National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

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STAR

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NASA STI Program ... in Profile

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- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
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Introduction

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STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA STI Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

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NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the CASI TRS – the publicly available contents of the NASA STI Database.

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National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 41, MAY 30, 2003

01
AERONAUTICS (GENERAL)

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*.

20030045767 Physics and Electronics Lab. TNO, The Hague, Netherlands
LCC Analysis M3/M4 Upgrade Trainer F-16
Smit, M. C.; December 2002; 43 pp.; In English
Contract(s)/Grant(s): TNO Proj. 015.31752/01.04
Report No.(s): FEL-02-A210; TD01-0341; Copyright; Avail: Other Sources

The aim of this LCC analysis is to make a cost comparison between three options in the field of logistic support for the M3/M4 upgrade of the trainer for the F-16 (ULT/M4). ULT/M4. It concerns the following options for logistic support: Continue the current support concept (zero-option), Assisted Customer Logistic Support (CLS) and Full CLS. The results of the LCC analysis show that continuing the current logistic support will lead to the lowest costs. Assisted CLS gives the highest costs and is therefore, based on cost, not a favourable option. Full CLS is more promising, although it will result in more costs than the zero option (but less than Assisted CLS). Full CLS requires no maintenance personnel. Furthermore, and even more important, it guarantees a 95\% availability of the trainer and a protection against obsolete parts. Furthermore, the difference between Full CLS and the zero option will reduce if the exchange rate between Euro and the US dollar declines (value Euro rises).
Author
Life Cycle Costs; F-16 Aircraft; Logistics; Upgrading

20030052217 Lawrence Livermore National Lab., Livermore, CA, Sandia National Labs., Albuquerque, NM, University of Southern California, Los Angeles, CA
March 2000 Working Group Meeting on Heavy Vehicle Aerodynamic Drag: Presentations and Summary of Comments and Conclusions
McCallen, R.; Flowers, D.; Dunn, T.; Owens, J.; Browand, F.; May 15, 2000; In English
Report No.(s): DE2002-793867; UCRL-ID-139020; No Copyright; Avail: National Technical Information Service (NTIS)

A Working Group Meeting on Heavy Vehicle Aerodynamic Drag was held at Lawrence Livermore National Laboratory on March 16, 2000. 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 the analysis of experimental results, model developments, simulations, and an investigation of an aerodynamic device. The focus of the meeting was a review of University of Southern California's (USC) experimental plans and results, NASA Ames experimental plans, the computational results from Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratories (SNL) for the integrated tractor-trailer benchmark geometry called the Ground Transportation System (GTS) Model, and turbulence model development and benchmark simulation for a rounded cube from California Institute of Technology (Caltech). Much of the meeting discussion involved deficiencies in commercial software, needed modeling improvements, and the importance of detailed data for code validation. The present and projected budget and funding situation was also discussed.
NTIS
Aerodynamic Drag; Surface Vehicles

20030052276 Swedish Defence Research Establishment, Stockholm
Some Remarks on Approximation for Subgrid Scale Modeling in Large Eddy Simulation
Peng, S. H.; Davidson, L.; Jan. 2002; 28 pp.
Report No.(s): PB2003-103176; FOI-R-0381-SE; No Copyright; Avail: CASI; A03, Hardcopy

The Leonard expansion on the subgrid-scale (SGS) terms is exploited for SGS modeling, in which the first two terms are kept from the truncation. This leads to an approximation that is related to the corresponding viscous dissipation and with properties similar to a mixed SGS model. Furthermore, a heuristic hypothesis is employed. It is assumed that, with a certain spatial filtering, a SGS turbulent quantity should correspond harmonically in magnitude to its resolved, large-scale counterpart. The SGS quantity is then approximated in terms of the product of an appropriate SGS time scale and the net energy occurrence between the resolved and the subgrid scales, leading to implicit algebraic expressions for the unknown SGS terms.
NTIS
Heuristic Methods; Large Eddy Simulation; Approximation; Models

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 Thermodynamics*.

20030038880 Lawrence Livermore National Lab., Livermore, CA
PlumeSat: A Micro-Satellite Based Plume Imagery Collection Experiment
Ledebuhr, A. G.; Ng, L. C.; Jun. 30, 2002; In English
Report No.(s): DE2002-803175; UCRL-JC-148989; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
NTIS
Plumes; Satellite Imagery; Boosters

20030039179 NASA Glenn Research Center, Cleveland, OH, USA
Design of Aspirated Compressor Blades Using Three-Dimensional Inverse Method
Dang, T. Q.; Rooij, M. Van; Larosiliere, L. M.; April 2003; 18 pp.; In English; Turbo Expo 2003, 16-19 Jun. 2003, Atlanta, GA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-714-03-15; DA Proj. 1L1-6221-A-47A
Report No.(s): NASA/TM-2003-212212; NAS 1.15:212212; E-13834; ARL-TR-2957; GT-2003-38492; Copyright; Avail: CASI; A03, Hardcopy

A three-dimensional viscous inverse method is extended to allow blading design with full interaction between the prescribed pressure-loading distribution and a specified transpiration scheme. Transpiration on blade surfaces and endwalls is implemented as inflow/outflow boundary conditions, and the basic modifications to the method are outlined. This paper focuses on a discussion concerning an application of the method to the design and analysis of a supersonic rotor with aspiration. Results show that an optimum combination of pressure-loading tailoring with surface aspiration can lead to a minimization of the amount of sucked flow required for a net performance improvement at design and off-design operations.
Author
Compressor Blades; Design Analysis; Design Optimization; Rotor Aerodynamics; Compressor Rotors; Rotor Blades (Turbomachinery); Aerodynamic Loads; Vacuum Effects

20030051998 General Accounting Office, Washington, DC
Aviation Safety: FAA Needs to Update the Curriculum and Certification Requirements for Aviation Mechanics
Mar. 2003; 66 pp.
Report No.(s): PB2003-103410; GAO-03-317; No Copyright; Avail: CASI; A04, Hardcopy

The safety of millions of airline passengers depends in part on aviation mechanics known as A&P mechanics that are certified to inspect, service, and repair the aircrafts body (airframe) and/or engine (powerplant). FAA establishes the requirements to become certified as an A&P mechanic. Concerns have been raised in the aviation industry about having a sufficient number of A&P mechanics over the long term. GAO was asked to determine how many aircraft mechanics and service technicians the Bureau of Labor Statistics (BLS) projects will be employed in 2010, and the reasonableness of that

projection; the sources that supply and train A&P mechanics and the likelihood that they will provide a sufficient number through 2010; and what is being done by FAA and the aviation industry to ensure that the skills of A&P mechanics are sufficient to work on technologically advanced aircraft. The GAO recommends: Aviation Maintenance Technician at Work FAA should review the required curriculum at aviation maintenance technician schools, identify courses that do not reflect widely used aircraft technology and materials and either de-emphasize or replace them. Also, FAA should ensure that changes to the required curriculum are reflected on the A&P certification examination.
NTIS
Aircraft Maintenance; Certification

20030052059 National Transportation Safety Board, Washington, DC
Annual Review of Aircraft Accident Data: U.S. Carrier Operations, Calendar Year 1998
2002; 66 pp.
Report No.(s): PB2002-106891; NTSB/ARC-02/02; No Copyright; Avail: CASI; A04, Hardcopy

This publication presents the record of aviation accidents involving revenue operations of U.S. air carriers including commuter for Calendar Year 1998.
NTIS
Aircraft Accidents; Air Transportation

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport 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*.

20030037098 MITRE Corp., McLean, VA, National Aeronautics and Space Administration, Moffett Field, CA
Summary of FlightDeck Observer Data from SafeFlight 21 OpEval-2
Joseph, K. M.; Domino, D.; Battiste, V.; Bone, R. S.; Olmos, B. O.; Feb. 2003; 68 pp.; In English
Report No.(s): PB2003-102980; No Copyright; Avail: CASI; A04, Hardcopy

In 2000, the Cargo Airlines Association and the Federal Aviation Administration conducted Operational Evaluation 2 (OpEval-2) of Cockpit Display of Traffic Information (CDTI) and Automatic Dependent Surveillance - Broadcast (ADS-B) technologies at the Standiford International Airport in Louisville, KY. This evaluation was designed to demonstrate the benefits of CDTI/ADS-B, including safety, efficiency, and capacity. Toward this end, five flight periods were designed to test five different applications: Airport Surface Situation Awareness (ASSA), Departure Spacing, Initial and Final Approach Spacing, Final Approach Runway Occupancy Awareness (FAROA), and Visual Acquisition and Traffic Awareness. OpEval-2 included 16 aircraft of various types and their flight crews. Flightdeck observers accompanied these flight crews to record human factors data. This report summarizes the collection and analysis of flightdeck observer data. In addition, the report includes empirically based recommendations for addressing human factors issues related to certification of CDTI for the five applications that were tested in OpEval-2.
NTIS
Aircraft Safety; Airports; Air Traffic; Flight Crews; Civil Aviation; Airline Operations

20030037107 National Transportation Safety Board, Washington, DC
National Transportation Safety Board Aircraft Accident Report: Loss of Control and Impact with Pacific Ocean, Alaska Airlines Flight 261, McDonnell Douglas MD-83, N963AS, About 2.7 Miles North of Anacapa Island, California, on January 31, 2000
Dec. 30, 2002; 250 pp.
Report No.(s): PB2002-910401; NTSB/AAR-02/01; No Copyright; Avail: CASI; A11, Hardcopy

This report explains the accident involving Alaska Airlines flight 261, a McDonnell Douglas MD-83, which crashed into the Pacific Ocean about 2.7 miles north of Anacapa Island, California. Safety issues discussed in this report include lubrication and inspection of the jackscrew assembly, extension of lubrication and end play check intervals, jackscrew assembly overhaul procedures, the design and certification of the MD-80 horizontal stabilizer trim control system, Alaska Airlines' maintenance

program, and Federal Aviation Administration (FAA) oversight of Alaska Airlines. Safety recommendations are addressed to the FAA.
NTIS
Aircraft Accidents; Airline Operations; Commercial Aircraft

20030037123 General Accounting Office, Washington, DC
National Airspace System: Better Cost Data Could Improve FAA's Management of the Standard Terminal Automation Replacement System
Jan. 2003; 30 pp.
Report No.(s): PB2003-102660; GAO-03-343; No Copyright; Avail: CASI; A03, Hardcopy

To enhance the capacity and safety of the national airspace system, the Federal Aviation Administration (FAA), within the Department of Transportation, is acquiring 74 Standard Terminal Automation Replacement Systems (STARS). STARS will replace some outdated air traffic control equipment. Since 1996, when FAA initiated this major computer hardware and software acquisition, the scope and estimated costs of STARS have changed many times. FAA now estimates that STARS's remaining costs will total about $2.54 billion. GAO was asked to assess the reliability of FAA's life-cycle cost estimate for STARS, determine the impact of STARS's estimated costs on future FAA budgets, and identify any alternatives to STARS that FAA is considering. GAO based its analysis on published FAA cost data and the guidance FAA uses for managing major acquisitions.
NTIS
Air Traffic Control; National Airspace System; Automatic Control; Control Equipment

20030038804 NASA Langley Research Center, Hampton, VA, USA
Wake Vortex Advisory System (WakeVAS) Concept of Operations
Rutishauser, David; Lohr, Gary; Hamilton, David; Powers, Robert; McKissick, Burnell; Adams, Catherine; Norris, Edward; April 2003; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 727-04-10-01
Report No.(s): NASA/TM-2003-212176; L-18281; NAS 1.15:212176; No Copyright; Avail: CASI; A03, Hardcopy

NASA Langley Research Center has a long history of aircraft wake vortex research, with the most recent accomplishment of demonstrating the Aircraft VOrtex Spacing System (AVOSS) at Dallas/Forth Worth International Airport in July 2000. The AVOSS was a concept for an integration of technologies applied to providing dynamic wake-safe reduced spacing for single runway arrivals, as compared to current separation standards applied during instrument approaches. AVOSS included state-of-the-art weather sensors, wake sensors, and a wake behavior prediction algorithm. Using real-time data AVOSS averaged a 6\% potential throughput increase over current standards. This report describes a Concept of Operations for applying the technologies demonstrated in the AVOSS to a variety of terminal operations to mitigate wake vortex capacity constraints. A discussion of the technological issues and open research questions that must be addressed to design a Wake Vortex Advisory System (WakeVAS) is included.
Author
Aircraft Wakes; Vortex Advisory System; Vortices; NASA Programs

20030038919 General Accounting Office, Washington, DC
Aviation Infrastructure: Challenges Related to Building Runways and Actions to Address Them
Jan. 2003; 94 pp.
Report No.(s): PB2003-102592; GAO-03-164; No Copyright; Avail: CASI; A05, Hardcopy

Aviation experts believe that building runways is one key way to address airport capacity issues and prevent delays that can affect the entire U.S. economy, but runway projects are often controversial and time-consuming. GAO was asked to examine how much time airports spend completing runways, what challenges airports and other stakeholders experience during this process, and what airports and other stakeholders have done to address challenges related to runway projects. GAO analyzed the results of surveys from 30 airports on 32 runway projects and visited 5 airports in order to interview numerous runway project stakeholders.
NTIS
Airports; Runways; Air Transportation

20030038928 General Accounting Office, Washington, DC
Aviation Finance: Implementation of General Aviation Entitlement Grants
Feb. 2003; 42 pp.
Report No.(s): PB2003-102663; GAO-03-347; No Copyright; Avail: CASI; A03, Hardcopy

In 2000, Congress created general aviation entitlement grants to provide funding up to $150,000 per fiscal year to individual general aviation airports. These grants fund capital improvements and repair projects. GAO was asked to (1) assess the amount of funding airports used, (2) identify the types of projects undertaken, and (3) convey suggestions made by interested parties to improve the grants in preparation for the reauthorization of the legislation in 2003.
NTIS
Airports; Grants

20030045790 Federal Aviation Administration, Washington, DC
Aviation Capacity Enhancement Plan 2001. Building Capacity Today for the Skies of Tomorrow
Dec. 2001
Report No.(s): PB2002-104045; No Copyright; Avail: National Technical Information Service (NTIS)

The Aviation Capacity Enhancement (ACE) Plan is published annually by the Federal Aviation Administrations (FAA) Office of System Capacity. Its purpose is to provide the aviation industry with a summary of significant accomplishments of FAA-related programs, technologies, and initiatives affecting the capacity of the National Airspace System. The ACE Plans audience consists of airports, airlines, aviation organizations, and academia that have a vested interest in U.S. aviation. The ACE Plan is also distributed to members of Congress. The ACE Plan contains data for Fiscal Year (FY) 2000 (October 1, 1999-September 30, 2000) and for Calendar Year (CY) 2000. Since forecasts are available only for fiscal years, all data relating to those forecasts are for fiscal years. Other data, such as delays, are presented for the most recent calendar year. Appendices B and C provide comparative data for last 3 fiscal and calendar years.
NTIS
Commercial Aircraft; National Airspace System; Forecasting; Management

20030045810 Bureau of Transportation Statistics, Washington, DC
Holiday Air Travel Delays, Christmas 2001 and New Year's Day 2002
2002; 124 pp.
Report No.(s): PB2003-102687; No Copyright; Avail: CASI; A06, Hardcopy

The U.S. Department of Transportation (DOT) Bureau of Transportation Statistics (BTS) is providing holiday travelers with historical flight delay information about major airlines and the nation's 29 busiest airports. By reviewing last year's flight delay information, travelers will be able to make more informed decisions about this year's holiday travel. Flight delays described in this analysis include departure delay (difference between actual and scheduled time that a flight leaves the departure gate) and arrival delay (difference between actual and scheduled time that a flight arrives at the destination gate).
NTIS
Air Transportation; Airline Operations; Civil Aviation; Delay

20030045821 Federal Aviation Administration, Washington, DC
Aviation Capacity Enhancement Plan 2002. Building Capacity Today for the Skies of Tomorrow
Dec. 2002; In English
Report No.(s): PB2003-102974; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Perspectives On National Aerospace System (NAS) Recovery; The Cyclical Nature of the Industry; Event And Recovery Timelines; September 11, 2001; Operational Evolution Plan (OEP): Achievements, Planning Adjustments and Communications Progress; Overview of the OEP Quadrants; 2002-A New Era In Aviation Begins; The Vision; Aviation Activity and Capacity in the National Airspace System; National Airspace System Performance; Airport Capacity Analysis and Enhancements; Airport Development; Operational Procedures; Airspace Redesign; National Airspace System Modernization; Appendices: Fundamentals of the National Airspace System; Aviation Statistics; Capacity Enhancement Plan Update; Runway Projects 2008 and Beyond; Airport Layouts for the Top 100 Airports; Acronym Listing; Glossary; Credits.
NTIS
Commercial Aircraft; Air Transportation

20030045822 Oklahoma Univ., Norman, Naval Surface Warfare Center, Silver Spring, MD, Maryland Univ., College Park, SBC Technology Resources, Inc., Austin, TX

Aiding Planning in Air Traffic Control: An Experimental Investigation of the Effects of Perceptual Information Integration

Moertl, P. M.; Canning, J. M.; Gronlund, S. D.; Dougherty, M. R. P.; Johansson, J.; Dec. 2002; 18 pp.; In English

Report No.(s): PB2003-102977; No Copyright; Avail: CASI; A03, Hardcopy

Prior research examined how controllers plan in their traditional environment and identified various information uncertainty by perceptually representing important constraints. This included integrating spatial information on the radar screen with discrete information (planned sequences of air traffic). They reported improved planning performance and decreased workload in the planning aid condition. The purpose of this paper was to determine the source of these performance improvements. Analysis of computer interactions using loglinear modeling showed that the planning interface led to less repetitive, but more integrated, information retrieval gave rise to the performance improvements. Potential applications of this research include the design and evaluation of interface automation that keeps users in active control by modification of perceptual task characteristics.

NTIS

Air Traffic Control; Airport Planning; Marking

20030045823 Federal Aviation Administration, Washington, DC

National Airspace System, Capital Investment Plan 2004-2008

2002; In English

Report No.(s): PB2003-102993; No Copyright; Avail: National Technical Information Service (NTIS)

This report details the Federal Aviation Administration's (FAA) Capital Investment Plan (CIP). The CIP is a five year financial plan that allocates funding to National Airspace System (NAS) projects based on a detailed analysis of project funding by FAA functional working groups. The goal is the comprehensive modernization of the NAS.

NTIS

National Airspace System; Budgeting; Management

20030045825 General Accounting Office, Washington, DC

Aviation and the Environment: Strategic Framework Needed to Address Challenges Posed by Aircraft Emissions

Feb. 2003; 80 pp.

Report No.(s): PB2003-103019; GAO-03-252; No Copyright; Avail: CASI; A05, Hardcopy

Although aviation-related activities result in the emission of pollutants that account for only about 0.5 percent of total air pollution in the USA, these pollutants are among the most prevalent and harmful in the atmosphere and are expected to grow. The Federal Aviation Administration (FAA) expects the demand for air travel in the USA to recover from the events of September 11, 2001, and then continue a long-term trend of 3.6 percent annual growth. This expected growth has heightened concerns among some communities, environmental groups, and others that airport operations will have an increasingly detrimental effect upon the environment. Although, to date, these groups have focused primarily on the noise generated by aircraft operations, they are becoming increasingly concerned about aviations impact on air quality. Our August 2000 report found that the operators of the nations 50 busiest airports considered that air quality issues would become a bigger concern and challenge for them in the future than any other environmental issue. Airport operators were particularly mindful of the effects on air quality of the increases in emissions due to airport growth. The emissions of most concern to many airport operators, as well as to many state and local air quality authorities, are nitrogen oxides, which are a primary contributor to the formation of ozone, a major pollutant in many metropolitan areas.

NTIS

Airports; Air Pollution; Noise Pollution; Environment Protection

20030051559 Federal Aviation Administration, Washington, DC

Aviation Capacity Enhancement Plan 1999. Federal Aviation Administration Office of System Capacity

Dec. 1999; In English

Report No.(s): PB2003-103083; No Copyright; Avail: National Technical Information Service (NTIS)

On the brink of the second century of aviation, the 1999 Airport Capacity Enhancement (ACE) Plans theme is the continuing shift in the Federal Aviation Administration's (FAA) philosophy from the traditional concept of air traffic control, in which pilots are directed by controllers, to the new idea of air traffic management where decisions are made collaboratively

between dispatchers and air traffic managers. This shift will be made possible by the development of new technologies but it will be accomplished only through the willingness of all parties to work together towards a common goal. The Air Traffic Control System Command Center's Collaborative Decision Making Program, which is an excellent example of the effective use of technological improvements through a cooperative relationship, is highlighted in this year's ACE Plan.
NTIS
Flight Management Systems; Air Traffic Control; Civil Aviation; Air Transportation; Decision Making

20030051598 William J. Hughes Technical Center, Atlantic City, NJ
Burning Behavior Within a Seat Armrest Cavity
Johnson, R. M.; Sep. 2002; 16 pp.; In English
Report No.(s): PB2003-102103; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this technical note is to document the results of fire tests conducted to examine the characteristics of fire that may occur in the cavity of an aircraft seat armrest and the fire-containment capability of the cavity. In all the tests conducted with actual seat armrests, the fire self-extinguished, the armrest materials did not ignite, and the fire was contained within the armrest cavity.
NTIS
Seats; Flammability; Cavities

20030051611 Western Center for Risk Management Education, Spokane, VA, Washington State Univ., Pullman. Dept. of Agricultural Economics
Functions and Benefits of Rural Airports in Washington
Newkirk, J.; Casavant, K.; Feb. 25, 2002; 108 pp.; In English
Report No.(s): PB2003-103403; No Copyright; Avail: CASI; A06, Hardcopy

Washington's urban and rural communities are served by an airport system that provides mobility to Washingtons citizens, visitors and other traveling public. The strong performance by Washingtons airports has been integral in the development and sustaining of Washington States role in international trade for the nation. The economic benefits of major airports are well known and acknowledged; less well known is the benefit to the state and rural communities provided by rural airports. This report identifies the wide range of benefits that rural communities receive because they have an airport. The objectives are to describe the economic environment within which rural communities are operating; understand why flights are made to understand how the community is served by aviation related and other activities, which use rural airports; identify the benefits communities receive and how integrated rural airports are into the fabric of the community; investigate strategies for decision makers concerned about the vitality of rural airports; and identify several emerging technologies or trends that may impact the role of airports in the future.
NTIS
Airports; Rural Areas; Regional Planning; Washington

20030052043 Lawrence Livermore National Lab., Livermore, CA
Model for Flow and Dispersion Around Buildings and Its Validation Using Laboratory Measurements
Chan, S. T.; Stevens, D. E.; Lee, R. L.; May 17, 2000; 8 pp.; In English
Report No.(s): DE2002-792814; UCRL-JC-137458; No Copyright; Avail: Department of Energy Information Bridge

Numerical modeling of airflow and pollutant dispersion around buildings is a challenging task due to the geometrical variations of buildings and the extremely complex flow created by such surface-mounted obstacles. The airflow around buildings inevitably involves impingement and separation regions, a multiple votex system with building wakes, and jetting effects in street canyons. The interference from adjacent buildings further complicates the flow and dispersion patterns. Thus accurate simulations of such flow and pollutant transport require not only appropriate physics submodels but also accurate numerics and significant computing resources. We have developed an efficient, high resolution CFD model for such purposes, with a primary goal to support incident response and preparedness in emergency response planning, vulnerability analysis, and the development of mitigation techniques.
NTIS
Air Flow; Buildings; Computational Fluid Dynamics; Mathematical Models; Air Transportation; Dispersion

20030052303 Federal Aviation Administration, Washington, DC

Evaluation of Conductivity Meters for Firefighting Foams

Bagot, K.; Oct. 2002; In English

Report No.(s): PB2003-103653; AAR-411; DOT/FAA/AR-02/115; No Copyright; Avail: National Technical Information Service (NTIS)

This evaluation was conducted to comparatively test various conductivity meters and refractometers used in testing airport rescue and firefighting (ARFF) vehicle foam-proportioning systems. The amount of foam concentrate fed to the foam proportioner of a firefighting system is critical, not only in the making of foam with the proper expansion and drainage rate, but also in making a fire-resistant foam. Therefore, it is essential that correct proportioning is maintained and that the concentration meets the required level. During the annual certification inspection of an airport fire department, refractometer and conductivity meter tests are conducted to test the foam concentrate and foam-proportioning systems of the ARFF apparatus. Historically, refractive index has been used to determine the proportioning of foam-generating systems. Recently, the accuracies of the refractometer tests have come into question. The National Fire Protection Association (NFPA) now requires the use of conductivity meters in NFPA 412, Standard for Evaluating Aircraft Rescue and Firefighting Foam Equipment, 1998 edition. The refractometer gives readings with an accuracy of plus or minus 0.3\%, whereas conductivity meters can give accuracies greater than 0.05\%. Five conductivity meters were evaluated against the standard refractometer. There were some variations to the operation and calibration of the conductivity meters that made some meters slightly better than others. It was determined, however, that all five conductivity meters were more accurate and easier to use for conducting tests on foam-proportioning systems than the refractometer.

