , NASA Goddard Space Flight Center , USA ; Deskevich, Joe , NASA Goddard Space Flight Center , USA ; [2001] ; 18p ; In English ; 8th Annual DOD EEE Program Review , 3 Apr. 2001 , Las Vegas, NV , USA ; Sponsored by Department of Defense , USA ; No Copyright ; Avail: CASI ; A03 , Hardcopy ; A01 , Microfiche

This viewgraph presentation gives an overview of NASA's E3 year 2000 activities. It includes details on NASA Headquarters safety, Headquarters sponsored technical documents, and the E3 activities of Marshall Space Flight Center, Kennedy Space Center, Goddard Space Flight Center, and Johnson Space Center. Information is provided on the Shuttle EMI requirements upgrade, SSV external launch, landing, and on-orbit environments, Goddard new technology spectrum needs, advanced communications (Tracking and Data Relay Satellite System), search and rescue (Synthetic Aperture Radar), and the Global Personnel Recovery System.

CASI
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Subject Term Index

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