NTIS

Conductivity Meters; Fire Fighting; Foams; Flame Retardants

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*.

20030052752 NASA Ames Research Center, Moffett Field, CA, USA

The Effect of Symbology Location and Format on Attentional Deployment within a Cockpit Display of Traffic Information

Johnson, Walter W.; Liao, Min-Ju; Tse, Stephen; April 2003; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 538-04-23

Report No.(s): NASA/TM-2003-212264; NAS 1.15:212264; IH-038; Copyright; Avail: CASI; A02, Hardcopy

The present experiment employed target detection tasks to investigate attentional deployment during visual search for target aircraft symbols on a cockpit display of traffic information (CDTI). Targets were defined by either a geometric property (aircraft on a collision course with Ownship) or a textual property (aircraft with associated altitude tags indicating an even altitude level). Effects of target location and target brightness (highlighting) were examined. Target location was systematically related to target detection time, and this interacted with the target's defining property (collision geometry or associated text). Highlighting (which was not linked to whether an aircraft symbol was the target) did not influence target detection time.

Author

Symbols; Cockpits; Display Devices; Target Acquisition; Air Traffic

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*.

20030051479 Wichita State Univ., KS

Impact Damage Characterization and Damage Tolerance of Composite Sandwich Airframe Structures-Phase II

Tomblin, J. S.; Raju, K. S.; Acosta, J. F.; Smith, B. L.; Romine, N. A.; Oct. 2002; 96 pp.; In English

Report No.(s): PB2003-102190; No Copyright; Avail: CASI; A05, Hardcopy

The impact responses and the damage states in flat composite sandwich panels with thin facesheets were investigated in Phase I and were found to be dependent on the diameter of the spherical steel impactor. The residual strength of impact-damaged sandwich panels under static in-plane compressive loads was reported to be dependent on the nature of the damage state. The impact damage due to blunt impactors is difficult to detect in service and depending on the size of the damage, can degrade the residual strength more than a punctured skin. The detectability of impact damage states using different field inspection techniques was experimentally investigated for different facesheet and core combinations. The impact damage in honeycomb core sandwich panels was better detected using instruments that exploit the local vibrational characteristics of the sandwich structure, while the damage in foam core panels was more amendable to acoustic-based techniques. The effect of facesheet stiffness on the sensitivity of the field inspection techniques was investigated and the results are reported. The behavior of the sandwich panels with impact damage and subjected to the in-plane static compressive loads was investigated in detail. The impact damage behaved in a characteristic sequence of events leading to contrasting final failure modes. The sequence of events was found to be dependent on the facesheet stiffness and the transverse compressive properties of the core material.
NTIS
Composite Materials; Damage; Airframe Materials

20030052026 Southern Univ., Baton Rouge, LA, USA
Knowledge Preservation for Design of Rocket Systems
Moreman, Douglas; [2002]; 5 pp.; In English
Contract(s)/Grant(s): NAG3-2076; No Copyright; Avail: CASI; A01, Hardcopy

An engineer at NASA Lewis RC presented a challenge to us at Southern University. Our response to that challenge, stated circa 1993, has evolved into the Knowledge Preservation Project which is here reported. The stated problem was to capture some of the knowledge of retiring NASA engineers and make it useful to younger engineers via computers. We evolved that initial challenge to this - design a system of tools such that, with this system, people might efficiently capture and make available via commonplace computers, deep knowledge of retiring NASA engineers. In the process of proving some of the concepts of this system, we would (and did) capture knowledge from some specific engineers and, so, meet the original challenge along the way to meeting the new. Some of the specific knowledge acquired, particularly that on the RL- 10 engine, was directly relevant to design of rocket engines. We considered and rejected some of the techniques popular in the days we began - specifically 'expert systems' and 'oral histories'. We judged that these old methods had too high a cost per sentence preserved. That cost could be measured in hours of labor of a 'knowledge professional'. We did spend, particularly in the grant preceding this one, some time creating a couple of 'concept maps', one of the latest ideas of the day, but judged this also to be costly in time of a specially trained knowledge-professional. We reasoned that the cost in specialized labor could be lowered if less time were spent being selective about sentences from the engineers and in crafting replacements for those sentences. The trade-off would seem to be that our set of sentences would be less dense in information, but we found a computer-based way around this seeming defect. Our plan, details of which we have been carrying out, was to find methods of extracting information from experts which would be capable of gaining cooperation, and interest, of senior engineers and using their time in a way they would find worthy (and, so, they would give more of their time and recruit time of other engineers as well). We studied these four ways of creating text: 1) the old way, via interviews and discussions - one of our team working with one expert, 2) a group-discussion led by one of the experts themselves and on a topic which inspires interaction of the experts, 3) a spoken dissertation by one expert practiced in giving talks, 4) expropriating, and modifying for our system, some existing reports (such as 'oral histories' from the Smithsonian Institution).
Derived from text
Design Analysis; Rocket Vehicles; Rocket Engines; Computer Techniques

20030052061 General Accounting Office, Washington, DC
Tactical Aircraft: DOD Should Reconsider Decision to Increase F/A-22 Production Rates While Development Risks Continue
Mar. 2003; 36 pp.
Report No.(s): PB2003-103408; GAO-03-531; No Copyright; Avail: CASI; A03, Hardcopy

The Air Force is developing the F/A-22 aircraft to fly at higher speeds for longer distances, be less detectable, and improve the pilot's awareness of the surrounding situation. The F/A-22 will replace the Air Force's existing fleet of F-15 aircraft. Over the past several years the program has experienced significant cost overruns and schedule delays. Congress mandated that GAO assess the development program and determine whether the Air Force is meeting key performance, schedule, and cost

goals. GAO also assessed the implications of the progress of the development program on production.
NTIS
F-22 Aircraft; Aircraft Production; Aircraft Production Costs; Cost Analysis

20030052176 Physics and Electronics Lab. TNO, The Hague, Netherlands
Unmanned Aerial Vehicles (UAVs)
Cambien, K. P. H.; Visser, B. J.; Rijgersberg, T. J.; vanderHorst, R. M.; deVries, S. C.; January 2003; 58 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32097
Report No.(s): FEL-02-A099; TD02-0207; Copyright; Avail: Other Sources

This report is one of a series of publications, which provide an overview of recent developments in the field of Unmanned Aerial Vehicles (UAVs). The information provided is based on open sources, such as periodicals and research reports. The time period covered by this report is January 2002 through July 2002.
Author
Pilotless Aircraft; Development; Literature

20030052264 Pratt and Whitney Aircraft Group, East Hartford, CT
Crack Growth-Based Predictive Methodologies for Maintenance of Structural Integrity of Repaired and Nonrepaired Aging Engine Stationary Components
Hirko, G. S.; Hatala, R. W.; Mattern, R. A.; Jan. 2003; 326 pp.; In English
Report No.(s): PB2003-102111; No Copyright; Avail: CASI; A15, Hardcopy

This report contains the results of work conducted by Pratt & Whitney between October 1994 and January 2001 under the Federal Aviation Administration contract to study the effect of aging on stationary engine components. The goal was to determine if long-term operation and multiple repairs affect the crack growth in engine-critical static structures and to provide a generic case management methodology to ensure continued airworthiness of these cases. The contract covers the evaluation of material crack growth properties in typically used case alloys, the ability to accurately predict crack growth in these components, a description of the risk assessment process, and provides a case management methodology for industry usage.
NTIS
Aircraft Engines; Aircraft Reliability; Engine Parts; Maintenance

20030052265 Dayton Univ. Research Inst., OH
Side Load Factor Statistics From Commercial Aircraft Ground Operations
Tipps, D. O.; Rustenburg, J.; Skinn, D.; DeFiore, T.; Jan. 2003; 134 pp.; In English
Report No.(s): PB2003-102109; UDR-TR-2002-00119; No Copyright; Avail: CASI; A07, Hardcopy

The University of Dayton is supporting Federal Aviation Administration (FAA) research on the loads and structured integrity requirements for the U.S. commercial transport airplane fleet. The primary objective of this research is to support the FAA's Operational Loads Monitoring Research by developing new and improved methods and criteria for processing and presenting commercial transport airplane flight and ground loads usage data. The scope of activities performed involve but are not limited to (1) defining the service-related factors that affect the operational life of commercial aircraft; (2) designing an efficient software system to reduce, store, and process large quantities of optical quick access recorder data; and (3) providing processed data in formats that will enable the FAA to reassess existing certification criteria. Presented herein are analyses and statistical summaries of landing and ground operations data to provide the FAA with a technical basis for assessing the suitability of the 0.5-g lateral acceleration criteria specified in Federal Aviation Regulation (FAR) 25.495 for turning.
NTIS
Commercial Aircraft; Loads (Forces); Statistical Analysis; Flight Tests; Ground Based Control; Aircraft Performance

20030052724 NASA Langley Research Center, Hampton, VA, USA, Army Aviation and Missile Command, Hampton, VA, USA
XV-15 Tiltrotor Aircraft: 1997 Acoustic Testing
Edwards, Bryan D.; Conner, David A.; April 2003; 63 pp.; In English
Contract(s)/Grant(s): WU 576-03-15-10
Report No.(s): NASA/TM-2003-212151; AMCOM/AFDD/TR-03-A-00I; NAS 1.15:212151; L-18265; No Copyright; Avail: CASI; A04, Hardcopy

XV-15 acoustic test is discussed, and measured results are presented. The test was conducted by NASA Langley and Bell Helicopter Textron, Inc., during June - July 1997, at the BHTI test site near Waxahachie, Texas. This was the second in a series of three XV-15 tests to document the acoustic signature of the XV-15 tiltrotor aircraft for a variety of flight conditions and minimize the noise signature during approach. Tradeoffs between flight procedures and the measured noise are presented to illustrate the noise abatement flight procedures. The test objectives were to: (1) support operation of future tiltrotors by further developing and demonstrating low-noise flight profiles, while maintaining acceptable handling and ride qualities, and (2) refine approach profiles, selected from previous (1995) tiltrotor testing, to incorporate Instrument Flight Rules (IFR), handling qualities constraints, operations and tradeoffs with sound. Primary emphasis was given to the approach flight conditions where blade-vortex interaction (BVI) noise dominates, because this condition influences community noise impact more than any other. An understanding of this part of the noise generating process could guide the development of low noise flight operations and increase the tiltrotor's acceptance in the community.
Author
Xv-15 Aircraft; Aeroacoustics; Rotor Dynamics; Acoustic Properties; Noise Measurement

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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

20030038848 Lawrence Livermore National Lab., Livermore, CA
Nonlinear Fuel Optimal Reaction Jet Control Law
Breitfeller, E. F.; Ng, L. C.; Jun. 30, 2002; 14 pp.
Report No.(s): DE2002-802835; UCRL-JC-148994; No Copyright; Avail: Department of Energy Information Bridge
We derive a nonlinear fuel optimal attitude control system (ACS) that drives the final state to the desired state according to a cost function that weights the final state angular error relative to the angular rate error. Control is achieved by allowing the pulse-width-modulated (PWM) commands to begin and end anywhere within a control cycle, achieving a pulse width pulse time (PWPT) control. We show through a MATLAB Simulink model that this steady-state condition may be accomplished, in the absence of sensor noise or model uncertainties, with the theoretical minimum number of actuator cycles. The ability to analytically achieve near-zero drift rates is particularly important in applications such as station-keeping and sensor imaging. Consideration is also given to the fact that, for relatively small sensor and model errors, the controller requires significantly fewer actuator cycles to reach the final state error than a traditional proportional-integral-derivative (PID) controller. The optimal PWPT attitude controller may be applicable for a high performance kinetic energy kill vehicle.
NTIS
Attitude Control; Nonlinearity; Avionics; Control Theory; Aircraft Fuel Systems

20030051563 Sandia National Labs., Albuquerque, NM
Mechanical Systems Characterization of Boeing 747 Aging Systems Test Bed Aircraft
Dec. 2002; 20 pp.; In English
Report No.(s): PB2003-102025; No Copyright; Avail: CASI; A03, Hardcopy
As part of the Federal Aviation Administration (FAA) Aging Aircraft Program, the FAA purchased a Boeing 747 to be used as a test bed aircraft for investigating aging mechanical and electrical systems. When retired, the airplane was decommissioned in a way to preserve the functionality of the mechanical and electrical systems. Total Aircraft Services, Inc., under contract to the FAA Airworthiness Assurance Nondestructive Validation Center located at Sandia National Laboratories, was charged with assessing the status of the aircraft's systems. The purpose of the assessment was to determine the condition of the mechanical systems on the airplane and to determine what would be required to make any nonworking systems functional. This report documents the results of this assessment. This assessment determined that most of the mechanical systems that are significant to the Aging Mechanical Systems Project are operational or are capable of easily being made operational.
NTIS
Avionics; Boeing 747 Aircraft; Electronics; Components; Aging (Materials); Aircraft Reliability

20030051605 NASA Langley Research Center, Hampton, VA, USA

Flight Test Comparison of Synthetic Vision Display Concepts at Dallas/Fort Worth International Airport

Glaab, Louis J.; Kramer, Lynda J.; Arthur, Trey; Parrish, Russell V.; Barry, John S.; January 05, 2003; 144 pp.; In English

Contract(s)/Grant(s): WU 728-60-10-01

Report No.(s): NASA/TP-2003-212177; L-18278; NAS 1.60:212177; No Copyright; Avail: CASI; A07, Hardcopy

Limited visibility is the single most critical factor affecting the safety and capacity of worldwide aviation operations. Synthetic Vision Systems (SVS) technology can solve this visibility problem with a visibility solution. These displays employ computer-generated terrain imagery to present 3D, perspective out-the-window scenes with sufficient information and realism to enable operations equivalent to those of a bright, clear day, regardless of weather conditions. To introduce SVS display technology into as many existing aircraft as possible, a retrofit approach was defined that employs existing HDD display capabilities for glass cockpits and HUD capabilities for the other aircraft. This retrofit approach was evaluated for typical nighttime airline operations at a major international airport. Overall, 6 evaluation pilots performed 75 research approaches, accumulating 18 hours flight time evaluating SVS display concepts that used the NASA LaRC's Boeing B-757-200 aircraft at Dallas/Fort Worth International Airport. Results from this flight test establish the SVS retrofit concept, regardless of display size, as viable for tested conditions. Future assessments need to extend evaluation of the approach to operations in an appropriate, terrain-challenged environment with daytime test conditions.

Author

Display Devices; Enhanced Vision; Head-Up Displays; Flight Instruments; Navigation Aids; Flight Tests

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; 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*.

20030038949 NASA Glenn Research Center, Cleveland, OH, USA

Blade Row Interaction Effects on the Performance of a Moderately Loaded NASA Transonic Compressor Stage

VanZante, Dale E.; To, Wai-Ming; Chen, Jen-Ping; March 2003; 17 pp.; In English; Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 22-714-03-54

Report No.(s): NASA/TM-2003-212180; NAS 1.15:212180; E-13781; GT-2002-30575; Copyright; Avail: CASI; A03, Hardcopy

Blade row interaction effects on loss generation in compressors have received increased attention as compressor work-per-stage and blade loading have increased. Two dimensional Laser Doppler Velocimeter measurements of the velocity field in a NASA transonic compressor stage show the magnitude of interactions in the velocity field at the peak efficiency and near stall operating conditions. The experimental data are presented along with an assessment of the velocity field interactions. In the present study the experimental data are used to confirm the fidelity of a three-dimensional, time-accurate, Navier Stokes calculation of the stage using the MSU-TURBO code at the peak efficiency and near stall operating conditions. The simulations are used to quantify the loss generation associated with interaction phenomena. At the design point the stator pressure field has minimal effect on the rotor performance. The rotor wakes do have an impact on loss production in the stator passage at both operating conditions. A method for determining the potential importance of blade row interactions on performance is presented.

Author

Compressor Blades; Transonic Compressors; Velocity Distribution; Compressor Rotors; Rotor Stator Interactions; Rotor Blades (Turbomachinery)

20030039177 NASA Glenn Research Center, Cleveland, OH, USA

Experimental High Temperature Characterization of a Magnetic Bearing for Turbomachinery

Montague, Gerald; Jansen, Mark; Provenza, Andrew; Palazzolo, Alan; Jansen, Ralph; Ebihara, Ben; March 2003; 17 pp.; In English; 59th Annual Forum and Technology Display, 6-8 May 2003, Phoenix, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-708-28-12; DA Proj. 1L1-61102-AF-20

Report No.(s): NASA/TM-2003-212183; E-13784; NAS 1.15:212183; ARL-TR-2929; Copyright; Avail: CASI; A03, Hardcopy

Open loop, experimental force and power measurements of a radial, redundant-axis, magnetic bearing at temperatures to 1000 F (538 C) and rotor speeds to 15,000 RPM along with theoretical temperature and force models are presented in this paper. The experimentally measured force produced by a single C-core using 22A was 600 lb. (2.67 kN) at room temperature and 380 lb. (1.69 kN) at 1000 F (538 C). These values were compared with force predictions based on a 1D magnetic circuit analysis and a thermal analysis of gap growth as a function of temperature. Tests under rotating conditions showed that rotor speed has a negligible effect on the bearing s load capacity. One C-core required approximately 340 W of power to generate 190 lb. (8.45 kN) of magnetic force at 1000 F (538 C); however the magnetic air gap was much larger than at room temperature. The data presented is after the bearing had already operated six thermal cycles and eleven total (not consecutive) hours at 1000 F (538 C).
Author
Turbomachinery; Magnetic Bearings; Mathematical Models; High Temperature Tests; Magnetic Cores

20030048822 NASA Glenn Research Center, Cleveland, OH, USA
A Study of Fan Stage/Casing Interaction Models
Lawrence, Charles; Carney, Kelly; Gallardo, Vicente; March 2003; 35 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-728-30-07
Report No.(s): NASA/TM-2003-212215; E-13836; NAS 1.15:212215; Copyright; Avail: CASI; A03, Hardcopy

The purpose of the present study is to investigate the performance of several existing and new, blade-case interactions modeling capabilities that are compatible with the large system simulations used to capture structural response during blade-out events. Three contact models are examined for simulating the interactions between a rotor bladed disk and a case: a radial and linear gap element and a new element based on a hydrodynamic formulation. The first two models are currently available in commercial finite element codes such as NASTRAN and have been showed to perform adequately for simulating rotor-case interactions. The hydrodynamic model, although not readily available in commercial codes, may prove to be better able to characterize rotor-case interactions.
Author
Fan Blades; Hydrodynamics; Computerized Simulation; Dynamic Loads; Rotor Blades (Turbomachinery); Turbine Wheels; Nastran

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)*.

20030052180 Physics and Electronics Lab. TNO, The Hague, Netherlands
Advice Regarding Use of Simulation for Training of Fighter Pilots
vanGeest, J.; January 2003; 37 pp.; In Dutch
Contract(s)/Grant(s): TNO Proj. 015.31752t
Report No.(s): FEL-02-A211; TD01-0333; Copyright; Avail: Other Sources

This report consults the Royal Netherlands Air Force on the use of simulators for training of fast jet pilots.
Author
Aircraft Pilots; Pilot Training; Simulators

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*.

20030052311 Lawrence Livermore National Lab., Livermore, CA
WET MARS: Plentiful Readily-Available Martian Water and Its Implications
Hyde, R.; Ishikawa, M.; Nuckolls, J.; Whitehead, J.; Wood, L.; Sep. 14, 2000; 28 pp.; In English
Report No.(s): DE2002-791693; No Copyright; Avail: Department of Energy Information Bridge

Water and its major constituent, oxygen, in large specific quantities are essential for maintenance of human life. Providing them in adequate quantities is widely believed to be a major challenge for human exploration and settlement of Mars. The Martian regolith isn't known to bear either water or hydrogen, the ice-rich Martian polar regions are thermally inhospitable, and the measured water content of Mars' thin atmosphere represents a layer of liquid water of average thickness only approximately 1\% that available on the Moon, or approximately 0.001 cm. Crucially, however, the atmospheric Martian water inventory is advected meteorologically to every place on Mars, so that the few cubic kilometers of liquid water-equivalent in the atmosphere are available anywhere when, merely for the effort of condensing it.
NTIS
Mars Surface; Mars Atmosphere; Water; Oxygen

13
ASTRODYNAMICS

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

20030038806 NASA Langley Research Center, Hampton, VA, USA
Dynamics and Control of Attitude, Power, and Momentum for a Spacecraft Using Flywheels and Control Moment Gyroscopes
Roithmayr, Carlos M.; Karlgaard, Christopher D.; Kumar, Renjith R.; Seywald, Hans; Bose, David M.; April 2003; 87 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): RTOP 706-25-02-33
Report No.(s): NASA/TP-2003-212178; NAS 1.60:212178; L-18277; Copyright; Avail: CASI; A05, Hardcopy

Several laws are designed for simultaneous control of the orientation of an Earth-pointing spacecraft, the energy stored by counter-rotating flywheels, and the angular momentum of the flywheels and control moment gyroscopes used together as an integrated set of actuators for attitude control. General, nonlinear equations of motion are presented in vector-dyadic form, and used to obtain approximate expressions which are then linearized in preparation for design of control laws that include feedback of flywheel kinetic energy error as a means of compensating for damping exerted by rotor bearings. Two flywheel steering laws are developed such that torque commanded by an attitude control law is achieved while energy is stored or discharged at the required rate. Using the International Space Station as an example, numerical simulations are performed to demonstrate control about a torque equilibrium attitude, and illustrate the benefits of kinetic energy error feedback. Control laws for attitude hold are also developed, and used to show the amount of propellant that can be saved when flywheels assist the CMGs. Nonlinear control laws for large-angle slew maneuvers perform well, but excessive momentum is required to reorient a vehicle like the International Space Station.
Author
Spacecraft Control; Attitude Control; Control Moment Gyroscopes; Flywheels; Control Systems Design; Control Simulation; Control Theory; Equations Of Motion

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*.

20030052293 Lockheed Martin Astronautics, King of Prussia, PA
Annual Technical Progress for the RPS Program for the Period 25 September 2000 through 30 September 2001
2002; In English
Report No.(s): DE2002-788363; No Copyright; Avail: National Technical Information Service (NTIS)

The technical progress achieved during the period 25 September 2000 through 30 September 2001 on Contract DE-AC03-98S21256, System Design and Integration of a Radioisotope Power System (RPS) is described herein. This report is organized by current program task structure. Contents: AMTEC/ARPS Design; AMTEC Conversion System Development and Testing; RTG Design and Development; Materials; AMTEC ARPS Qualification Unit; ARPS Flight Unit; Launch Support; Launch Safety Analysis and Assessment Support; Power System Design and Mission Application Studies; Spacecraft

Integration and JPL Liaison; Program Management; Subcontract Management; Quality and Reliability; Readiness.
NTIS
Design Analysis; Radioisotope Batteries; Performance Tests; Safety; Reliability

20
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*.

20030045730 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Semi-Empirical Prediction Methods to Determine Explosion Effects, Part 2, Evaluation and Comparison
Rhijnsburger, M. P. M.; vanDoormaal, J. C. A. M.; February 2003; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/D/429; TNO Proj. 014.11904
Report No.(s): PML-2003-A1-Pt-2; TD2003-0175-Pt-2; Copyright; Avail: Other Sources

To predict the loads due to an explosion, a large number of semi-empirical programs can be utilized. The choice of which program to use, is primarily based on the availability of the program and the user s experience with that program. However, the suitability of the different programs to a specific problem can be different. Until now, no good overview is present of what program is best for a specific topic. In the framework of the VDI-programme, a study, in order to identify the capabilities of the available programs at TNO Prins Maurits Laboratory TNO-PML has been carried out and is presented in this report. In the first part of this study an inventory has been made of the programs available at TNO-PML. A description of these semiempirical programs and other known programs is given. For the semi-empirical programs, available at TNO-PML, matrixes with the application areas had been made. All the information was obtained from the manuals or other ('written') sources. In this second part of the study, the programs are used and compared with measured data from experiments. With this information a better judgement of the programs can be given. In Chapter 2 a short description is given of the tests which measurements are used as reference for the present study. Then in Chapter 3 some specific features of the way the programs are used are described. Next, the results are described and compared in Chapters 4 to 6. Finally, conclusions and recommendations are given in Chapter 7.
Author
Explosions; Effectiveness; Prediction Analysis Techniques; Experimentation

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 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20030037133 Department of Housing and Urban Development, Washington, DC, Centers for Disease Control and Prevention, Atlanta, GA, Environmental Protection Agency, Washington, DC
Lead Paint Safety: A Field Guide for Painting, Home Maintenance, and Renovation Work
Mar. 2001; 88 pp.; In English
Report No.(s): PB2003-102699; HUD-1779-LHC; No Copyright; Avail: CASI; A05, Hardcopy

Every child should have a lead-safe home. That's why HUD is working to create lead-safe affordable housing through outreach and public education, a lead hazard control grant program, worker training, and the enforcement of regulations. This guide is one part of HUDs comprehensive approach to lead safety in the home. If you perform routine maintenance on homes or apartments built before 1978, this guide will help you plan and carry out your work safely. Step-by-step instructions and illustrations explain and show what you need to do to protect yourself and your clients if you are working in older housing that could contain lead paint. This Field Guide is a valuable tool that thousands of workers and contractors across the country are using as part of a national effort to eliminate childhood lead poisoning.
NTIS
Lead Poisoning; Paints; Safety; Handbooks

20030037142 Geological Survey, Portland, OR, Corps of Engineers, Portland, OR

Total Dissolved Gas and Water Temperature in the Lower Columbia River, Oregon and Washington, 2002: Quality-Assurance Data and Comparison to Water-Quality Standards

Tanner, D. W.; Johnston, M. W.; Bragg, H. M.; 2002; In English

Report No.(s): PB2003-102723; WRIR-02-4283; No Copyright; Avail: National Technical Information Service (NTIS)

The U.S. Army Corps of Engineers (USACE) operates several dams in the Columbia River Basin, which encompasses 259,000 square miles of the Pacific Northwest. These dams are multipurpose facilities that fill regional needs for flood control, navigation, irrigation, recreation, hydopower production, fish and wildlife habitat, water-quality maintenance, and municipal and industrial water supply. When water is released through the spillways of these dams (instead of being routed through the turbines to generate electricity), air is entrained in the water, increasing the concentration of total dissolved gas (TDG) down-stream from the spillways. Consequently, TDG may exceed Oregon and Washington water-quality standards for the protection of freshwater aquatic life. Concentrations above 110\% saturation have been shown to cause gas-bubble trauma in fish and adversely affect other aquatic organisms.

NTIS

Water Quality; Water Temperature

20030037144 Westinghouse Savannah River Co., Aiken, SC

PUREX Organic Waste Solidification (U)

Langton, C. A.; Dec. 03, 2002; In English

Report No.(s): DE2002-805854; WSRC-TR-2002-00570; No Copyright; Avail: National Technical Information Service (NTIS)

Approximately 38,000 gallons of PUREX waste is currently stored in H-Area at the New Solvent Storage Facility (NSST). About 25,000 gallons of this waste is an organic liquid containing solvents from the PUREX process. This waste was originally planned for treatment at the Consolidated Incineration Facility (CIF). However, because of the high cost to restart and operate the CIF, a more cost effective treatment alternative is desired. The goal is a waste treatment producing an acceptable waste form for final disposal either at the SRS low-level waste landfill in E-Area or at the Nevada Test Site (NTS). This report summarizes the results of a feasibility study that evaluated solidification as an alternative treatment for organic waste.

NTIS

Solvents; Radioactive Wastes; Waste Treatment; Organic Compounds

20030038795 Lawrence Livermore National Lab., Livermore, CA

Livermore Big Trees Park: 1998 Results

Mac Queen, D.; Gallegos, G.; Surano, K.; Apr. 18, 2002; 134 pp.; In English

Report No.(s): DE2002-15002152; UCRL-ID-143311; No Copyright; Avail: Department of Energy Information Bridge

This report is an in-depth study of results from environmental sampling conducted in 1998 by the Lawrence Livermore National Laboratory (LLNL) at Big Trees Park in the city of Livermore. The purpose of the sampling was to determine the extent and origin of plutonium found in soil at concentrations above fallout-background levels in the park. This report describes the sampling that was conducted, the chemical and radio-chemical analyses of the samples, the quality control assessments and statistical analyses of the analytical results, and LLNL's interpretations of the results. It includes a number of data analyses not presented in LLNL's previous reports on Big Trees Park.

NTIS

Plutonium; Background Radiation

20030045763 Lawrence Livermore National Lab., Livermore, CA

Final Report for Poly HANAA

Richards, J. B.; Stratton, P. L.; Benett, W. J.; Koopman, R. P.; Milanovich, F. P.; Apr. 30, 2001; In English

Report No.(s): DE2002-802586; UCRL-ID-144099; No Copyright; Avail: National Technical Information Service (NTIS)

The PolyHanaa is a 24 chamber thermal cycling instrument designed to perform rapid, real-time optical detection of biological agents using the Polymerase Chain Reaction (PCR) process with TaqManTM reagents. Liquid samples are pipetted into small, disposable polypropylene tubes that are then inserted into the chambers. The 24 duplex chambers are divided into

6 independent groups and run information is presented simultaneously, in real time, for all groups.
NTIS
Detection; Biological Weapons; Chain Reactions (Chemistry); Optical Measurement; Thermal Cycling Tests

20030051413 Numatec Hanford Corp., Richland, WA
Waste Feed Delivery PUREX PROCESS CONNECTOR DESIGN PRESSURE
Brackenbury, P. J.; Apr. 11, 2000; 34 pp.; In English
Report No.(s): DE2002-803004; RPP-5793; No Copyright; Avail: Department of Energy Information Bridge
The pressure retaining capability of the PUREX process connector is documented. A context is provided for the connector's current use within existing Projects. Previous testing and structural analyses campaigns are outlined. The deficient condition of the current inventory of connectors and assembly wrenches is highlighted. A brief history of the connector is provided. A bibliography of pertinent references is included.
NTIS
Gaskets; Connectors

20030051429 Analytical Chemistry Organization, Oak Ride, TN, Tennessee Univ., Knoxville. Dept. of Chemistry, Oak Ridge National Lab., TN
Enhanced Trace-Fiber Color Discrimination by Electrospray Ionization Mass Spectrometry: A Quantitative and Qualitative Tool for the Analysis of Dyes Extracted from Sub-Millimeter Nylon Fibers
Tuinman, A. A.; Lewis, L. A.; Lewis, S. A.; Sep. 26, 2002; 30 pp.; In English
Report No.(s): DE2002-805817; Y/DK-2030; No Copyright; Avail: Department of Energy Information Bridge
The application of electrospray-ionization mass spectrometry (ESI-MS) to trace-fiber color analysis is explored using acidic dyes commonly employed to color nylon-based fibers, as well as extracts from dyed nylon fibers. Qualitative information about constituent dyes and quantitative information about the relative amounts of those dyes present on a single fiber become readily available using this technique. Sample requirements for establishing the color-identity of different samples (i. e., comparative trace-fiber analysis) are shown to be submillimeter. Absolute verification of dye-mixture identity (beyond the comparison of molecular weights derived from ESI-MS) can be obtained by expanding the technique to include tandem mass spectrometry (ESI-MS/MS). For dyes of unknown origin, the ESI-MS/MS analyses may offer insights into the chemical structure of the compound - information not available from chromatographic techniques alone. This research demonstrates that ESI-MS is viable as a sensitive technique for distinguishing dye constituents extracted from a minute amount of trace fiber evidence. A protocol is suggested to establish/refute the proposition that two fibers - one of which is available in minute quantity only - are of the same origin.
NTIS
Dyes; Nylon (Trademark); Chemical Composition; Chromatography; Law (Jurisprudence)

20030051430 Lawrence Livermore National Lab., Livermore, CA
Establishing the Value of Advanced Galzings
Lee, E. S.; Selkowitz, S. E.; Jan. 1999; 16 pp.; In English
Report No.(s): DE2002-806094; LBNL-42761; No Copyright; Avail: Department of Energy Information Bridge
Numerous glazing technologies are under development worldwide to improve the performance of building facades. High-performance glazings can provide substantial energy and related environmental benefits, but often at greatly increased first cost when compared to conventional design solutions. To increase market viability, we discuss strategies to reduce the actual and owner-perceived costs associated with developing and producing advanced window systems, specifically switchable electrochromic glazings, and we also suggest marketing strategies designed to appeal to early adopter and mainstream purchasers. These strategies may be applicable to a broad range of advanced glazing materials.
NTIS
Glazes; Buildings

20030051439 Environmental Protection Agency, Cincinnati, OH
Office of Water Methods and Guidance, Version 2.0 - Suite
Jun. 2002; In English
Report No.(s): PB2002-500076; No Copyright; Avail: National Technical Information Service (NTIS)
The Selected Office of Water Methods and Guidance CD-ROM includes recently developed and frequently requested

analytical methods and related guidance, including methods for the detection of trace metals, microbiological contaminants, and organics in wastewater and drinking water, chemical and biological methods for biosolids, guidance documents on Office of Water's (OW) revised approach to method approval, whole affluent toxicity testing, and oil and grease analysis. This video demonstrates the 'clean' field sampling techniques described in EPA draft method 1669: Sampling Ambient Water for Determination of Metals at EPA Water Quality Criteria Levels. Method 1669 was designed to support the implementation of water quality monitoring and permitting programs administered under the Clean Water Act. The video provides viewers with instruction on the collection of both ambient and effluent samples for total recoverable and dissolved metals. The video will be used for training purposes at meeting, conferences, and workshops.
NTIS
Methodology; Chemical Analysis; Waste Water; Potable Water

20030051498 Iowa State Univ. of Science and Technology, Ames, IA
Development of Novel Polymeric Materials for Gene Therapy and pH-Sensitive Drug Delivery: Modeling, Synthesis, Characterization, and Analysis
Anderson, B. C.; 2002; 188 pp.; In English
Report No.(s): DE2003-804533; No Copyright; Avail: Department of Energy Information Bridge
The underlying theme of the research is the use of the polymeric materials in bioapplications. Chapters 2-5 either develop a fundamental understanding of current materials used for bioapplications or establish protocols and procedures used in characterizing and synthesizing novel materials. In chapters 6 and 7 these principles and procedures are applied to the development of materials to be used for gene therapy and drug delivery.
NTIS
Product Development; Copolymers; Biopolymers; Drugs; Chemical Analysis; Synthesis (Chemistry)

20030051537 Research Triangle Inst., Durham, NC
Flamespray Coating as an Environmentally Acceptable Pavement Marking Technique
Andrady, A.; Feb. 2003; 32 pp.; In English
Report No.(s): PB2003-102865; No Copyright; Avail: CASI; A03, Hardcopy
The approach used in this effort was to attempt flamespray coating of appropriate resins onto asphalt (and/or concrete) pavements as a cost-effective and environmentally-compatible means of marking. The technique of flamespray coating with powder resin materials has been extensively tested for pavement marking. The authors propose to demonstrate the feasibility of using novel powder resins, specially those based on the already established thermoplastic materials, as flamesprayed coatings as an effective environmentally acceptable pavement marking system.
NTIS
Pavements; Sprayed Coatings; Flame Spraying; Marking; Transportation

20030051557 Manufactured Housing Research Alliance, New York, NY
Opportunities to Improve Manufactured Housing through the Use of Advanced Adhesives and Sealants
Jan. 02, 2003; 38 pp.; In English
Report No.(s): PB2003-103073; No Copyright; Avail: CASI; A03, Hardcopy
Factory-produced housing provides many opportunities for adhesive-based automation and assembly line methods to significantly reduce labor and increase building performance and durability. Newer adhesives are also available that reduce worker exposure to dangerous chemicals, reduce air pollution and minimize waste disposal concerns that are becoming more common with older solvent-based products. A team from government and industry was assembled to investigate these opportunities, including representatives from home manufacturers; adhesives manufacturers and distributors; engineering, testing and certification firms; and the U.S. Department of Housing and Urban Development.
NTIS
Buildings; Fabrication; Manufacturing; Adhesives; Sealers

20030051565 Environmental Protection Agency, Washington, DC
Emergency Planning Community Right-To-Know Act Section 313 Reporting Guidance for Spray Application and Electrodeposition of Organic Coatings
Dec. 1998; 176 pp.
Report No.(s): PB2003-103110; EPA/745/R-98/014; No Copyright; Avail: CASI; A09, Hardcopy

This document supersedes the booklets entitled Title III Section 313 Release Reporting Guidance, Estimating Chemical Releases from Electrodeposition of Organic Coatings and Title III Section 313 Release Reporting Guidance, Estimating Chemical Releases from Spray Application of Organic Coatings, both dated January 1988. It is intended to assist establishments and facilities performing electrodeposition and spray application of organic coatings in complying with the Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313 reporting requirements, the preparation of Form R or the alternate certification statement, Form A. The EPCRA Section 313 program is commonly referred to as the Toxic Chemical Release Inventory (TRI).

NTIS

Electrodeposition; Organic Materials; Toxicity; Sprayed Coatings; Chemical Compounds

20030052006 Lawrence Livermore National Lab., Livermore, CA

Brookhaven Synchrotron WAXS and SAXS Studies of Kel-F 800

Cook, B.; Dec. 03, 1999; 34 pp.

Report No.(s): DE2002-15001994; No Copyright; Avail: Department of Energy Information Bridge

On August 11 - 13, 1999, Cheng Saw and I collected WAXS and SAXS data on Kel- F 800 and poly(chlorotrifluoroethane) (pCTFE) polymer samples using the Advanced Polymer Beamline at the National Synchrotron Light Source at Brookhaven National Laboratory. The purpose of these experiments was to attempt to gain insight into the structure of the polymer in both amorphous and crystalline states.

NTIS

Kel-F; Wide Angle Lenses; X Ray Scattering; Synchrotron Radiation; Polymers

20030052023 Lawrence Livermore National Lab., Livermore, CA

Laser Induced Material Modification in the Bulk KDP Crystals

Demos, S. G.; Radousky, H. B.; Staggs, M.; Runkel, M.; Burnham, A.; Dec. 16, 1999; 14 pp.; In English

Report No.(s): DE2002-791032; UCRL-JC-136902; No Copyright; Avail: Department of Energy Information Bridge

Laser induced material modifications in the bulk and on the surface of KDP (KH2PO4) and DKDP (70-80\% deuterated KDP) are studied using fluorescence imaging and spectroscopy. Photoluminescence is observed at damaged regions following above threshold exposure with an emission peak centered at 550-nm. In addition, surfaces exposed to greater than 100 high power, 355-nm laser pulses reveal a reduced surface finishing quality as evidenced by an associated emission under UV photoexcitation. The emission spectra from the laser-induced damage sites and the laser degraded surfaces are similar suggesting the generation of similar defect species.

NTIS

Crystals; Laser Induced Fluorescence; Photoluminescence; Imaging Techniques; Laser Beams

20030052024 Lawrence Livermore National Lab., Livermore, CA

Effects of Moisture on LiD Single Crystals Studied by Temperature Programmed Reaction

Dinh, L. N.; Balooch, M.; Cecala, C. M.; Leckey, J. H.; Sep. 14, 2000; 30 pp.; In English

Report No.(s): DE2002-791077; UCRL-JC-140650; No Copyright; Avail: Department of Energy Information Bridge

Temperature programmed reaction (TPR) technique was performed on LiOH powders and LiD single crystals previously exposed to different moisture levels. Our results show that the LiOH decomposition process has an activation energy barrier of 30 to 33.1 kcal/mol. The LiOH structure is stable even if kept at 320 K for 100 years. However, LiOH structures formed on the surface of LiD during moisture exposure at low dosages may have multiple activation energy barriers, some of which may be much lower than 30 kcal/mol. We attribute the lowering of the activation energy barrier for the LiOH decomposition to the existence of dangling bonds, cracks, and other long range disorders in the LiOH structures formed at low levels of moisture exposure. These defective LiOH structures may decompose significantly over the next 100 years of storage even at room temperature. At high moisture exposure levels, LiOH.H2O formation is observed. The release of H2O molecules from LiOH.H2O structure has small activation energy barriers in the range of 13.8 kcal/mol to 16.0 kcal/mol. The loosely bonded H2O molecules in the LiOH. H2O structure can be easily pumped away at room temperature in a reasonable amount of time. Our experiments also suggest that handling LiD single crystals at an elevated temperature of 340 K or more reduces the growth rate of LiOH and LiOH.H2O significantly. Therefore, a proposed way of minimizing hydrogen formation (due to H2O reaction with LiD) in a closed system containing LiOH in the presence of LiD may be to handle LiD at a slightly, elevated temperature during the assembly.

NTIS

Single Crystals; Chemical Bonds; Lithium Hydroxides; Activation Energy; High Temperature

20030052044 Lawrence Livermore National Lab., Livermore, CA
Inter-Laboratory Uranium Double-Spike Experiment
Russ, G. P.; Nov. 11, 1999; 42 pp.; In English
Report No.(s): DE2002-792251; UCRL-ID-136975; No Copyright; Avail: Department of Energy Information Bridge

In environmental samples, the major analytical limitation on the use of uranium 238U/235U determinations as an indicator of uranium enrichment is mass dependent bias occurring during the measurement. The double-spike technique can be used to correct the data for this effect. The purpose of this experiment was to evaluate the variation of mass bias among several laboratories and to determine the extent to which the double-spike could be used to reduce analytical uncertainty. Four laboratories performed replicate analyses on each of three samples. Generally mass bias was determined to be small compared to the random scatter of the measurements, but in at least one case, the bias was greater than 1\%.
NTIS
Uranium; Environmental Monitoring; Mass Spectroscopy

20030052070 Lawrence Livermore National Lab., Livermore, CA
Kinetics of Beta-((14)C) Carotene in a Human Subject Using Accelerator Mass Spectrometry
Dueker, S. R.; Lin, Y.; Follett, J. R.; Clifford, A. J.; Buchholz, B. A.; Jan. 31, 2000; 10 pp.; In English
Report No.(s): DE2002-793945; UCRL-JC-139205; No Copyright; Avail: Department of Energy Information Bridge

Beta-carotene is a tetraterpenoid distributed widely throughout the plant kingdom. It is a member of a group of pigments referred to as carotenoids that have the distinction of serving as metabolic precursors to vitamin A in humans and many animals. We used Accelerator Mass Spectrometry (AMS) to determine the metabolic behavior a physiologic oral dose of Beta-((14)C) carotene (200 nanoCuries; 0.57) in a healthy human subject. Serial blood specimens were collected for 210-d and complete urine and feces were collected for 17 and 10-d, respectively. Balance data indicated that the dose was 42\% bioavailable. The absorbed Beta-carotene was lost slowly via urine in accord with the slow body turnover of 13-carotene and vitamin A. HPLC fractionation of plasma taken at early time points (0-24-h) showed the label was distributed between 13-carotene and retinyl esters (vitamin A) derived from intestinal metabolism.
NTIS
Carotene; Human Beings; Mass Spectroscopy

20030052195 Geological Survey, Northborough, MA, Environmental Protection Agency, Washington, DC
Guidance on the Use of Passive-Vapor-Diffusion Samplers to Detect Volatile Organic Compounds in Ground-Water-Discharge Areas, and Example Applications in New England
Church, P. E.; Vroblesky, D. A.; Lyford, F. P.; Willey, R. E.; 2002; In English
Report No.(s): PB2003-103562; USGS/WRI-02-4186; No Copyright; Avail: National Technical Information Service (NTIS)

Polyethylene-membrane passive-vapor diffusion samplers, or PVD samplers, have been shown to be an effective and economical reconnaissance tool for detecting and identifying volatile organic compounds (VOCs) in bottom sediments of surface-water bodies in areas of ground-water discharge. The PVD samplers consist of an empty glass vial enclosed in two layers of polyethylene membrane tubing. When samplers are placed in contaminated sediments, the air in the vial equilibrates with VOCs in pore water. Analysis of the vapor indicates the presence or absence of VOCs and the likely magnitude of concentrations in pore water. detected to more than 1,000,000 parts per billion by volume. These results provided insights about contaminant distributions and ground-water-flow patterns in discharge areas, and have guided the design of focused characterization activities.
NTIS
Ground Water; Volatile Organic Compounds; Water Pollution; Pollution Control

20030052278 National Inst. of Standards and Technology, Gaithersburg, MD
Factors Affecting Ultrasonic Extraction of Lead from Household Paint Films: Further Investigations
Rossiter, W. J.; Toman, B.; McKnight, M. E.; Emenanjo, I.; Anaraki, M. B.; Mar. 2003; 42 pp.; In English
Report No.(s): PB2003-103340; NISTIR-6948; No Copyright; Avail: CASI; A03, Hardcopy

Previous studies at NIST on the use of ultrasonic extraction/anodic stripping voltammetry (UE/AV) for determining lead in household paint found that the particle size of the ground specimen plays an important role in lead extraction efficiency, particularly when the extraction is performed under the commonly used sonication conditions of 45 degrees C and 30 min. Consequently, it was proposed that, in conducting a UE/ASV analysis of a paint-film specimen in the field, the specimen particle size should be estimated prior to selecting an appropriate combination of sonication temperature and time. This report

presents the results of a follow-up study performed to evaluate the reliability and practicality of the particle size recommendation.
NTIS
Lead (Metal); Quantitative Analysis; Paints

24
COMPOSITE MATERIALS

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

20030037169 Tuskegee Inst., AL, USA
Survivability of Affordable High Temperature Polymer Matrix Composites for Propulsion Engine Components
Dean, Derrick; Haque, Anwar; Vaidya, Uday; Meador, Michael A., Technical Monitor; April 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2654; WU 708-87-23-00
Report No.(s): NASA/CR-2003-212192; NAS 1.26:212192; E-13795; No Copyright; Avail: CASI; A03, Hardcopy

PMR-type polyimides are regarded as state of the art high temperature polymers, due to their excellent thermo-mechanical properties and thermo-oxidative stability. One of their drawbacks, however is the inability to process them using cost-effective processing methods such as Resin Transfer Molding (RTM) and Resin Film Infusion (RFI). Development of low viscosity, high temperature polymers has been the subject of intense research. Recently, a new generation of low viscosity polyimides were synthesized by the introduction of twisted biphenyl or binapthyl groups into the backbone. This report details the progress for Year 1, which has involved acquiring samples and initiating Phases I and II of the proposed research. Specifically, studies of the process-property relationships of a series of polymers using oligomers based on 2,3,3' ,4'-biphenyltertracarboxylic dianhydride (PBDA) and a mixture of a diamine, BAX and a triamine, 1,3,5-Tris (4-aminophenoxybenzene), TAB, where the amount of TAB was varied have been initiated. The sample containing 10 percent TAB possesses a slightly higher degree of crystalline order versus that of the 20 percent TAB sample, based on x-ray diffraction studies of the b-staged oligomers. Both systems lose all of the crystalline order upon curing, however. The chemorheology has been studied as a function of the TAB content. While the magnitude of the viscosity is essentially the same for both systems, the cure kinetics of the 10 percent TAB system is faster than that for the 20 percent TAB system. The sample exhibits a melting-recrystallization-remelting behavior before the crosslinking commences. Correlation of other kinetic parameters, such as the activation energies for curing, the Tg and mechanical properties to the structure of these systems is underway. Future studies will involve characterization of mechanical and thermal properties of the pure resins and the fabrication of fiber reinforced composites using these materials.
Author
Polymer Matrix Composites; Polyphenyls; Crystallinity; Mechanical Properties; Oligomers; Polyimides

20030038963 NASA Glenn Research Center, Cleveland, OH, USA
Dependency of Shear Strength on Test Rate in SiC/BSAS Ceramic Matrix Composite at Elevated Temperature
Choi, Sung R.; Bansal, Narottam P.; Gyekenyesi, John P.; April 2003; 20 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 22-714-04-30
Report No.(s): NASA/TM-2003-212182; E-13783; NAS 1.15:212182; Copyright; Avail: CASI; A03, Hardcopy

Both interlaminar and in-plane shear strengths of a unidirectional Hi-Nicalon(TM) fiber-reinforced barium strontium aluminosilicate (SiC/BSAS) composite were determined at 1100 C in air as a function of test rate using double notch shear test specimens. The composite exhibited a significant effect of test rate on shear strength, regardless of orientation which was either in interlaminar or in in-plane direction, resulting in an appreciable shear-strength degradation of about 50 percent as test rate decreased from 3.3 10(exp -1) mm/s to 3.3 10(exp -5) mm/s. The rate dependency of composite's shear strength was very similar to that of ultimate tensile strength at 1100 C observed in a similar composite (2-D SiC/BSAS) in which tensile strength decreased by about 60 percent when test rate varied from the highest (5 MPa/s) to the lowest (0.005 MPa/s). A phenomenological, power-law slow crack growth formulation was proposed and formulated to account for the rate dependency of shear strength of the composite.
Author
Ceramic Matrix Composites; Crack Propagation; Shear Strength; Notch Tests; High Temperature Tests

20030045766 Lawrence Livermore National Lab., Livermore, CA
Failure Plane Orientations for Fiber Composites
Christensen, R. M.; DeTeresa, S. J.; Jul. 12, 2002; 16 pp.
Report No.(s): DE2002-802840; UCRL-JC-149293; No Copyright; Avail: Department of Energy Information Bridge

Using a recently developed failure theory for transversely isotropic fiber composites, it is shown how the orientation of the failure surface can be determined for transverse tension; and compression. Experimental data on failure surface orientations have been obtained for four carbon fiber composite systems based on both thermoplastic and thermosetting matrix materials. Average compression failure planes for the diflerent composite materials were measured to range from 31DG to 3 8 O from the load axis. Reasonable agreement was obtained between these measured angles and those predicted from application of the new failure theory.
NTIS
Fiber Composites; Fiber Orientation; Fatigue (Materials)

20030051471 Wichita State Univ., KS
Damage Tolerance Characterization of Sandwich Composites Using Response Surfaces
Lacy, T. E.; Samarah, I. K.; Tomblin, J. S.; Nov. 2002; 54 pp.; In English
Report No.(s): PB2003-102192; No Copyright; Avail: CASI; A04, Hardcopy

The influence of material configuration and impact parameters on the damage tolerance characteristics of sandwich composites comprised of carbon-epoxy woven fabric facesheets and Nomex honeycomb cores was investigated using empirically based response surfaces. A series of carefully selected tests were used to isolate the coupled influence of various combinations of the number of facesheet plies, core density, core thickness, impact energy, impactor diameter, and impact velocity on the residual strength degradation due to vertical impact. The ranges of selected material parameters were typical of those found in common aircraft applications. Quadratic response surface estimates of the compressive residual strength as a continuous function of sandwich configuration and impact parameters did not correlate as well as impact resistance because of bifurcations between failure modes. For a fixed set of impact parameters, regression results suggest that impact damage development and residual strength degradation is highly sandwich configuration dependent. Increasing the number of facesheet plies and the thickness of the core material resulted in the greatest improvement in the damage tolerance characteristics. An increase in the impactor diameter and impact energy results in a significant decrease in the estimated residual strength, particularly for those sandwich panels with thicker facesheets. The effects of impact velocity on damage formation and loss of strength were also addressed.
NTIS
Sandwich Structures; Tolerances (Mechanics); Damage Assessment; Mechanical Properties; Fracture Mechanics

20030052086 Fermi National Accelerator Lab., Batavia, IL
Kinetics of Phase Growth in the Cu-Sn System and Application to Composite Nb(3)Sn Strands
Mattafirri, S.; Barzi, E.; Fineschi, F.; Rey, J. M.; Nov. 2002; 10 pp.; In English
Report No.(s): DE2003-804650; FERMILAB-CONF-02/175-E; No Copyright; Avail: Department of Energy Information Bridge

Nb(sub3)Sn is the superconductor most used in the R&D of high field accelerator magnets by either the wind & react or the react & wind technique. In order to program the low temperature steps of the heat treatment, the growth kinetics of Cu-Sn intermetallics was investigated as a function of duration and temperature The diffusion constants of n, epsilon and delta phases between 150 and 550 degrees C were evaluated using Cu-Sn model samples. Statistical and systematic errors were thoroughly evaluated for an accurate data analysis. Next the behavior of Internal Tin ad Modified Jelly Roll Nb(sub 3) Sn composites was compared with the model predictions.
NTIS
Intermetallics; Superconductors (Materials); Copper; Tin; Composite Materials; Phase Transformations

20030052147 Institute of Industrial Technology TNO, Enschede, Netherlands
Survey of the Possibilities of Application of Ceramic Coatings on Textile Cloth
Schrijer, G. J. M.; February 2003; 46 pp.; In Dutch
Contract(s)/Grant(s): UTP-872.2662.0780.00
Report No.(s): Rept-42/02.0004602; TD-2003-0163; Copyright; Avail: Other Sources

A literature search has been performed in order to provide information about the possibilities of application of ceramic

coatings on textile cloth. Two different types of ceramic coatings have been distinguished: (1) hybrid coatings or nano-composite coatings composed of an anorganic/organic (ceramic) component which is disperse a nano-scale fineness (10(exp -9)) and (2) conventional textile coatings filled with ceramic beads of micro-dimensions. Both coating types are different in physical/chemical composition and possess different properties: (1) Hybrid coatings are mechanically strong and chemically and thermally resistant by nature. By chemical modification other functional properties may be introduced e.g. hydrophobic/hydrophilic, antistatic and antibiot properties and possibly flame retardancy. (2) Conventional coatings filled with ceramic particles provide thermal isolation, are wear-resistant and dirt-repellent. Application of the coating on textile cloth is specific for each of the two coatings. End-uses of textiles coated with ceramics are expected in the area of technical textiles e.g. protective clothing. Commercial supply of the hybrid coatings is hardly possible at the moment. Laboratory production of specific coating compositions is necessary. Ceramic filled conventional coatings are supplied by one company.
Author
Ceramic Coatings; Textiles; Nanocomposites; Beads

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20030037059 Clark Atlanta Univ., GA
Study of the Effects of Ambient Conditions Upon the Performance of Fan Powered, Infrared, Natural Bas Burners
Dec. 2002; 68 pp.; In English
Report No.(s): DE2002-805233; No Copyright; Avail: Department of Energy Information Bridge

The final report describes work performed under DOE Grant No. DE-FG22-94MT94011 during the period September 1, 1994 to May 28, 1997. The objective of this investigation is to characterize the operation of a fan-powered, infrared burner (IR burner) at various gas compositions and ambient conditions, develop numerical model to simulate the burner performances, and provide design guidelines for appliances containing PIR burners for satisfactory performance.
NTIS
Natural Gas; Burners; Ambient Temperature

20030037100 Westinghouse Savannah River Co., Aiken, SC
Behavior of Pu and Gd Mixtures Under Simulated SRAT Conditions (U)
Bibler, N. E.; Bronikowski, M. G.; Gray, J. H.; Hill, B. C.; May 13, 2002; 40 pp.
Report No.(s): DE2002-805603; No Copyright; Avail: Department of Energy Information Bridge

A mechanism was found for separating Pu from Gd in the SRAT cycle. The separation could not be spatially quantified by SEM due to being at or below the LOD of the method. From solubility only 2.6\% of the Gd is solubilized at normal SRAT conditions. Pu solubility, as expected, is very low, ranging from 0.32\% to 10\% in the bounding conditions studied. The Gd solubility appears to be dependent on the relative amount of the more soluble sludge components. In the pH and concentration range studied here, the amount of Gd that is solubilized ranges from 13\% to 47\% with sludge and essentially 100\% in the absence of sludge.
NTIS
Sludge; Tanks (Containers); Waste Management; Radioactive Wastes

20030037129 National Inst. of Standards and Technology, Gaithersburg, MD, Laboratoire de Mineralogie-Cristallographie, Paris (France)
X-Ray-Absorption Edge Separation Using Diffraction Anomalous Fine-Structure
Ravel, B.; Bouldin, C. E.; Renevier, H.; Hodeau, J. L.; Berar, J. F.; Dec. 24, 1998; 14 pp.; In English
Report No.(s): PB2003-102684; No Copyright; Avail: CASI; A03, Hardcopy

When two or more absorption edges in a material are sufficiently close in energy, Extended X-ray Absorption Fine-Structure (EXAFS) spectroscopy is of limited utility as the usable data range above the lower energy edge is truncated by the higher energy edge. Energy or wavelength discriminating detection methods may fail to resolve fluorescence lines which are very close in energy. In this paper we present a novel solution to this problem using the resolution in momentum transfer of Diffraction Anomalous Fine-Structure (DAFS) to separate the fine structure signals from elements with closely

spaced fluorescence lines. We demonstrate our technique by isolating the titanium edge signal from DAFS measurements.
NTIS
Diffraction; Fine Structure; X Ray Absorption; Anomalies; X Ray Spectroscopy

20030037168 Lawrence Livermore National Lab., Livermore, CA
Shock Induced Birefringence in Lithium Fluoride
Nguyen, J. H.; Holmes, N. C.; Jun. 01, 2001; In English
Report No.(s): DE2002-15002087; UCRL-JC-145221; No Copyright; Avail: National Technical Information Service (NTIS)

We have used an ellipsometer to measure the birefringence of lithium fluoride in shock compression experiments. In previous x-ray diffraction experiments, single crystal has been reported to remain cubic at moderate pressures.
NTIS
Birefringence; Ellipsometers; Lithium Fluorides; Shock Loads

20030037175 Air Products and Chemicals, Inc., Allentown, PA
Engineering Development of Slurry Bubble Column Reactor (SBCR) Technology
2002; 58 pp.; In English
Report No.(s): DE2002-803205; 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.
NTIS
Bubbles; Reactor Design; Reactor Technology; Slurries; Chemical Reactors

20030037184 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Nanoporous Silicon Carbide for Nanoelectromechanical Systems Applications
Hossain, T.; Khan, F.; Adesida, I.; Bohn, P.; Rittenhouse, T.; Lienhard, Michael, Technical Monitor; April 2003; 17 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2661; WU 708-87-23
Report No.(s): NASA/CR-2003-212198; NAS 1.26:212198; E-13801; No Copyright; Avail: CASI; A03, Hardcopy

A major goal of this project is to produce porous silicon carbide (PSiC) via an electroless process for eventual utilization in nanoscale sensing platforms. Results in the literature have shown a variety of porous morphologies in SiC produced in anodic cells. Therefore, predictability and reproducibility of porous structures are initial concerns. This work has concentrated on producing morphologies of known porosity, with particular attention paid toward producing the extremely high surface areas required for a porous flow sensor. We have conducted a parametric study of electroless etching conditions and characteristics of the resulting physical nanostructure and also investigated the relationship between morphology and materials properties. Further, we have investigated bulk etching of SiC using both photo-electrochemical etching and inductively-coupled-plasma reactive ion etching techniques.
Author
Nanostructure (Characteristics); Porous Silicon; Silicon Carbides; Nanotechnology; Crystal Morphology

20030038812 Georgia Inst. of Tech., Atlanta, GA, USA
Subgrid Combustion Modeling for the Next Generation National Combustion Code
Liu, Nan Suey, Technical Monitor; Menon, Suresh; Sankaran, Vaidyanathan; Stone, Christopher; April 2003; 34 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2660; WU 708-87-23
Report No.(s): NASA/CR-2003-212202; E-13805; NAS 1.26:212202; CCL-02-003; No Copyright; Avail: CASI; A03, Hardcopy

In the first year of this research, a subgrid turbulent mixing and combustion methodology developed earlier at Georgia Tech has been provided to researchers at NASA/GRC for incorporation into the next generation National Combustion Code

(called NCCLES hereafter). A key feature of this approach is that scalar mixing and combustion processes are simulated within the LES grid using a stochastic 1D model. The subgrid simulation approach recovers locally molecular diffusion and reaction kinetics exactly without requiring closure and thus, provides an attractive feature to simulate complex, highly turbulent reacting flows of interest. Data acquisition algorithms and statistical analysis strategies and routines to analyze NCCLES results have also been provided to NASA/GRC. The overall goal of this research is to systematically develop and implement LES capability into the current NCC. For this purpose, issues regarding initialization and running LES are also addressed in the collaborative effort. In parallel to this technology transfer effort (that is continuously on going), research has also been underway at Georgia Tech to enhance the LES capability to tackle more complex flows. In particular, subgrid scalar mixing and combustion method has been evaluated in three distinctly different flow field in order to demonstrate its generality: (a) Flame-Turbulence Interactions using premixed combustion, (b) Spatially evolving supersonic mixing layers, and (c) Temporal single and two-phase mixing layers. The configurations chosen are such that they can be implemented in NCCLES and used to evaluate the ability of the new code. Future development and validation will be in spray combustion in gas turbine engine and supersonic scalar mixing.

Author

Mathematical Models; Turbulent Flow; Turbulent Mixing; Multiphase Flow; Large Eddy Simulation; Turbulent Combustion; Reacting Flow

20030038817 NASA Glenn Research Center, Cleveland, OH, USA

Transient Evolution of a Planar Diffusion Flame Aft of a Translating Flat Plate

Gokoglu, Suleyman A.; April 2003; 17 pp.; In English; Second Mediterranean Combustion Symposium, 6-9 Jan. 2002, Sharm El-Sheikh, Egypt; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-101-42-02

Report No.(s): NASA/TM-2003-212107; NAS 1.15:212107; E-13762; No Copyright; Avail: CASI; A03, Hardcopy

The high degree of spatial symmetry of a planar diffusion flame affords great simplifications for experimental and modeling studies of gaseous fuel combustion. Particularly, in a microgravity environment, where buoyancy effects are negligible, an effectively strain-rate-free, vigorous flame may be obtained. Such a flame can also provide long residence times and large length scales for practical probing of flame structures and soot processes. This 2-D numerical study explores the feasibility of establishing such a planar diffusion flame in an enclosed container utilizing a realistic test protocol for a microgravity experiment. Fuel and oxygen mixtures, initially segregated into two half-volumes of a squat rectangular container by a thin separator, are ignited as soon as a flammable mixture is formed in the wake of the separator withdrawn in the centerplane. A triple-flame ensues that propagates behind the trailing edge of the separator. The results of calculations show that the mechanically- and thermally-induced convection decays in about two seconds. The establishment of a planar diffusion flame after this period seems feasible in the central region of the container with sufficient quantities of reactants left over for subsequent studies. An analysis of the flame initiation and formation process suggests how the feasibility of creating such a flame can be further improved.

Author

Diffusion Flames; Flat Plates; Fuel Combustion; Combustion Physics; Flame Stability; Flame Propagation

20030038872 CH2M Hill Hanford Group, Inc., Richland, WA

Nonradioactive Environmental Emissions Chemical Source Term for the Double-Shell Tank Vapor Space During Waste Retrieval Operations

May, T. H.; Estey, S. D.; Fort, L. A.; Hedengren, D. C.; Apr. 2000; 90 pp.; In English

Report No.(s): DE2002-803012; RPP-6023; No Copyright; Avail: Department of Energy Information Bridge

A nonradioactive chemical vapor space source term for tanks on the Phase 1 and the extended Phase 1 delivery, storage, and disposal mission was determined. Operations modeled included mixer pump operation and DST waste transfers. Concentrations of ammonia, specific volatile organic compounds, and quantitative volumes of aerosols were estimated.

NTIS

Radioactive Wastes; Vapors

20030038877 CH2M Hill Hanford Group, Inc., Richland, WA

Data and Observations of Single-Shell Flammable Gas Watch List Tank Behavior

Hedengren, D. C.; Feb. 14, 2001; 264 pp.; In English

Report No.(s): DE2002-806024; RPP-7249; No Copyright; Avail: Department of Energy Information Bridge

This report summarizes the available data, observations, and analyses performed relating to flammable gas generation, retention, and release in the nineteen single-shell nuclear waste storage tanks at the Hanford Site that are on the Flammable Gas Watch List (Public Law 101-510 1990). The tanks and the waste they contain are described in terms of their fill history, chemistry, and waste physical properties and configuration. In-situ measurement and monitoring systems are described and their data are summarized. The gas generation rates, retained gas volumes, and the spontaneous and induced gas release history of each tank are discussed. Saltwell pumping activities are also summarized, and the effects of pumping on gas generation, retention, and release are described.
NTIS
Flammable Gases; Radioactive Wastes; Storage Tanks

20030038899 Lawrence Livermore National Lab., Livermore, CA
Experimental Validation for Atomistic Simulations of the Deformation of Tantalum
Campbell, G. H.; Jan. 31, 2000; 12 pp.; In English
Report No.(s): DE2002-15002377; UCRL-ID-137430; No Copyright; Avail: Department of Energy Information Bridge
The transition metals exist in several crystal structures due to the influence of the d-bands on bonding. The central transition metals are stabilized in the body-centered-cubic (BCC) structure due to the approximately half filled d-bands. The d-bands have an inherent structure which imparts a directional dependence to the interatomic interactions. These electronic effects, through their influence on the core structure of dislocations, cause the unusual mechanical properties observed in these metals. Atomistic simulation offers a means of understanding the structure of dislocation cores and their structural changes and motion under the influence of applied stress. The interatomic distances and angles experienced by atoms residing in the core of a dislocation are highly disturbed from those in equilibrium lattice positions.
NTIS
Crystal Structure; Deformation; Mechanical Properties; Tantalum; Transition Metals; Computerized Simulation

20030038975 Technische Univ., Eindhoven
Analysis of a Stretched Stagnation Flame
de Goey, L. P. H.; ten Thije Boonkkamp, J. H. M.; Nov. 1998; 20 pp.
Report No.(s): PB2003-101952; EUT-98-WSK-03; No Copyright; Avail: CASI; A03, Hardcopy
In this paper the authors derive expressions for the flame temperature and the mass burning rate of a stretched stagnation flame with an infinitely thin reaction zone. Asymptotic expansions for weak stretch are also given.
NTIS
Flame Temperature; Flames; Stagnation Point

20030045717 Lawrence Livermore National Lab., Livermore, CA
Metals Far From Equilibrium: From Shocks to Radiation Damage
Bringa, E. M.; Wirth, B. D.; Caturla, M. J.; Stoelken, J.; Kalantar, D.; Jun. 22, 2002; In English
Report No.(s): DE2002-15002350; UCRL-JC-148559; No Copyright; Avail: National Technical Information Service (NTIS)
Shock waves and high-energy particle radiation can each drive materials far from thermodynamic equilibrium and enable novel scenarios in the processing of materials. A large number of theoretical and experimental studies of shock deformation have been performed on polycrystalline materials, but shock deformation in single crystals has only recently been studied in some detail. We present Molecular Dynamics (MD) simulations of the shock response of single crystal copper, modeled using an embedded atom potential that reproduces both defect formation and high pressure behavior. Shock-induced plasticity will also be discussed. Predicting the in-service response of ferritic alloys in future fusion energy environments requires a detailed understanding of the mechanisms of defect accumulation and microstructure evolution in harsh radiation environments, which include a high level of He generation concurrent with primary damage production. The second half of this paper describes results of atomistic MD and kinetic Monte Carlo simulations to investigate the role of He on point defect cluster behavior and damage accumulation in bcc Fe.
NTIS
Shock Waves; Thermodynamic Equilibrium; Radiation Damage

20030045787 Lawrence Livermore National Lab., Livermore, CA
Passive Corrosion Behavior of Alloy 22 in Multi-Ionic Aqueous Environments
Lian, T.; Estill, J. C.; Hust, G. A.; Fix, D. V.; Rebak, R. B.; Jun. 03, 2002; 18 pp.; In English
Report No.(s): DE2002-803183; UCRL-JC-147905; No Copyright; Avail: Department of Energy Information Bridge

In current waste packaging design, Alloy 22 (Ni-22Cr-13Mo-3W-3Fe) has been chosen as the candidate materials to fabricate a 2 cm outer layer of the high-level nuclear waste containers, as part of proposed geological repository at Yucca Mountain, Nevada. During the repository period, the container materials will be subject to the corrosion due to its exposure to the multi-ionic aqueous environments. Although Alloy 22 has demonstrated excellent corrosion resistance, but accumulation of small yearly corrosion rate for 10,000 or more years can be significant enough. The goal of this research is to seek alternative techniques to obtain a reasonably confident corrosion rate determination, since the conventional weight loss technique requires many years to achieve a detectable weight loss in Alloy 22 samples. This paper will discuss the latest experiment results in using potentiostatic technique to determine passive dissolution rates.
NTIS
Radioactive Wastes; Corrosion Resistance

20030045800 William J. Hughes Technical Center, Atlantic City, NJ
Correlation of Heat Release Calorimetry Measurements
Filipczak, R.; Lyon, R. E.; Nov. 2002; 28 pp.; In English
Report No.(s): PB2003-101716; No Copyright; Avail: CASI; A03, Hardcopy

The Ohio State University (OSU) Rate of Heat Release Apparatus specified in FAR Part 25.853 (a-1) defines both apparatus test conditions and pass/fail criteria for large surface area aircraft interior materials, such as sidewall panels, bulkheads, and stowage bins. The cone calorimeter (ASTM E-1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen consumption Calorimeter) similarly measure heat release rates from materials subjected to a constant external heat flux. However, heat release from the cone calorimeter is calculated by measuring the decrease in oxygen concentration in a stream of air flowing over the test specimen, rather than the temperature (enthalpy) increase of the air stream leaving the device, as is done with the OSU Rate of Heat Release Apparatus. This report will examine the differences between measurement of convective, radiant, and total heat release rates, and discuss techniques to obtain substantial conformity between the two techniques. Results for both methods are compared for single-ply, bisphenol-A epoxy-impregnated glass cloth.
NTIS
Heat Measurement; Thermodynamic Properties

20030045805 Chinese Inst. of Engineers, Taipei
Journal of the Chinese Institute of Engineers, Volume 25, No. 3, May 2002. Transactions of the Chinese Institute of Engineers, Series A
Wang, C. Y.; May 2002; 128 pp.; In English
Report No.(s): PB2003-101753; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Robust CMAC Control Schemes for Dynamic Trajectory Following; A Neural Network-Based Method for Fuzzy Parameter Tuning of PID Controllers; Limit Cycle Analysis for Electro-Hydraulic Systems with Friction; A Genetic Algorithm with Domain Knowledge for Weapon-Target Assignment Problems; Scene Analysis System Using A Combined Fuzzy Logic-Based Technique; Tracing the Complex Power of Generators; Perceptual Rate Control Algorithms for Low Bit-Rate Video Coding; A New Structured Isfet with Integrated Ti/Pd/Ag/AgCl Electrode and Micromachined Back-Side P Contacts; Study and Improvement of Near-Field Diffraction Limits of Circular Aperture Imaging Systems, and Flexible Stability Criteria of A Class of Neutral Systems with Multiple Time Delays via LMI Approach.
NTIS
Aerospace Engineering; Systems Engineering; Electrical Engineering; Chemical Engineering

20030051412 Lawrence Livermore National Lab., Livermore, CA
Energetic Materials and Atomic Force Microscopy: Structure and Kinetics
Weeks, B. L.; Weese, R. K.; Zaug, J. M.; Jul. 31, 2002; 14 pp.; In English
Report No.(s): DE2002-802849; UCRL-JC-145215; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
NTIS
Atomic Force Microscopy; Energetic Particles; Reaction Kinetics; Atomic Structure

20030051426 Westinghouse Savannah River Co., Aiken, SC
Analysis of Tank 43H Samples at the Conclusion of Uranyl Carbonate Addition
Oji, L. N.; Hobbs, D. T.; Jan. 25, 2002; 20 pp.; In English
Report No.(s): DE2002-803393; WSRC-TR-2001-00518; No Copyright; Avail: Department of Energy Information Bridge

Three variable depth samples from Tank 43H (TK43-HTF-E-106 (24 inches below liquid surface), TK43-HTF-E-113 (Middle depth sample, 200 inches) and TK43-HTF-E-110 (24 inches above sludge)), were characterized for actinides, cations and other chemical species of interest. Only the last variable depth sample, TK43-HTF-E-110 (24 inches above sludge), contained any visible solids. The U-235 enrichments, as measured by the weight percent of U-235 to U-238, in all three variable depth samples are less than 0.5 wt %; with the 24 inches above sludge sample showing the highest average enrichment of 0.483 plus or minus 0.037 wt % (liquid fraction) and 0.464 plus or minus 0.042 wt % (dry and digested solids). The U-235 enrichments in the other variable depth sample averaged 0.363 plus or minus 0.008 wt % for the 24 inches below liquid surface sample and 0.361 plus or minus 0.007 wt % for the middle depth sample. The U-235 enrichments are well within the acceptance criteria of 0.7 wt % established in the Nuclear Criticality Safety Evaluation (NCSE) for restart of the 2H Evaporator.

NTIS

Uranium 238; Uranium 235; Radiation Protection; Enrichment

20030051579 Bureau of Mines, Washington, DC

Cause of Floor Self-Heatings in and Underground Coal Mine

Miron, Y.; Lazzara, C. P.; Smith, A. C.; 1992; 34 pp.

Report No.(s): PB2003-103263; BUMINES-RI-9415; No Copyright; Avail: CASI; A03, Hardcopy

This report presents a U.S. Bureau of Mines study to identify the causes of self-heating events beneath the floor of a deep underground coal mine. Mine samples from both heated and unheated areas were examined by various techniques, including visual, microscopic, thermal, chemical, and instrumental tests. The combined results led to the conclusion that pyrite oxidation was the prime cause of the heatings. However adiabatic oven tests of selected samples did not indicate the effect of the pyrite on the self-heating process, probably because of the experimental conditions. A fast simple procedure tp assess the concentration of pyrite in the mine samples was developed, utilizing the reactivity of the sample with an aqueous solution of hydrogen peroxide.

NTIS

Coal; Mines (Excavations); Heating; Underground Structures

20030051610 Iowa State Univ. of Science and Technology, Ames, IA

Imaging Catalytic Surfaces by Multiplexed Capillary Electrophoresis with Absorption Detection

Christodoulou, M.; 2002; 50 pp.; In English

Report No.(s): DE2003-804534; No Copyright; Avail: Department of Energy Information Bridge

A new technique for in situ imaging and screening heterogeneous catalysts by using multiplexed capillary electrophoresis with absorption detection was developed. By bundling the inlets of a large number of capillaries, an imaging probe can be created that can be used to sample products formed directly from a catalytic surface with high spatial resolution. In this work, we used surfaces made of platinum, iron or gold wires as model catalytic surfaces for imaging. Various shapes were recorded including squares and triangles. Model catalytic surfaces consisting of both iron and platinum wires in the shape of a cross were also imaged successfully. Each of the two wires produced a different electrochemical product that was prepared by capillary electrophoresis. Based on the collected data we were able to distinguish the products from each wire in the reconstructed image.

NTIS

Electrophoresis; Catalysts; Absorption; Detection

20030052018 Lawrence Livermore National Lab., Livermore, CA

Numerical Simulation of Gas-Solid Interfaces with Large Deformations

Vorobiev, O. Y.; Lomov, I. N.; Feb. 01, 2000; 12 pp.; In English

Report No.(s): DE2002-791047; UCRL-JC-136868; No Copyright; Avail: Department of Energy Information Bridge

A method of treatment of multimaterial interfaces on Eulerian grids is developed which works well for mixtures of materials with diverse compressibilities and shear moduli. This makes it possible to use this method not only for problems of gas dynamics and solid mechanics but also to model fluid-structure interaction problems.

NTIS

Deformation; Gas-Solid Interfaces; Gas Dynamics; Shear Properties

20030052035 Lawrence Livermore National Lab., Livermore, CA

Dynamic and Thermodynamic Behavior of Carboneous and Hydrogen-Bonding Materials

Ree, F. H.; Galli, G.; Glosli, J. N.; Gygi, F.; Schwegler, E.; Feb. 04, 2000; 10 pp.; In English

Report No.(s): DE2002-792812; UCRL-JC-137515; No Copyright; Avail: Department of Energy Information Bridge

Dissociation behavior of carboneous materials with or without fluorine atoms at pressures (P) of tens of gigapascal (GPa) and temperature (2') at several thousand Kelvin is not so well understood. The main issues are: (a) carbon condensation processes and (b) thermodynamics of hydrogen fluoride (HF) produced from dissociation. Item (a) requires information on (i) the melting line of carbon, (ii) liquid carbon, (iii) stability and energy barrier between graphite and diamond clusters, and (iv) kinetics of cluster growth. Item (b) requires knowledge of (v) intermolecular potentials involving HF and (vi) influence of fluorine chemistry on supercritical phase change.

NTIS

Dissociation; Hydrogen Bonds; Thermodynamics; Bonding; Carbonaceous Materials

20030052041 Colorado Univ., Boulder, CO, USA

[Activities of Colorado University]

Snow, Theodore P.; Bierbaum, Veronica; April 25, 2003; 3 pp.; In English

Contract(s)/Grant(s): NAG5-11487; NAG5-6758; No Copyright; Avail: CASI; A01, Hardcopy

During the report period we completed several studies and embarked on a new set of laboratory experiments. We also hired a new post-doctoral Research Associate, Momir Stepanovic, who has gradually assumed leadership in the laboratory work. The other person involved has been graduate student Brian Eichelberger, who will complete his Ph.D. based on this work by late spring of this year. We have also continued to collaborate with our previous postdoctoral Research Associate, Valery Le Page, through a consulting arrangement. In the following sections we summarize work that has been completed and either in print, in press, or in final stages of preparation for publication; current work being carried out in the laboratory; and plans for the coming year. Work completed in 2002: 1. Modeling the physical and chemical states of PAHs in the diffuse interstellar medium. 2. Hydrogenation and charge states of polycyclic aromatic hydrocarbons in diffuse clouds. 3. Laboratory studies of chemical reactions involving carbon chain anions.

Author

Laboratories; Experimentation; Interstellar Matter; Chemical Reactions; Hydrocarbons

20030052047 Lawrence Livermore National Lab., Livermore, CA

General and Localized Corrosion of Outer Barrier of High-Level Waste Container in Yucca Mountain

Farmer, J.; McCright, D.; Gdowski, G.; Wang, F.; Summers, T.; May 02, 2000; 24 pp.; In English

Report No.(s): DE2002-791828; UCRL-JC-138890; No Copyright; Avail: Department of Energy Information Bridge

As described in the License Application Design Selection Report, the recommended waste, package design is Engineering Design Alternative II (CRWMS M&O 1999). This design includes a double-wall waste package (WP) underneath a protective drip shield (DS). The purpose and scope of the process-level model described here is to account for both general and localized corrosion of the waste package outer barrier (WPOB), which assumed to be Alloy 22 UNS N06022-21Cr-13Mo-4Fe-3W-2C-Ni (ASTM 1997a). This model will include several sub-models, which will account for dry oxidation (DOX), humid air corrosion (HAC), general corrosion (GC) in the aqueous phase, and localized corrosion (LC) the aqueous phase. This model serves as a feed to the waste package degradation (WAPDEG) code for performance, assessment.

NTIS

Corrosion; Containers; Radioactive Wastes

20030052053 Lawrence Livermore National Lab., Livermore, CA

Mass Spectrometric Immunoassay for Parathyroid Hormone Related Protein (PTHrP)

Zheng, K.; Rivera, J. D.; Vogel, J. S.; Buchholz, B. A.; Burton, D. W.; Jun. 16, 2000; 10 pp.; In English

Report No.(s): DE2002-793940; UCRL-JC-139327; No Copyright; Avail: Department of Energy Information Bridge

Many cancers, including prostate, breast and lung express parathyroid hormone related protein (PTHrP). Despite the common tumor overexpression of PTHrP, serum levels of PTHrP are not commonly elevated in affected patients. We postulate that the reasons for the discrepancy between tissue and serum measurements of PTHrP are the inadequate sensitivity and specificity of current PTHrP serum assays. To improve the clinical value of PTHrP serum assays for the cancer patient, we are developing a new generation of novel and ultrasensitive PTHrP serum immunoassays based on immunoaffinity

purification, nanospray liquid chromatography tandem mass spectrometry (LC/MS/MS) and accelerator mass spectrometry (AMS).
NTIS
Hormones; Immunoassay; Mass Spectroscopy; Parathyroid Gland; Proteins

20030052073 Lawrence Livermore National Lab., Livermore, CA
Aged Nuclear Explosive Melt Glass: Radiography and Scanning Electron Microscope Analyses Documenting Radionuclide Distribution and Glass Alteration
Eaton, G. F.; Smith, D. K.; Mar. 28, 2000; 16 pp.; In English
Report No.(s): DE2002-793990; UCRL-JC-136658; No Copyright; Avail: Department of Energy Information Bridge

Assessment of the long-term performance of nuclear melt glass under saturated conditions provides insight into factors controlling radionuclide release into groundwater. Melt glass samples were collected from an underground nuclear detonation cavity at the Nevada Test Site that was in contact with groundwater for more than 10 years. The samples were made into thin sections and the distribution of alpha activity mapped using CR-39 plastic detectors. The melt glass is visually heterogeneous and the results of the alpha track radiography indicate that the highest alpha activity is associated with areas of dark colored glass. Analyses of the thin sections by alpha spectrometry show the prominent actinide species to be 238Pu, 239Pu and 241Am. Scanning electron microprobe analysis of the bulk glass shows conspicuous alteration layers lining internal vesicle surfaces in the glass. X-ray diffraction patterns for the alteration phases are consistent with clay mineral compositions. Glass dissolution models indicate these layers are too thick to have formed at ambient temperatures over the 10 year period in which they remained in a saturated environment. This implies the alteration layers likely formed at temperatures higher than ambient during cooling of the cavity following the underground detonation. Mobilization of this clay alteration layer as colloidal particles in groundwater represents a potential source of actinide release into the environment.
NTIS
Radioactive Isotopes; Radiography; Scanning Electron Microscopy; Glass; Nuclear Explosions; Melts (Crystal Growth); Aging (Materials)

20030052077 Lawrence Livermore National Lab., Livermore, CA
Thermodynamics of Combustion in a Confined Explosion
Kuhl, A.; Openheim, A. K.; Ferguson, R. E.; Feb. 05, 2000; 8 pp.; In English
Report No.(s): DE2002-793988; UCRL-JC-137417; No Copyright; Avail: Department of Energy Information Bridge

Considered here are explosions from condensed TNT charges--where the expanded detonation products gases are rich in C and CO. Mixing with air causes oxidation/combustion, which dramatically increases the pressure in confined systems. We treat this as an Inverse Problem: infer fuel consumption from the measured pressure P(triple underline bond)(bar p)(t)/p(sub i). The Model expounded here represents a valuable tool for extracting the evolution of combustion system from a readily measurable quantity (pressure). The Model establishes the fuel consumption history as well as the evolution of thermodynamic solution (specific volumes, energies and densities) of the components that will generate the observed pressure profile. This solution in Thermodynamic (State) Space provides extraordinarily clear insight into the combustion process, which is normally clouded by a myriad of transport processes that occur in physical space.
NTIS
Thermodynamics; Combustion; Pressure Distribution

20030052080 University of Southern California, Los Angeles, CA
SiC-Based Hydrogen Selective Membranes for Water-Gas-Shift Reaction
Dec. 2000; 42 pp.; In English
Report No.(s): DE2002-802826; No Copyright; Avail: Department of Energy Information Bridge

A hydrogen selective membrane as a membrane reactor (MR) can significantly improve the power generation efficiency with a reduced capital and operating cost for the waster-gas-shift reaction. Existing hydrogen selective ceramic membranes are not suitable for the proposed MR due to their poor hydrothermal stability. In this project we have focused on the development of innovative silicon carbide (SiC) based hydrogen selective membranes, which can potentially overcome this technical barrier. During Year I, we have successfully fabricated SiC macro porous membranes via extrusion of commercially available SiC powder, which were then deposited with thin, microporous (6 to 40 degrees in pore size) films via sol-gel technique as intermediate layers. Finally, an SiC hydrogen selective thin film was deposited on this substrate via our CVD/I technique. The composite membrane thus prepared demonstrated excellent hydrogen selectivity at high temperature (approx.

600 degrees C). More importantly, this membrane also exhibited a much improved hydrothermal stability at 600 degrees C with 50\% steam (atmospheric pressure) for nearly 100 hours. In parallel, we have explored an alternative approach to develop a H2 selective SiC membrane via pyrolysis of selected pre-ceramic polymers.
NTIS
Hydrogen; Silicon Carbides; Chemical Reactions; Phase Shift; Membrane Structures; Water

20030052082 Lawrence Livermore National Lab., Livermore, CA
Effects of Confinement on Combustion of TNT Explosion Products in Air
Kuhl, A. L.; Oppenheim, A. K.; Ferguson, R. E.; Reichenbach, H.; Neuwald, P.; Feb. 05, 2000; 20 pp.; In English
Report No.(s): DE2002-793989; UCRL-JC-137418; No Copyright; Avail: Department of Energy Information Bridge
Turbulent combustion fields established by detonative explosions of TNT in confinements of different sizes are studied by high-resolution numerical simulation, using AMR (Adaptive Mesh Refinement) method. The chambers are filled with nitrogen or air at NPT conditions. In the second case, the detonation products, rich in C and CO, act, upon turbulent mixing with air, as fuel in an exothermic process of combustion, manifested by a distinct pressure rise. It is the evolution in space and time of this dynamic process that formed the principal focus of this study.
NTIS
Nitroglycerin; Confinement; Combustion; Combustion Products

20030052096 Institute of Gas Technology, Des Plaines, IL
Calla Energy Biomass Cofiring Project
Jun. 2002; 16 pp.; In English
Report No.(s): DE2002-802829; No Copyright; Avail: Department of Energy Information Bridge
The Calla Energy Biomass Project, to be located in Estill County, Kentucky is to be conducted in two phases. The objective of Phase I is to evaluate the technical and economic feasibility of cofiring biomass-based gasification fuel-gas in a power generation boiler. Waste coal fines are to be evaluated as the cofired fuel. The project is based on the use of commercially available technology for feeding and gas cleanup that would be suitable for deployment in municipal, large industrial and utility applications. Define a combustion system for the biomass gasification-based fuel-gas capable of stable, low-NOx combustion over the full range of gaseous fuel mixtures, with low carbon monoxide emissions and turndown capabilities suitable for large-scale power generation applications.
NTIS
Biomass Burning; Biomass; Nitrogen Oxides; Electric Generators

20030052113 Savannah River Lab., Aiken, SC
Ion Exchange Membrane Processes
Wallace, R. M.; May 26, 1965; 134 pp.; In English
Report No.(s): DE2003-804675; DPST-65-301; No Copyright; Avail: Department of Energy Information Bridge
Techniques were developed and promising preliminary tests were completed in an exploratory study of the applicability of ion exchange membrane processes to such chemical operations as the separation of plutonium from uranium, the separation of americium from curium, the isolation of individual rare earths, the removal of strontium from process waste streams and the continuous concentration of solutions of ions such as PU(sup 3+) + or Pu(sup 4+).
NTIS
Ion Exchanging; Ion Exchange Membrane Electrolytes

20030052126 Lawrence Livermore National Lab., Livermore, CA
Multi-fluid Model of Exothermic Fields in Explosions
Kuhl, A. L.; Ferguson, R. E.; Oppenheim, A. K.; Feb. 05, 2000; 10 pp.; In English
Report No.(s): DE2002-793987; UCRL-JC-137419; No Copyright; Avail: Department of Energy Information Bridge
Combustion in the Multi-Fluid Model is treated material transformations in the Le Chatelier plane (rather than 'heat release' found in traditional models). This is the only way to construct a thermodynamically-consistent representation of the fluids. The exothermic front provides an extraordinarily sharp representation of turbulent combustion fields--which are normally clouded by a myriad of diffusional effects.
NTIS
Exothermic Reactions; Turbulent Combustion; Combustion Physics; Explosions

20030052134 Tetra Tech, Inc., San Diego, CA

Demonstration of the HiPOx Advanced Oxidation Technology for the Treatment of MTBE-Contaminated Groundwater

Speth, T. F.; Swanson, G.; Sep. 2002; 36 pp.; In English

Report No.(s): PB2003-103275; No Copyright; Avail: CASI; A03, Hardcopy

The HiPOx technology is an advanced oxidation process that incorporates high-precision delivery of ozone and hydrogen peroxide to chemically destroy organic contaminants with the promise of minimizing bromate formation. A MTBE-contaminated groundwater from the Ventura County Naval Base in Port Hueneme, CA was used to evaluate this technology. Due to extremely high concentrations of bromide in the feed water (1.3 mg/L) and the desire to limit bromate formation, an experimental system was operated with 630 ozone injector ports in series.

NTIS

Ground Water; Oxidation; Water Pollution; Pollution Control

20030052247 Brookhaven National Lab., Upton, NY

Electrons in Nonpolar Liquids

Holroyd, R. A.; Sep. 18, 2002; 74 pp.; In English

Report No.(s): DE2003-804609; BNL-69404; No Copyright; Avail: Department of Energy Information Bridge

Excess electrons can be introduced into liquids by absorption of high energy radiation, by photoionization, or by photoinjection from metal surfaces. The electrons chemical and physical properties can then be measured, but this requires that the electrons remain free. That is, the liquid must be sufficiently free of electron attaching impurities for these studies. The drift mobility as well as other transport properties of the electron are discussed here as well as electron reactions, free-ion yields and energy levels. Ionization processes typically produce electrons with excess kinetic energy. In liquids during thermalization, where this excess energy is lost to bath molecules, the electrons travel some distance from their geminate positive ions.

NTIS

Liquids; Chemical Properties; Transport Properties; Electron Mobility

20030052259 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette

Bloch Hyperbolicity

McQuillan, M. L.; Dec. 2001; 42 pp.

Report No.(s): PB2003-102088; IHES/P/01/59; No Copyright; Avail: CASI; A03, Hardcopy

Recent study of the hyperbolicity of algebraic varieties has centered on purely qualitative aspects such as non-existence of maps from the complex line. Occasionally such properties thanks to lemmas of R. Brody and M. Green give quantitative information, but in general cannot be related to A. Bloch's dictum. The authors remedy this for quasi-projective surfaces (X,D) of general type and s(sub 2)(X,D) > 0. The authors' techniques also yield essentially optimal bounds for the degeneration of the Kobayashi metric, and the heights of algebraic points over fields of functions in characteristic zero.

NTIS

Hyperbolic Functions; Degeneration; Algebra

20030052285 Virginia Transportation Research Council, Charlottesville, VA

Application of Cathodic Prevention in a New Concrete Bridge Deck in Virginia

Clemena, G. G.; Pritchett, M. B.; Napier, C. S.; Feb. 2003; 50 pp.; In English

Report No.(s): PB2003-102876; VTRC-03-R11; Copyright; Avail: National Technical Information Service (NTIS)

Corrosion of reinforcement in concrete bridges has been a major factor in limiting the service life of many such structures. As part of a concerted effort to identify cost-effective options for eliminating corrosion of reinforcement, the application of cathodic prevention was tried in a recently constructed concrete bridge deck. The incorporation of an impressed-current cathodic prevention system in a new concrete bridge deck while it was being constructed was made possible by the use of titanium mesh ribbon anodes coated with mixed-metal oxide. The anodes were spaced 32 cm (13 in) apart and transversely across the entire bridge deck to allow for the trouble-free placement of the concrete. The system has been operating for almost 2 years with no extraordinary problems. A comparison of the long-term cost of this option with those of other options, such as the use of corrosion-resistant clad bars or stainless steel bars, indicated that this option is not economically favorable.

NTIS

Concretes; Corrosion Resistance; Cladding

20030052315 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA, USA

Kinetics of Organic Transformations Under Mild Aqueous Conditions: Implications for the Origin of Life and Its Metabolism

Weber, Arthur L.; [2003]; 1 pp.; In English; Copyright; Avail: Other Sources; Abstract Only

The rates of thermal transformation of organic molecules containing carbon, hydrogen, and oxygen were systematically examined in order to identify the kinetic constraints that governed origin-of-life organic chemistry under mild aqueous conditions. Arrhenius plots of the kinetic data were used to estimate the reaction half-life at 50 C, and to reveal the effect of functional groups on reactivity. This survey showed that hydrocarbons and organic substances containing a single oxygenated group were kinetically the most stable (i. e. acetate decarboxylation half-life was l0(exp 18) years at 50 C); whereas, organic substances containing two oxygenated groups in which one group was a beta-positioned carbonyl group were the most reactive (i. e. acetoacetate decarboxylation half-life was l0(exp-2) years at 50 C). Of all functional groups the beta-positioned carbonyl group (aldehyde or ketone) was the strongest activating group, giving rates of reaction that were up to 10(exp 24)-times faster than rates of similar molecules lacking the beta-carbonyl group. From this knowledge of organic reactivity and the inherent constraints of autocatalytic processes, we concluded that an origins-of-life process based on autocatalytic transformation of C,H,O-substrates was constrained to using the most reactive organic molecules that contain alpha- or beta-carbonyl groups, since small autocatalytic domains of plausible catalytic power that used less reactive substrates could not carry out chemical transformations fast enough to prevent catastrophic efflux (escape) of reaction intermediates. Knowledge of the kinetics of organic transformations is useful, not only in constraining the chemistry of the earliest autocatalytic process related to the origin of life, but also in establishing the relative reactivity of organic molecules on the early Earth and other planets that may or may not be related to the origin of life.

Author

Organic Chemistry; Phase Transformations; Metabolism; Carbonyl Compounds; Biosynthesis; Molecules; Biological Evolution; Reaction Kinetics

26
METALS AND METALLIC MATERIALS

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

20030037128 Geological Survey, Reston, VA

Cobalt Recycling in the USA in 1998

Shedd, K.; 2002; 22 pp.

Report No.(s): PB2003-102704; USGS-OFR-02-299; No Copyright; Avail: CASI; A03, Hardcopy

This report is one of a series of reports on metals recycling. It defines and quantifies the 1998 flow of cobalt-bearing materials in the USA, from imports and stock releases through consumption and disposition, with particular emphasis on the recycling of industrial scrap (new scrap) and used products (old scrap). Because of cobalts many and diverse uses, numerous types of scrap were available for recycling by a wide variety of processes. In 1998, an estimated 32 percent of U.S. cobalt supply was derived from scrap. The ratio of cobalt consumed from new scrap to that from old scrap was estimated to be 50:50. Of all the cobalt in old scrap available for recycling, an estimated 68 percent was either consumed in the USA or exported to be recycled.

NTIS

Cobalt; Recycling; Scrap

20030039170 Lawrence Livermore National Lab., Livermore, CA

Cleaning of OAB Universal Covers: An Orgin of Smut in Aluminum Alloys

Shen, T. H.; May 14, 2002; In English

Report No.(s): DE2002-15002160; UCRL-ID-148327; No Copyright; Avail: National Technical Information Service (NTIS)

The smut that appeared on the universal covers after the OAB cleaning process consists of sub-micron size aluminum particles originating from the machining of these parts prior to cleaning. The rigorous gross and precision cleanings with Brulin in the OAB cleaning process could not completely wash these fine particles away from the surfaces. However, applying a phosphoric acid etch before the cleaning helped to remove these fine aluminum particles. Experimental results again showed that an acid etching before cleaning is essential in preventing the occurrence of smut in aluminum alloy alter gross/precision

cleaning. A mechanism, based on the electrostatic zeta potential, is proposed to explain the occurrence of smut that is often encountered during the cleaning of aluminum alloys.
NTIS
Aluminum Alloys; Cleaning; Residues

20030039182 Lawrence Livermore National Lab., Livermore, CA
Density-Functional Study of Magnetism in (delta)-Pu and Its Alloys
Landa, A.; Soederlind, P.; Sep. 30, 2002; 16 pp.; In English
Report No.(s): DE2002-15002242; UCRL-JC-150394; No Copyright; Avail: Department of Energy Information Bridge

At atmospheric pressure plutonium metal exhibits six crystal structures upon heating from room temperature to its melting point of 913 K. Among these phases, the delta-Pu has received a significant interest in the metallurgical community because of its high ductility that makes it easy to machine and form. The pure Pu delta phase is stable at elevated temperatures, between 593 K and 736 K, however a small amount of so-called delta stabilizer, for example, Al, Ga, Zn, Cd, Zr, SC, Am, Ce, In, or Tl can help to retain delta-Pu down to ambient temperature. In recent papers we proposed that delta-Pu is a disordered magnet that becomes unstable below about 600 K due to the antiferromagnetic (AF) ordering followed by a mechanical instability of the FCC phase. In this paper we study the effect of alloying on the magnetic properties of delta-Pu and the stability of the FCC phase.
NTIS
Alloying; Crystal Structure; Magnetic Properties; Metal Crystals; Plutonium; Plutonium Alloys

20030045774 Institute of Industrial Technology TNO, Netherlands
The Pre-Treatment of Shop Primed Steel and the Effects on Corrosion Resistance
Tiemens, Ing H. J.; Hoeflaak, M.; August 21, 2001; 49 pp.; In English
Contract(s)/Grant(s): A/97/KM/112; TNO Proj. 007.50168
Report No.(s): TNO-43/02.002207/sec; Copyright; Avail: Other Sources

A proposal for the investigation of the effects of different pre-treatments of shop primed steel on the final corrosion resistance of coated steel was accepted by TNO Defence Research. The project is focused on the investigation of the pre-treatment, the coating process and the influence of variations in the pre-treatment on the final corrosion resistance. Steel plates that are used in shipbuilding are normally protected against corrosion during the building process by means of a temporary weldable primer, a so-called shop primer. Current specifications of the Royal Dutch Navy require that the shop primer is completely or at least partially removed before the application of the final protective coating system. The degree of removal depends on the part of the construction concerned. Different shipyards use different shop primers. Shipyards are interested in minimizing the amount of pre-treatment before the application of the final coating system by deleting or reducing the removal of shop primer by grit blasting or grinding. Shipyards would also like to be allowed to leave sections for longer periods in the shop primer and to store sections outside. The Royal Dutch Navy wants to investigate the effects, due to the changes in the production process, on the resulting durability of the final corrosion protective coating system. If, as a result of this investigation, it is decided to make changes to the current process, then the implementation of such a process and the appropriate test and control methods will have to be decided upon and new methods may have to be developed. It may also be necessary to change the list of accepted shop primers when the current processes are changed.
Derived from text
Protective Coatings; Metal Plates; Marine Technology; Corrosion Resistance; Steels

20030045779 Ames Lab., IA
Development of Metallic Filters for Hot Gas Cleanup in Pressurized Fluidized Bed Combustion Applications
Anderson, I. E.; Gleeson, B.; Terpstra, R. L.; 2002; In English
Report No.(s): DE2002-802956; No Copyright; Avail: National Technical Information Service (NTIS)

Alternative alloys derived from the wide array of aerospace superalloys will be developed for hot gas filtration to improve on both ceramic filters and 'first-generation' iron aluminide metallic filter materials. New high performance metallic filters should offer the benefits of non-brittle mechanical behavior at all temperatures, including ambient temperature, and improved resistance to thermal fatigue compared to ceramic filter elements, thus improving filter reliability. A new powder processing approach also will be established that results in lightweight metallic filters with high permeability and weldability for enhanced capability for filter system manufacturing.
NTIS
Heat Resistant Alloys; High Temperature Gases; Thermal Fatigue; Filtration

20030045802 Kobe Steel Ltd. (Japan)
Kobelco Technology Review, No. 25, April 2002. Feature: Steel Wire Rod and Bard
2002; 68 pp.
Report No.(s): PB2003-101756; Copyright; Avail: National Technical Information Service (NTIS)

Steel can be freely manufactured into products with various properties, such as strength and workability, to meet customer's needs. Steel is also cheaper to recycle. The Japanese steel industry has made important contributions to society and industry with its first class, worldwide product quality and high productivity. However, presently, the circumstances surrounding the steel industry are changing rapidly. Major changes in this regard include: (1) The growing awareness that manufacturing technologies can contribute to the reduction of CO2 emissions on a global scale; (2) Additional elements can be easily removed from recyclable materials before they are reused; and (3) Environmentally friendly materials either include no harmful substances or significantly contribute to reducing industrial waste.
NTIS
Steels; Japan; Research And Development

20030051423 North Dakota Univ., Grand Forks. Energy and Environmental Research Center
High-Temperature Materials Research
Jun. 2002; In English
Report No.(s): DE2002-803197; 2002-EERC-06-03; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this research effort was to determine temperature and chemical effects on speed and thickness of scale development. The test samples were placed in a Thermolyne furnace for a duration of 100 hours at 1600 degrees C. Three identical trays of seven samples each were removed at 10-, 50-, and 100-hour intervals. The sample specimens were weighed initially and at the proposed intervals to determine corrosion rates. Morphology analyses were also performed on sample coupons after the 100-hour exposure. The laboratory effort is divided into two separate tasks. The first task was exposing the test samples in the high-temperature and gaseous environment. The second task was evaluating the 100-hour exposed samples using a scanning electron microscope (SEM).
NTIS
Refractory Materials; Scale (Corrosion)

20030051474 Louisiana Transportation Research Center, Baton Rouge
Evaluation of Ground Granulated Iron Blast-Furnace Slag: Grade 100
Eggers, J. E.; Sep. 2002; 42 pp.; In English
Report No.(s): PB2003-102165; No Copyright; Avail: CASI; A03, Hardcopy

Currently, the use of grade-120 Granulated Ground Blast Furnace Slag (GGBFS) is incorporated into the specifications of LA DOTD concrete mixes. This study evaluates grade-100 GGBFS and its effect on the properties of hydraulic cement concretes used in structures and pavements construction. Four mix designs were used for this study, two structural and two pavements, with varying amounts (15\%, 30\%, and 50\%) of grade-100 GGBFS used as a by-weight substitution for cement. Additionally in order to simulate field conditions, the study used three different temperatures (50 F, 73 F and 90 F) for the components at mixing and curing conditions. This study looked at the effects of slag on workability, durability, and the compressive and flexural strengths of the concrete. How grade-100 GGBFS compared to grade-120 GGBFS in its effect on the concrete's physical properties and set times was also crucial in determining its acceptability for LA DOTD concrete structures and pavements.
NTIS
Furnaces; Cements; Concretes; Slags

20030052031 Lawrence Livermore National Lab., Livermore, CA
Steady State Creep of Zirconium at High and Intermediate Temperatures
Hayes, T. A.; Rosen, R. S.; Apr. 08, 2000; 10 pp.; In English
Report No.(s): DE2002-791518; UCRL-JC-138716; No Copyright; Avail: Department of Energy Information Bridge

Creep of zirconium and zirconium alloys has been labeled 'anomalous'. Researchers often report that zirconium and its alloys never reach true steady state creep and have stress exponents that continuously change with stress and temperature. Many varied interpretations have been offered explaining the creep behavior of zirconium. Some have suggested that creep is diffusion controlled, while others maintain that creep is dislocation glide controlled. Cumulative zirconium creep data will

be presented based on an extensive literature review. An interpretation of results will be presented and compared to previous interpretations.
NTIS
Creep Properties; Zirconium; Temperature Effects

20030052032 Lawrence Livermore National Lab., Livermore, CA
Modeling Creep Rupture of Zirconium Alloys
Rosen, R. S.; Hayes, T. A.; Apr. 08, 2000; 10 pp.; In English
Report No.(s): DE2002-791517; UCRL-JC-138714; No Copyright; Avail: Department of Energy Information Bridge

Safe interim dry storage of spent nuclear fuel (SNF) must be maintained for a minimum of twenty years according to the Code of Federal Regulations. The most important variable that must be regulated by dry storage licensees in order to meet current safety standards is the temperature of the SNF. The two currently accepted models to define the maximum allowable storage temperature for SNF are based on a diffusion controlled cavity growth (DCCG) failure mechanism for the cladding. Although these models are based on the same fundamental failure theory (DCCG), the researchers who developed the models made different assumptions, including selection of some of the most critical variables in the DCCG failure equation. These inconsistencies are discussed together with recommended modifications to the failure models based on recent data.
NTIS
Creep Properties; Zirconium Alloys; Diffusion

20030052235 Case Western Reserve Univ., Cleveland, OH, Oak Ridge National Lab., TN
Enhancements in Magnesium Die Casting Impact Properties
Schwam, D.; Wallace, J. F.; Zhu, Y.; Viswanathan, S.; Iskander, S.; Jun. 2000; 164 pp.; In English
Report No.(s): DE2002-803212; No Copyright; Avail: Department of Energy Information Bridge

The need to produce lighter components in transportation equipment is the main driver in the increasing demand for magnesium castings. In many automotive applications, components can be made of magnesium or aluminum. While being lighter, often times the magnesium parts have lower impact and fatigue properties than the aluminum.
NTIS
Casting; Dies; Magnesium; Aluminum; Impact Resistance

20030052251 Helsinki Univ. of Technology, Espoo (Finland)
Technical and Environmental Requirements for Surplus Foundry Sand Utilization
Orkas, J.; 2001; 152 pp.
Report No.(s): PB2003-102065; TKK-VAL-3/2001; Copyright; Avail: National Technical Information Service (NTIS)

The objective of this thesis was to characterize the environmental properties of surplus foundry sands used in Finland and to technically and environmentally test their most potential reuse possibilities. The research work consisted of several total and leaching analyses of surplus foundry sands and dusts as well as of reuse tests in asphalt production, in Portland cement concrete production, in mineral wool production, in the composting process and in mineral liner production. Sands from ten foundries using different binding techniques were characterized and their environmental properties were assessed in the first part of the study on the environmental properties of surplus foundry sands. General environmental criteria for the utilization of surplus foundry sands in earth construction were established. The suitability criteria set for different reuse types of surplus sands were based on the target and limit values set for the assessment of soil pollution. Some analyzed surplus foundry sands were considered as suitable for use in earth construction.
NTIS
Foundries; Sands; Environment Management; Waste Energy Utilization

20030052268 NASA Glenn Research Center, Cleveland, OH, USA
A Deterministic Interfacial Cyclic Oxidation Spalling Model, Part 2, Algebraic Approximation, Descriptive Parameters, and Normalized Universal Curve
Smialek, James L.; December 2002; 24 pp.; In English
Contract(s)/Grant(s): WBS 22-708-73-05
Report No.(s): NASA/TM-2002-211906/PT2; E-13596-2/PT2; NAS 1.15:211906/PT2; No Copyright; Avail: CASI; A03, Hardcopy

A cyclic oxidation interfacial spalling model has been developed in Part 1. The governing equations have been simplified

here by substituting a new algebraic expression for the series Sigma square root of i (Good-Smialek approximation). This produced a direct relationship between cyclic oxidation weight change and model input parameters. It also allowed for the mathematical derivation of various descriptive parameters as a function of the inputs. It is shown that the maximum in weight change varies directly with the parabolic rate constant and cycle duration and inversely with the spall fraction, all to the 1/2 power. The number of cycles to reach maximum and zero weight change vary inversely with the spall fraction, and the ratio of these cycles is exactly 1:3 for most oxides. By suitably normalizing the weight change and cycle number, it is shown that all cyclic oxidation weight change model curves can be represented by one universal expression for a given oxide scale.
Author
Oxidation; Spalling; Models; Reaction Kinetics

20030053002 Missouri Univ., Rolla
Development of Submerged Entry Nozzles that Resist Clogging
Smith, J. D.; Peaslee, K. D.; 2002; 162 pp.; In English
Report No.(s): DE2002-805824; No Copyright; Avail: Department of Energy Information Bridge

Accretion formation and the associated clogging of SEN's is a major problem for the steel industry leading to decreased strand speed, premature changing of SEN's or strand termination and the associated reductions in productivity, consistency, and steel quality. The program to evaluate potentially clog resistant materials was initiated at the University of Missouri-Rolla. The main objective of the research effort was to identify combinations of steelmaking and refractory practices that would yield improved accretion resistance for tundish nozzles an submerged entry nozzles.
NTIS
Nozzles; Plugging; Steels; Refractory Materials; Metals

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*.

20030037103 Westinghouse Savannah River Co., Aiken, SC, Pacific Northwest National Lab., Richland, WA
Development of High Waste Loading Glasses for Advanced Melter Technologies
Peeler, D. K.; Edwards, T. B.; Herman, C. C.; Workman, R. J.; Reamer, I. A.; Sep. 15, 2002; In English
Report No.(s): DE2002-805616; No Copyright; Avail: National Technical Information Service (NTIS)

The vitrification programs at Hanford and Savannah River may benefit from higher temperature glass formulations that are processable in advanced melters e. g., induction-heated, cold-crucible melter (ICCM) or by changing the current liquidus temperature (TL) limit for Joule heated ceramic melters (JHCM). The focus of this report was on the glass formulation activities in support of the ICCM and JHCM demonstrations with C-106/AY-102 simulant.
NTIS
Chemical Composition; Ceramics

20030037115 National Inst. of Standards and Technology (MSEL), Gaithersburg, MD
Materials Science and Engineering Laboratory, Ceramics Division, FY 2002 Programs and Accomplishments
Sep. 2002; In English
Report No.(s): PB2003-102200; NISTIR-6904; No Copyright; Avail: National Technical Information Service (NTIS)

Division scientists have been able to characterize the structure and composition of the nanometer scale silicon oxide-nitride-oxide layers, which are of high current interest as possible charge storage structures in non-volatile memory devices. As a result of this research, nanoparticles can now be placed into chemically and structurally well-defined environments on silicon substrates. Other Highlights in the Report include both experimental and theoretical investigations. Studies were made of high-speed contact at the head-disk interface in a magnetic disk hard drive, and exciting new first principles calculations were made of properties from atomic scale structure of microwave dialectrics. In addition to these new selected Highlights, we report numerous other significant accomplishments in our projects under the 9 Programs in the Materials Science and Engineering Laboratory. These brief reports provide a fairly comprehensive synopsis of the breadth and depth of research conducted in our Division.
NTIS
Ceramics; Materials Science; Data Processing

20030038816 Lawrence Livermore National Lab., Livermore, CA

Technical Progress Report on Single Pass Flow Through Tests of Ceramic Waste Forms for Plutonium Immobilization

Zhao, P.; Roberts, S.; Bourcier, W.; Dec. 03, 2000; 30 pp.

Report No.(s): DE2002-802610; No Copyright; Avail: Department of Energy Information Bridge

This report updates work on measurements of the dissolution rates of single-phase and multi-phase ceramic waste forms in flow-through reactors at Lawrence Livermore National Laboratory. Previous results were reported in Bourcier (1999). Two types of tests are in progress: (1) tests of baseline pyrochlore-based multiphase ceramics; and (2) tests of single-phase pyrochlore, zirconolite, and brannerite (the three phases that will contain most of the actinides).

NTIS

Ceramics; Plutonium; Waste Utilization

20030038853 Michigan Technological Univ., Houghton

Improvement of Wear Component's Performance by Utilizing Advanced Materials and New Manufacturing Technologies: Castcon Process for Mining Applications

Huang, X.; Gertsch, R.; Jun. 12, 2002; 14 pp.; In English

Report No.(s): DE2002-802847; No Copyright; Avail: Department of Energy Information Bridge

The project has seen quite a bit of activity in this quarter, highlighted by the fabrication of a bit insert for field testing. In addition: (1) Several alternative process techniques were attempted to prevent bloating, cracking and delamination of FM material that occurs during binder burnout. The approaches included fabrication of FM material by three pass extrusion and warm isostatic pressing of green material, slow and confined burnouts as well as, burnout of thin plate instead of rod stock. Happily, a confined burnout followed by HIPing, produced FM button inserts without bloating or delamination. (2) Four rock bit inserts were produced from FM material and are ready for use on blast hole bits in the field. (3) Six of the project participants from Michigan Technological University, Advanced Ceramic Manufacturing, and The Robbins Group visited the Superior Rock Bit Company in Minnesota and planned the field test of FM inserts.

NTIS

Field Tests; Manufacturing; Wear; Mining; Fabrication

20030038873 Sandia National Labs., Albuquerque, NM

All-Ceramic Thin Film Battery

Boyle, T. J.; Ingersoll, D.; Cygan, R. T.; Roadriguez, M. A.; Rahimian, K.; Nov. 2002; In English

Report No.(s): DE2002-805862; No Copyright; Avail: National Technical Information Service (NTIS)

We have undertaken the synthesis of a thin film 'All Ceramic Battery' (ACB) using solution route processes. Based on the literature and experimental results, we selected SnO(sub 2), LiCoO(sub 2), and LiLaTiO(sub 3) (LLT) as the anode, cathode, and electrolyte, respectively. Strain induced by lattice mismatch between the cathode and bottom electrode, as estimated by computational calculations, indicate that thin film orientations for batteries when thicknesses are as low as 500 A are strongly controlled by surface energies. Therefore, we chose platinized silicon as the basal platform based on our previous experience with this material. The anode thin films were generated by standard spin-cast methods and processing using a solution of (Sn(ONep))(sub 8) and HOAc which was found to form Sn(sub 6)(O)(sub 4)(ONep)(sub 4). Electrochemical evaluation showed that the SnO(sup 2) was converted to Sn during the first cycle. The cathode was also prepared by spin coating using the novel (Li(ONep))(sup 8) and Co(OAc)(sup 2). The films could be electrochemically cycled (i.e., charged/discharged), with all of the associated structural changes being observable by XRD. Computational models indicated that the LLT electrolyte would be the best available ceramic material for use as the electrolyte. The LLT was synthesized from (Li(ONep))(sub 8), (Ti(ONep)(sub 4))(sub 2), and La(DIP)(sub 3)(py)(sub 3) with RTP processing at 900 degrees Centigrade being necessary to form the perovskite phase.

NTIS

Thin Films; Electrolytes; Ceramics

20030038945 Forest Products Lab., Madison, WI

Acoustic Emission and Acousto-Ultrasonic Techniques for Wood and Wood-Based Composites-A Review

Kawamoto, S.; Williams, R. S.; Dec. 2002; 24 pp.

Report No.(s): PB2003-102317; FPL-GTR-134; No Copyright; Avail: CASI; A03, Hardcopy

This review focuses on the feasibility of acoustic emission (AE) and acoustic-ultrasonic (AU) techniques for monitoring defects in wood, particularly during drying. The advantaged and disadvantages of AE and AU techniques are described.

Particular emphasis is placed on the propagation and attenuation of ultrasonic waves in wood and the associated measurement problems. The review is divided into two sections, acoustic emission techniques and acousto-ultrasonic techniques. It includes historical background on the techniques as well as applications for wood and wood products. Because much research on nondestructive tests for wood has been published only in Japanese, considerable attention is given to those publications.
NTIS
Wooden Structures; Nondestructive Tests; Wood

20030039005 Lawrence Livermore National Lab., Livermore, CA
Thin-Walled Compliant Plastic Structures for Meso-Scale Fluidic Systems
Miles, R. R.; Schumann, D. L.; Dec. 29, 1998; 14 pp.; In English
Report No.(s): DE2002-15002109; UCRL-JC-131083; No Copyright; Avail: Department of Energy Information Bridge

Thin-walled, compliant plastic structures for meso-scale fluidic systems were fabricated, tested and used to demonstrate valving, pumping, metering and mixing. These structures permit the isolation of actuators and sensors from the working fluid, thereby reducing chemical compatibility issues. The thin-walled, compliant plastic structures can be used in either a permanent, reusable system or as an inexpensive disposable for single-use assay systems. The implementation of valving, pumping, mixing and metering operations involve only an elastic change in the mechanical shape of various portions of the structure. Advantages provided by the thin-walled plastic structures include reduced dead volume and rapid mixing. Five different methods for fabricating the thin-walled plastic structures discussed including laser welding, molding, vacuum forming, thermal heat staking and photolithographic patterning techniques.
NTIS
Plastic Properties; Dynamic Structural Analysis

20030045792 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Investigation Into the Quality of Some Low-VOC Paint Systems for the Army
Hoeflaak, M.; June 26, 2001; 48 pp.; In Dutch
Contract(s)/Grant(s): A00/KL/158; TNO Proj. 007.50072
Report No.(s): TNO-42/02.005499; TD-2002-0251; Copyright; Avail: Other Sources

Eleven paint systems with a low content of volatile organic components (VOC) are tested on their suitability for new products and maintenance on steel and aluminum. The test program concerns mechanical properties, repaintability, corrosion resistance in accelerated corrosion tests also the correlation with outdoor exposure are determined. Only four of the tested low VOC coatings may probably be suitable for military use. They do not fully meet the requirements in the specifications, but the differences are limited. It concerns three coating systems for steel in severe corrosive environments and one coating system for use in moderate corrosive environments. The latter can be used on steel as well as on aluminum. The systems have to be tested further under practical conditions. Based on correlation with outdoor exposure, the salt fog test and a cyclic corrosion test are recommended for a fast assessment of corrosion resistance of coatings on steel. However, outdoor exposure tests are still necessary to be quite on the safe side.
Author
Paints; Volatile Organic Compounds; Mechanical Properties; Corrosion Tests; Corrosion Resistance; Protective Coatings

20030046827 NASA Ames Research Center, Moffett Field, CA, USA
Morphologies, Processing and Properties of Ceramic Foams and Their Potential as TPS Materials
Stackpoole, Mairead; Simoes, Conan R.; Johnson, Sylvia M.; December 11, 2002; 1 pp.; In English; NSMMS Conference, 23-27 Jun. 2003, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The current research is focused on processing ceramic foams with compositions that have potential as a thermal protection material. The use of pre-ceramic polymers with the addition of sacrificial blowing agents or sacrificial fillers offers a viable approach to form either open or closed cell insulation. Our work demonstrates that this is a feasible method to form refractory ceramic foams at relatively low processing temperatures. It is possible to foam complex shapes then pyrolize the system to form a ceramic while retaining the shape of the unfired foam. Initial work focused on identifying suitable pre-ceramic polymers with desired properties such as ceramic yield and chemical make up of the pyrolysis product after firing. We focused on making foams in the Si system (Sic, Si02, Si-0-C), which is in use in current acreage TPS systems. Ceramic foams with different architectures were formed from the pyrolysis of pre-ceramic polymers at 1200 C in different atmospheres. In some systems a sacrificial polyurethane was used as the blowing agent. We have also processed foams using sacrificial fillers to introduce controlled cell sizes. Each sacrificial filler or blowing agent leads to a unique morphology. The effect of different

fillers on foam morphologies and the characterization of these foams in terms of mechanical and thermal properties are presented. We have conducted preliminary arc jet testing on selected foams with the materials being exposed to typical re-entry conditions for acreage TPS and these results will be discussed. Foams processed using these approaches have bulk densities ranging from 0.15 to 0.9 g/cm3 and cell sizes ranging from 5 to 500 pm. Compression strengths ranged from 2 to 7 MPa for these systems. Finally, preliminary oxidation studies have been conducted on selected systems and will be discussed.
Author (revised)
Thermal Protection; Ceramics; Foams; Silicon Polymers

20030051532 National Inst. for Occupational Safety and Health, Rockville, MD
Evaluation of Aerosol Release During the Handling of Unrefined Single Walled Carbon Nanotube Material
Baron, A. A.; Maynard, A. D.; Foley, M.; Dec. 2002; In English
Report No.(s): PB2003-102401; NIOSH-DART-02-191; No Copyright; Avail: National Technical Information Service (NTIS)

Carbon nanotubes represent a new form of carbon that has several unique properties, including great tensile strength, high conductivity (in some states), high surface area, unique electronic properties, and potentially high molecular adsorption capacity. A number of laboratories are generating small quantities of this material, and commercial interest in the substance is motivating the rapid development of large-scale production facilities. However, little is known of the potential toxicity of the material, or how it should most appropriately be handled to minimize exposure. Two separate studies have been undertaken on single-walled carbon nanotubes (SWCNT)-a specific form of the material comprised of carbon tubes around 1.5 nanometers (nm) in diameter and up to a millimeter or more in length, and having a single layer of carbon atoms that form the tube wall. Two sources of the material were considered: (1) laser ablation, which leads to a relatively compact powder, and (2) nanotubes formed using the High-Pressure Carbon Monoxide process (HiPCO), leading to an expanded material that has very low bulk density.
NTIS
Aerosols; Carbon Nanotubes; Environment Effects; Toxic Hazards; Nanostructure Growth

20030052314 NASA Dryden Flight Research Center, Edwards, CA, USA
Experimental Evaluation of Hot Films on Ceramic Substrates for Skin-Friction Measurement
Noffz, Gregory K.; Lavine, Adrienne S.; Hamory, Philip J.; March 2003; 25 pp.; In English; 6th ASME-JSME Thermal Engineering Joint Conference, 16-20 Mar. 2003, Hawaii Island, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): Wu 710-55-04
Report No.(s): NASA/TM-2003-210742; NAS 1.15:210742; H-2517; Copyright; Avail: CASI; A03, Hardcopy

An investigation has been performed on the use of low-thermal conductivity, ceramic substrates for hot films intended to measure skin friction. Hot films were deposited on two types of ceramic substrates. Four hot films used composite-ceramic substrates with subsurface thermocouples (TCs), and two hot films were deposited on thin Macor(R) substrates. All six sensors were tested side by side in the wall of the NASA Glenn Research Center 8-ft by 6-ft Supersonic Wind Tunnel (SWT). Data were obtained from zero flow to Mach 1.98 in air. Control measurements were made with three Preston tubes and two boundary-layer rakes. The tests were repeated at two different hot film power levels. All hot films and subsurface TCs functioned throughout the three days of testing. At zero flow, the films on the high-thermal conductivity Macor(R) substrates required approximately twice the power as those on the composite-ceramic substrates. Skin-friction results were consistent with the control measurements. Estimates of the conduction heat losses were made using the embedded TCs but were hampered by variability in coating thicknesses and TC locations.
Author
Experimentation; Evaluation; Ceramics; Substrates; Hot Surfaces; Thermoplastic Films; Skin Friction; Friction Measurement

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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*.

20030037043 Westinghouse Savannah River Co., Aiken, SC, Lawrence Berkeley National Lab., CA, Florida State Univ., Tallahassee. Inst. for International Cooperative Environmental Research

Bioremediation of Petroleum Hydrocarbon-contaminated Soils Comprehensive Report

Dec. 1999; In English

Report No.(s): DE2002-803751; No Copyright; Avail: National Technical Information Service (NTIS)

The US Department of Energy and the Institute for Ecology of Industrial Areas (IETU), Katowice, Poland have been cooperating in the development and implementation of innovative environmental remediation technologies since 1995. A major focus of this program has been the demonstration of bioremediation techniques to cleanup the soil and sediment associated with a waste lagoon at the Czechowice Oil Refinery (CZOR) in southern Poland. After an expedited site characterization (ESC), treatability study, and risk assessment study, a remediation system was designed that took advantage of local materials to minimize cost and maximize treatment efficiency. 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

Contamination; Ecology; Hydrocarbons; Soils; Crude Oil; Environmental Cleanup; Sediments

20030037055 Department of Energy, Tulsa, OK

Development of Improved Oil Field Waste Injection Disposal Techniques

Nov. 2002; 152 pp.; In English

Report No.(s): DE2002-805007; No Copyright; Avail: Department of Energy Information Bridge

Slurry Fracture Injection (SFI) is a waste disposal technology in which petroleum exploration and production wastes, such as produced sand, drill cuttings, tank bottoms, and pit sludge are mixed with water into a slurry and injected into deep unconsolidated sandstone formations above fracturing pressure. The solids are permanently emplaced within hydraulic fractures generated during the pumping process, and the carrying fluid subsequently drains into the high permeability formation. The mechanics governing the fracturing of unconsolidated sandstone formations remain poorly understood, and as a result there are few guidelines available to optimize the SFI process. This Final Report summarizes Terralog's efforts and results for the project 'development of Improved Fracture Injection Disposal Techniques for Oilfield Waste', completed under DOE Contract DE-AC-2699BC15222. The goals of this project have been to assemble and analyze a comprehensive database of past waste injection operations; develop improved diagnostic techniques for monitoring fracture growth and formation changes; develop operating guidelines to optimize daily operations and ultimate storage capacity of the target formation; and to apply these improved models and guidelines in the field.

NTIS

Oil Fields; Waste Disposal; Wells; Fracture Mechanics

20030037119 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering

Diesel Aerosol Sampling Methodology (CRC-E-43) Executive Summary, Technical Summary and Conclusions

Kittelson, D.; Aug. 19, 2002; 34 pp.; In English

Report No.(s): PB2003-102418; CRC-E-43-EX-SUMM; No Copyright; Avail: CASI; A03, Hardcopy

The University of Minnesota and research partners West Virginia University, Carnegie Mellon University, Tampere University, Paul Scherrer Institute, University of California at Riverside, Caterpillar, Inc., and Cummins, Inc. undertook the study titled Diesel Aerosol Sampling Methodology to sample, characterize and quantify particles in Diesel exhaust. The goal of this project (E-43) was to develop Diesel aerosol sampling methods for the laboratory that would produce particle size distributions similar to those obtained under real-world roadway conditions.

NTIS

Aerosols; Diesel Engines; Methodology; Air Pollution; Air Sampling; Diesel Fuels

20030038791 Lawrence Livermore National Lab., Livermore, CA
U. S. Energy Flow: 2000
Kaiper, G. V.; Feb. 01, 2002; In English
Report No.(s): DE2002-15002144; UCRL-ID-129990-00; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
NTIS
Flow Charts; Energy Consumption; Electric Power Supplies

20030038800 Lawrence Livermore National Lab., Livermore, CA
Certification Testing and Demonstration of Insulated Pressure Vessels for Vehicular Hydrogen and Natural Gas Storage
Aceves, S. M.; Martinez-Frias, J.; Espinosa-Loza, F.; Schaffer, R.; Clapper, W.; May 22, 2002; 16 pp.
Report No.(s): DE2002-15002156; UCRL-JC-148472; No Copyright; Avail: Department of Energy Information Bridge
We are working on developing an alternative technology for storage of hydrogen or natural gas on light-duty vehicles. This technology has been titled insulated pressure vessels. Insulated pressure vessels are cryogenic-capable pressure vessels that can accept either liquid fuel or ambient-temperature compressed fuel. Insulated pressure vessels offer the advantages of cryogenic liquid fuel tanks (low weight and volume), with reduced disadvantages (fuel flexibility, lower energy requirement for fuel liquefaction and reduced evaporative losses). The work described in this paper is directed at verifying that commercially available pressure vessels can be safely used to store liquid hydrogen or LNG. The use of commercially available pressure vessels significantly reduces the cost and complexity of the insulated pressure vessel development effort. This paper describes a series of tests that have been done with aluminum-lined, fiber-wrapped vessels to evaluate the damage caused by low temperature operation. All analysis and experiments to date indicate that no significant damage has resulted. Future activities include a demonstration project in which the insulated pressure vessels will be installed and tested on two vehicles. A draft standard will also be generated for obtaining insulated pressure vessel certification.
NTIS
Certification; Tests; Automobiles; Fuel Tanks; Renewable Energy

20030038809 Lawrence Livermore National Lab., Livermore, CA
Small-Scale Safety Test for Initiation Components
Cutting, J. L.; Chow, C.; Chau, H.; Hodgin, R. L.; Lee, R. S.; Apr. 22, 2002; 12 pp.
Report No.(s): DE2002-15002226; UCRL-JC-147144; No Copyright; Avail: Department of Energy Information Bridge
We have developed a small-scale safety test for initiation train components. A low-cost test was needed to assess the response of initiation components to an abnormal shock environment and to detect changes in the sensitivity of initiation components as they age. The test uses a disk of Detasheet to transmit a shock through a PMMA barrier into a the test article.
NTIS
Circuits; Shock Tests; Initiators (Explosives)

20030038862 Lawrence Livermore National Lab., Livermore, CA
Design of High Explosive Pulsed Power Systems for 20 MB Isentropic Compression Experiments
Goforth, J. H.; Atchison, W. L.; Fowler, C. M.; Kienigs, R. K.; Oona, H.; Jul. 05, 2002; In English
Report No.(s): DE2002-803184; UCRL-JC-148988; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
NTIS
Explosives; Power Transmission

20030038939 TNO Environment, Energy and Process Innovation, Apeldoom, Netherlands
Fuel Cells Without Reformer, State of Art
Bastianen, J. P. C. M.; Schmal, D.; March 2003; 28 pp.; In Dutch
Contract(s)/Grant(s): A02/KM/112; TNO Proj. 33388
Report No.(s): R-2003/004; TD2003-0011; Copyright; Avail: Other Sources
It is generally expected that in the future fuel cells will play an important role in military applications, for instance in the future all-electric-ship and on board of submarines (for air independent propulsion). An important disadvantage at the moment

is that, using strategic fuels like diesel, requires a bulky, complex reformer system in which the fuel is converted to hydrogen. This also has a negative influence on the energy efficiency of the fuel cell system. In the underlying inventory it is investigated what the state of art is for fuel cells requiring no reformer for fuels other than hydrogen (direct fuel cells) or only need a simple pre-treatment (prereformer). The following options have been identified: - Direct low temperature polymer membrane fuel cells using methanol and possibly dimethyl ether (a possible alternative fuel for diesel) as fuel. - Direct high temperature solid oxide or molten carbonate fuel cells normally working with natural gas as fuel (the methane is converted in hydrogen and carbon monoxide in the fuel cell stack). On a small laboratory scale it was found that this route is at least principally possible for diesel in a solid oxide fuel cell. Semi-direct high temperature solid oxide or molten carbonate fuel cells in which diesel or any fuel other than hydrogen or natural gas in a relatively simple prereformer is converted into methane, going into the fuel cell. - Because for budgetary reasons the study was stopped after 1 year (instead of the planned 5 years) it was only possible to draw very qualitative conclusions. It is advised, taking into account the potential advantages of direct fuel cells, to do a more detailed quantitative study.
Author
Solid Oxide Fuel Cells; Diesel Fuels; Energy Technology; Molten Carbonate Fuel Cells; Military Technology

20030038978 Lawrence Livermore National Lab., Livermore, CA
Performance Evaluation Tests of Insulated Pressure Vessels for Vehicular Hydrogen Storage
Aceves, S. M.; Martinez-Frias, J.; Espinosa-Loza, F.; Mar. 04, 2002; 18 pp.; In English
Report No.(s): DE2002-15002028; UCRL-JC-147482; No Copyright; Avail: Department of Energy Information Bridge

Insulated pressure vessels are cryogenic-capable pressure vessels that can be fueled with liquid hydrogen or ambient-temperature compressed hydrogen. This flexibility results in multiple advantages with respect to compressed hydrogen tanks or low-pressure liquid hydrogen tanks. Our work is directed at verifying that commercially available aluminum-lined, fiber-wrapped pressure vessels can be safely used to store liquid hydrogen. A series of tests have been conducted, and the results indicate that no significant vessel damage has resulted from cryogenic operation. Future activities include a demonstration project in which the insulated pressure vessels will be installed and tested on two vehicles. A draft standard will also be generated for certification of insulated pressure vessels.
NTIS
Liquid Hydrogen; Gas Pressure; Compressed Gas; Ambient Temperature

20030039189 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Environmental Impact of Munitions
vanHam, N. H. A.; March 2003; 23 pp.; In Dutch
Contract(s)/Grant(s): A01/D/4KA; TNO Proj. 014.13088
Report No.(s): PML-2002-A63; TD2002-0063; Copyright; Avail: Other Sources

This literature search gives an overview of recent publications in the field of environmental impact of munitions. Most of this work has been performed in the USA. From this overview it becomes clear that metals are the prime burden on the environment, caused by munitions. In some specific cases the use of shaped charges (anti-tank rounds), caused by the presence of RDX, and smoke canisters filled with white phosphorus may lead to environmental damage in vulnerable areas. The detection of TNT in soils has been the subject of many studies. This search reveals the fact that TNT binds very strongly to soil particles. The standard method to extract the TNT from these soils did not lead to reproducible results. This makes it necessary to develop new methods to extract all the TNT from the soil. Besides it is desirable to perform parallel to the chemical analysis so called bio-assay's. In these experiments the soil will be spiked with low amounts of TNT. Subsequently certain small animals like worms are exposed to these soils. A significant change in the number of worms that will show abnormal behavior or excess mortality is an indication for the occurrence of environmental damage due to the concentrations of TNT that were introduced in these soils.
Author
Environmental Surveys; Incendiary Ammunition; Trinitrotoluene; Shaped Charges; Soil Pollution; Chemical Analysis; Environment Effects

20030045719 Lawrence Livermore National Lab., Livermore, CA
Estimating Equivalency of Explosives Through A Thermochemical Approach
Maienschein, J. L.; Jul. 08, 2002; 18 pp.; In English
Report No.(s): DE2002-15002352; UCRL-JC-147683; No Copyright; Avail: Department of Energy Information Bridge

The Cheetah thermochemical computer code provides an accurate method for estimating the TNT equivalency of any explosive, evaluated either with respect to peak pressure or the quasi-static pressure at long time in a confined volume. Cheetah calculates the detonation energy and heat of combustion for virtually any explosive (pure or formulation). Comparing the detonation energy for an explosive with that of TNT allows estimation of the TNT equivalency with respect to peak pressure, while comparison of the heat of combustion allows estimation of TNT equivalency with respect to quasi-static pressure. We discuss the methodology, present results for many explosives, and show comparisons with equivalency data from other sources.
NTIS
Explosives; Thermochemistry; Computer Programs

20030045722 Lawrence Livermore National Lab., Livermore, CA
Conversion of Surplus Energetic Materials to Higher Value Products. A New Production of TATB
Mitchell, A. R.; Coburn, M. D.; Schmidt, R. D.; Pagoria, P. F.; Lee, G. S.; Jul. 11, 2002; 22 pp.; In English
Report No.(s): DE2002-15002355; UCRL-JC-147642; No Copyright; Avail: Department of Energy Information Bridge
The progression of this project from a general demilitarization activity to the development of a new production of 1,3,5-triamino- 2,4,6-trinitrobenzene (TATB) is described. There are four major synthetic routes to TATB. Only one of these routes has been used in the industrial production of TATB. There is a need to replace this route, which employs relatively harsh reaction conditions (elevated temperatures, strong acid) and a halocarbon starting material, with a less expensive and more environmentally friendly process. The Livermore process, which uses chemistry based on the vicarious nucleophilic substitution (VNS) of hydrogen and employment of relatively inexpensive feedstocks, is described and compared with other routes to TATB. Process development studies and the issue of TATB purification are also discussed.
NTIS
Tatb; Halocarbons; Purification

20030045726 Lawrence Livermore National Lab., Livermore, CA
Understanding and Predicting the Thermal Explosion Violence of HMX-Based and RDX-Based Explosives: Experimental Measurements of Material Properties and Reaction Violence
Maienschein, J. L.; Wardell, J. F.; Weese, R. K.; Cunningham, B. J.; Tran, T. D.; Jul. 03, 2002; 16 pp.; In English
Report No.(s): DE2002-15002363; UCRL-JC-144615; No Copyright; Avail: Department of Energy Information Bridge
The violence of thermal explosions with energetic materials is affected by many material properties, including mechanical and thermal properties, thermal ignition kinetics, and deflagration behavior. These properties must be characterized for heated samples as well as pristine materials. We present available data for these properties for two HMX-based formulations - LX-04 and PBX- 9501, and two RDX-based formulations - Composition B and PBXN-109. We draw upon separately published data on the thermal explosion violence with these materials to compare the material properties with the observed violence. We have the most extensive data on deflagration behavior of these four formulations, and we discuss the correlation of the deflagration data with the violence results. The data reported here may also be used to develop models for application in simulation codes such as ALE3D to calculate and predict thermal explosion violence.
NTIS
Hmx; Rdx; Explosions

20030045749 Lawrence Livermore National Lab., Livermore, CA
Glow Discharge Mass Spectrometry Analysis of LX-17 and PBX-9502 High Explosive Samples
Nilsen, J.; Castor, J. I.; Lane, M. A.; Overturf, G. E.; Dec. 16, 2002; 18 pp.; In English
Report No.(s): DE2002-15002382; No Copyright; Avail: Department of Energy Information Bridge
We present the analysis of several LX-17 and PBX-9502 samples using the glow discharge mass spectrometer to measure both the main constituents of the high explosive as well as any trace materials that may be present.
NTIS
Glow Discharges; Mass Spectrometers; Explosives; Mass Spectroscopy

20030045784 Lawrence Livermore National Lab., Livermore, CA
Assessing and Managing the Risks of Fuel Compounds: Ethanol Case Study
Layton, D. W.; Rice, D. W.; Feb. 04, 2002; 12 pp.; In English
Report No.(s): DE2002-803165; UCRL-JC-145533; No Copyright; Avail: Department of Energy Information Bridge

We have implemented a suite of chemical transport and fate models that provide diagnostic information about the behavior of ethanol (denoted EtOH) and other fuel-related chemicals released to the environment. Our principal focus is on the impacts to water resources, as this has been one of the key issues facing the introduction of new fuels and additives. We present analyses comparing the transport and fate of EtOH, methyl tertiary butyl ether (MTBE), and 2,2,4 trimethyl pentane (TMP) for the following cases (1) discharges to stratified lakes, subsurface release in a surficial soil, (3) cross-media transfer from air to ground water, and (4) fate in a regional landscape. These compounds have significantly different properties that directly influence their behavior in the environment. EtOH, for example, has a low Henry's law constant, which means that it preferentially partitions to the water phase instead of air. An advantageous characteristic of EtOH is its rapid biodegradation rate in water; unlike MTBE or TMP, which degrade slowly. As a consequence, EtOH does not pose a significant risk to water resources. Preliminary health-protective limits for EtOH in drinking water suggest that routine releases to the environment will not result in levels that threaten human health.
NTIS
Ethyl Alcohol; Trimethyl Compounds; Risk; Biodegradation

20030045813 Hawaii Natural Energy Inst., Honolulu, Sentech, Inc., Bethesda, MD
Nurturing a Clean Energy Future in Hawaii: Assessing the Feasibility of the Large-Scale Utilization of Hydrogen and Fuel Cells in Hawaii
2002; In English
Report No.(s): PB2003-102693; No Copyright; Avail: National Technical Information Service (NTIS)
Since the early 1970's, Hawaii has grown increasingly dependent on fossil fuels, with imported raw crude oil and finished petroleum products from Alaska and foreign counties currently supplying over 90 percent of the state's energy needs. To reduce this dependence, the state is exploring innovative ways to develop and use renewable energy derived from solar, wind, and geothermal resources. The use of hydrogen fuel also holds significant potential for diversifying Hawaii's energy mix - especially in the state's transportation and distributed power generation sectors - and could lead to a decrease in Hawaii's dependence on fossil fuels, higher energy efficiencies, and a reduction in polluting emissions and greenhouse gases.
NTIS
Fuel Cells; Hydrogen Fuels; Hawaii

20030049667 Pacific Northwest National Lab., Richland, WA, Idaho Univ., Moscow
Regeneration of Hydrotreating and FCC Catalysts
Gerber, M. A.; Frye, J. G.; Bowman, L. E.; Fulton, J. L.; Silva, L. J.; Sep. 1999; 62 pp.; In English
Report No.(s): DE2002-15001475; No Copyright; Avail: Department of Energy Information Bridge
Hydrotreating, hydrocracking, and fluid catalytic cracking (FCC) catalysts are important components of petroleum refining processes. Hydrotreating and hydrocracking catalysts are used to improve the yield of high-quality light oil fractions from heavier crude oil and petroleum feedstocks containing high levels of impurities. FCC catalysts improve the yield of higher octane gasoline from crude oil. Residuum hydrotreating and cracking catalysts are susceptible to irreversible deactivation caused by adsorption of sulfur and by metals impurities, such as vanadium and nickel. The gradual buildup of these impurities in a hydrotreating catalyst eventually plugs the pores and deactivates it. Nickel and vanadium adversely affect the behavior of cracking catalysts, reducing product yield and quality.
NTIS
Catalysts; Cracking (Chemical Engineering); Hydrocracking; Impurities

20030052093 Southern Research Inst., Birmingham, AL
Development of a Validated Model for Use in Minimizing NO(X) Emissions and Maximizing Carbon Utilization When Co-Firing Biomass with Coal
Felix, L. G.; Vann Bush, P.; Jul. 31, 2000; 54 pp.; In English
Report No.(s): DE2002-802828; No Copyright; Avail: Department of Energy Information Bridge
This is the seventh Quarterly Technical Report for DOE Cooperative Agreement No. DE-FC26-00NT40895. A statement of the project objectives is included in the Introduction of this report. Two additional biomass co-firing test burns were conducted during this quarter. In the first test (Test 12), up to 20\% by weight dry hardwood sawdust and switchgrass was comilled with Galatia coal and injected through the single-register burner. Liquid ammonia was intermittently added to the primary air stream to increase fuel-bound nitrogen and simulate cofiring with chicken litter. Galatia coal is a medium-sulfur (approx. 1.2\% S), high chlorine (approx. 0.5\%) Illinois Basin coal. In the second test (Test 13), up to 20\% by weight dry

hardwood sawdust and switchgrass was comilled with Jim Walters no.7 mine coal and injected through the single-register burner. Jim Walters no.7 coal is a low-volatility, low-sulfur (approx. 0.7\% S) Eastern bituminous coal. The results of these tests are presented in this quarterly report. Progress has continued to be made in implementing a modeling approach to combine reaction times and temperature distributions from computational fluid dynamic models of the pilot-scale combustion furnace with char burnout and chemical reaction kinetics to predict NOX emissions and unburned carbon levels in the furnace exhaust.
NTIS
Biomass; Nitrogen Oxides; Coal; Charring

20030052131 National Defence Research Establishment, Stockholm
FM) (Annual Report 2001 on Environmental Studies (Armed Forces)
Ahlberg, M.; Jan. 2002; 24 pp.; In Swedish
Report No.(s): PB2003-103190; FOA-R-0358-SE; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes the results of the research program Environmental studies during 2001. A compilation of all reports published 1995 - 2000 has been made. A pilot study investigating the possibilities of using maps to support the estimate environmental and industrial health hazards in international operations has been performed. Investigations of mixed soil materials indicate that micro-organisms are important for the binding of TNT to organic soil matter. Studies of lead bullets and oil from old battlefields show that the leakage of lead from bullet to soil has been very low during a time period of 300 years. The toxicity of three tested explosives (FOX12, CL20 and ADN) is affected by UV-A radiation. However, the acute toxicity of FOX7 is not affected. CL20 and FOX7 give rise to small changes in the growth of algae. Toxicity tests of soil extracts with daphnia magna give distinct answers and compare well with that of other methods. Temperature and pressure during extraction strongly affect the toxicity as measured by the cell test method. A grinding method has been developed for gunpowder and plastic bound explosives which are able to grind most materials. The material is first ground in a shredder and then by a colloid mill.
NTIS
Environmental Monitoring; Environmental Engineering; Hydrogeology; Toxicology

20030052227 Calderon Energy Co., Bowling Green, OH
Phase II Calderon Process to Produce Direct Reduced Iron Research and Development Project
Jul. 30, 2002; 30 pp.; In English
Report No.(s): DE2002-802867; No Copyright; Avail: Department of Energy Information Bridge

This project was initially targeted to the making of coke for blast furnaces by using proprietary technology of Calderon in a phased approach, and Phase I was successfully completed. The project was then re-directed to the making of iron units. U.S. Steel teamed up with Calderon for a joint effort which will last 30 months to produce directly reduced iron with the potential of converting it into molten iron or steel consistent with the Roadmap recommendations of 1998 prepared by the Steel Industry in cooperation with the Department of Energy.
NTIS
Coke; Furnaces; Iron; Steels; Industries

20030052282 Swedish Defence Research Agency, Stockholm. Div. of Systems Technology
Learning to Cooperate in a Search Mission via Policy Search
Martin, D.; Feb. 2002; 62 pp.
Report No.(s): PB2003-103179; FOI-R-0386-SE; No Copyright; Avail: CASI; A04, Hardcopy

The dangers of and the time needed when clearing an area from unexploded ordnance can be reduced by a system consisting of unmanned, autonomous robots. The system will need less time when more than one robot cooperates to search the area. The reinforcement learning algorithm GPOMDP is evaluated for the specific case of finding a decision rule that, given a map and the robot's position on the map, enables the robot to automatically choose between different possible actions. The actions lead to a near optimal path through an area where some parts need to be searched. A neural network is used as a function approximator to store and improve the decision rule, and also to find actions according to it. The problem expanded to include two robots using the same decision rule, distributed in a sense that the robots pick actions according to their own perception of the surroundings and independent of the other robot's action. To achieve cooperation between the robots, they are trained to maximize a shared reward that is equal to the sum of individual rewards that are given according to the consequences of the robots' actions. When using the learnt policy to search the largest of the experiment's areas, two robots

that have been trained with a shared reward use 70\% of the time that one optimal robot would need, while two agents that have been trained with their individual rewards need 88\%.
NTIS
Neural Nets; Policies; Robots; Algorithms

20030052290 Energy Information Administration, Washington, DC
Petroleum Marketing Monthly, March 2003 with Data for December 2002
Mar. 2003; In English
Report No.(s): PB2003-103581; DOE/EIA-0380(2003/03); No Copyright; Avail: National Technical Information Service (NTIS)

The Petroleum Marketing Monthly (PMM) provides information and statistical data on a variety of crude oils and refined petroleum products. The publication presents statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiners acquisition cost of crude oil. Refined petroleum product sales data include motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane.
NTIS
Petroleum Products; Crude Oil; Marketing; Data Bases

20030052298 Energy Information Administration, Washington, DC
Petroleum Marketing Monthly, February 2002 with Data for November 2002
Feb. 2003; In English
Report No.(s): PB2003-103582; DOE/EIA-0380(2003/02); No Copyright; Avail: National Technical Information Service (NTIS)

The Petroleum Marketing Monthly (PMM) provides information and statistical data on a variety of crude oils and refined petroleum products. The publication presents statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiners acquisition cost of crude oil. Refined petroleum product sales data include motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane.
NTIS
Petroleum Products; Crude Oil

20030052305 North Dakota Univ., Grand Forks. Energy and Environmental Research Center
Final Topical Report for Novel Systems Sequestering and Utilization of CO2
Olson, E. S.; Apr. 1999; 28 pp.; In English
Report No.(s): DE2002-778920; No Copyright; Avail: Department of Energy Information Bridge

A sequestering and utilization system for mitigation of CO2 emissions requires a low-cost conversion coupled with a large-volume application. We proposed a concept based on copolymerization of CO2 from stack gases or from a concentrated CO2 stream coupled with use of the water-soluble products in enhanced oil recovery (EOR). The low cost results from the use of formaldehyde and other carbonyl compounds rather than epoxides as the comonomers. The project has demonstrated that catalytic conversion of CO2 to copolymers can be accomplished. The copolycarbonate products obtained from formaldehyde precursors are in fact water-soluble.
NTIS
Carbon Dioxide; Sequencing; Utilization; Emission; Copolymerization; Technology Assessment

31
ENGINEERING (GENERAL)

Includes general research topics related 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*.

20030037136 Department of Commerce, Washington, DC
U.S. Corporate R and D Investment, 1994-1999 with Advance Estimates for 2000
Oct. 15, 2001; In English
Report No.(s): PB2003-102720; No Copyright; Avail: National Technical Information Service (NTIS)

The U.S. Corporate R&D data series is derived, in part, from Standard and Poor's Compustat database, which in turn is based on financial statements filed with the Securities and Exchange Commission (SEC). Compustat includes 10,000 actively-traded U.S. corporations (and 11,000 no longer active corporations) of which approximately one-third report R&D in a given year. Based on analysis of SEC filings and other sources, the Office of Technology Policy (OTP) substantially adjusts raw Compustat data to remove R&D double counts and write-offs of acquired in-process R&D4 that are largely associated with firm acquisitions and mergers. To more accurately depict levels of corporate R&D, this is the first OTP report to be based on the North American Industry Classification System (NAICS) rather than the decades-old Standard Industrial Classification (SIC). The U.S. Corporate R&D data series now includes nine major sectors that conduct R&D, which are subdivided into 63 detailed sectors.
NTIS
Research And Development; Investments; Organizations; Industries

20030037138 Hawaii Dept. of Business, Economic Development and Tourism, Honolulu
Sea Water District Cooling Feasibility Analysis for the State of Hawaii
Oct. 2002; In English
Report No.(s): PB2003-102714; No Copyright; Avail: National Technical Information Service (NTIS)
This study is an evaluation of the potential for using cold seawater to provide air conditioning for areas in Hawaii that have high demand concentrations. Presently air conditioning (A/C) is provided in these areas by conventional cooling systems (CCSs) that use electric power to chill water that is distributed throughout the building to pick up heat and transfer it to the outside air. The conventional A/C system consumes around 40\% of the total electrical power used in such buildings. A seawater A/C district cooling system (SDC) consists of a cold seawater supply line, a heat exchanger (at the shoreline), and a closed cycle fresh water distribution system, all with appropriate pumps. The electrical energy required by an SDC system is only to run the pumps. This amounts to about 10\%, or less, of what is needed for the conventional A/C system.
NTIS
Sea Water; Air Conditioning; Hawaii

20030038867 Sandia National Labs., Albuquerque, NM
Self-Reconfigurable Robots
Hensinger, D. M.; Johnston, G. A.; Hinman-Sweeney, E. M.; Feddema, J.; Eskridge, S.; Oct. 2002; In English
Report No.(s): DE2002-805834; No Copyright; Avail: National Technical Information Service (NTIS)
A distributed reconfigurable micro-robotic system is a collection of unlimited numbers of distributed small, homogeneous robots designed to autonomously organize and reorganize in order to achieve mission-specified geometric shapes and functions. This project investigated the design, control, and planning issues for self-configuring and selforganizing robots. In the 2D space a system consisting of two robots was prototyped and successfully displayed automatic docking/undocking to operate dependently or independently. Additional modules were constructed to display the usefulness of a selfconfiguring system in various situations. In 3D a self-reconfiguring robot system of 4 identical modules was built. Each module connects to its neighbors using rotating actuators. An individual component can move in three dimensions on its neighbors. We have also built a self-reconfiguring robot system consisting of 9-module Crystalline Robot. Each module in this robot is actuated by expansion/contraction. The system is fully distributed, has local communication (to neighbors) capabilities and it has global sensing capabilities.
NTIS
Robots; Robotics; Control

20030038898 National Inst. of Standards and Technology, Gaithersburg, MD
Information Technology for Engineering and Manufacturing (ITEM), 2000 Conference
Jun. 12, 2000; In English
Report No.(s): PB2000-105257; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Basis for Perspective; Leading Edge Implementations of IT; Keys to Expanding Use of IT; MSC Business (Simulation of Physics, Largest CAE company); Role of Collaboration at MSC (Interface with Customers, Interface with Suppliers).
NTIS
Information Systems; Conferences; Computer Aided Manufacturing

20030038905 SWPC, Pittsburgh, PA

Development of a Candle Filter Failure Safeguard Device

Bruck, G. J.; Smeltzer, E. E.; Sanjana, Z. N.; Jun. 06, 2002; In English

Report No.(s): DE2002-803195; No Copyright; Avail: National Technical Information Service (NTIS)

Development, testing and optimization of advanced metal and ceramic, barrier and fiber safeguard devices (SGDs) is described. Metal barrier devices are found prone to manufacturing defects and premature blinding. Fiber devices are found to be satisfactory if fine fibers are used. Durable alloys are identified for both oxidation and gasification conditions. Ceramic honeycomb SGDs were found to perform as excellent barrier devices. Optimization has shown such devices to be durable. Field testing of ceramic honeycomb SGDs from two different manufacturers is being pursued.

NTIS

Gas Turbines; High Temperature Gases; Cleaning; Filters; Fossil Fuels; Power Plants

20030038946 Washington State Transportation Center, Seattle

Overview of Studded and Studless Tire Traction and Safety

Scheibe, R. R.; Oct. 2002; 84 pp.; In English

Report No.(s): PB2003-103402; No Copyright; Avail: CASI; A05, Hardcopy

Studded tires have generated much controversy over the years; a number of states have banned them, while others, including Washington, have restricted their use and passed legislation to require lighter-weight studs. This report reviews recent studies that have addressed the performance and safety of the current generation of studded tires as well as the new studless winter tires on late-model vehicles. The well-documented correlation between studded tires and pavement wear was not the focus of this work. The issues surrounding studded tire performance and safety are complex. From the standpoint of traction alone, studded tires, when new, often provide some benefit over other tire types on ice-covered roads when the temperature is near freezing. However, the advent of the new studless tires has diminished the marginal benefit, and recent studies suggest that the infrequent, narrow range of conditions necessary for benefit from studded tires may not outweigh their detrimental effect on traction in dry or wet conditions on certain pavement types. In addition, a host of primary and secondary safety factors are related to studded tire use, many of which are very difficult to quantify, including facets of driver behavior and safety perception.

NTIS

Tires; Traction; Highways; Safety; Automobiles

20030039002 Massachusetts Inst. of Tech., Cambridge

Applying AUV Lessons and Technologies to Autonomous Surface Craft Development

Manley, J.; Curran, J.; Lockyer, B.; Morash, J.; Chryssostomidis, C.; 2002; 12 pp.; In English

Report No.(s): PB2003-102883; MITSG-02-12; No Copyright; Avail: CASI; A03, Hardcopy

Recent restructuring at the MIT AUV Lab has led to a convergence of autonomous vehicle technologies. Previously, the development of AUVs and Autonomous Surface Craft (ASCs) was pursued independently. In 1999 and 2000 new AUV software and electronic systems were developed and the lab's primary ASC underwent a significant mechanical redesign. The timing of these developments was fortuitous; it allowed the results of both efforts to be brought together during late 2000 and early 2001. This work to combine developments in two different vehicle programs streamlined the autonomous vehicle fleet at the AUV Lab. With identical user interfaces and programming requirements any engineer familiar with the AUV can now operate the ASC as well. Similarity in AUV and ASC control systems improves the economics of vehicle maintenance and deployment.

NTIS

Autonomy; Underwater Vehicles

20030051493 Florida Univ., Gainesville. Solar Energy and Energy Conversion Lab

Development of New Thermodynamic Cycles

Goswami, D. Y.; 2002; 70 pp.; In English

Report No.(s): DE2002-803214; No Copyright; Avail: Department of Energy Information Bridge

In general, optimization is a way to find the best solution to a problem of any kind. We do a lot of optimization in our daily life. For example, we always search for the best product, which meets our demands, with the lowest possible price. In engineering, optimization is a very powerful tool. There is usually more than one acceptable solution to an engineering problem. The goal of an engineer is to find the best one. When there are more than a few acceptable solutions, it may be simply

impossible to compare them by hand. More sophisticated mathematical methods have been developed to help find the best solution.
NTIS
Thermodynamic Cycles; Optimization; Engineering

20030052019 National Inst. of Standards and Technology (BFRL), Gaithersburg, MD
Refrigerator Energy Consumption Test Results using the USA Department of Energy and International Organization for Standardization Test Procedures (Revision)
Yashar, D. A.; Mar. 2000; 52 pp.; In English
Report No.(s): PB2003-103354; NISTIR-6945-REV; No Copyright; Avail: CASI; A04, Hardcopy

This investigation compares the energy consumption ratings obtained for refrigerators using the Association of Home Appliance Manufacturers (AHAM) HRF-1 test procedure, as adopted by the USA Department of Energy (DOE), and the International Organization for Standardization (ISO) equivalent test procedures (ISO 8561 and ISO 7371). Tests were performed on four different units according to both the DOE test procedure and the appropriate ISO test procedure. These units included two household kitchen-type, automatic defrost refrigerator-freezers, one of each body style that is prevalent in the U.S. (one unit with the top mounted freezer compartment and the other unit with the refrigerator and freezer compartments in a side-by-side configuration). A top mount, automatic defrost refrigerator-freezer which employs many novel energy saving devices and techniques was also tested. The final unit tested was a manual defrost refrigerator, as this is a popular design in many European countries.
NTIS
Energy Consumption; Refrigerators; Performance Tests; Data Acquisition

20030052115 Brookhaven National Lab., Upton, NY
Duct Retrofit Strategy to Complement a Modulating Furnace
Andrews, J. W.; Oct. 2002; 24 pp.; In English
Report No.(s): DE2003-804678; BNL-69435; No Copyright; Avail: Department of Energy Information Bridge

Recent work by the author and others indicates that conductive heat losses in ductwork will usually increase significantly when airflow rates are reduced, as will happen when a modulating furnace is installed in place of an existing high-output unit. A duct retrofit strategy is proposed that to mitigate these losses. The strategy involves the use of insulating sleeves installed inside the supply runout ducts.
NTIS
Conductive Heat Transfer; Ducts

20030052289 Manufactured Housing Research Alliance, New York, NY
Whole Housing Ventilation Strategies
Jan. 02, 2003; 36 pp.; In English
Report No.(s): PB2003-103090; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this research was to provide a baseline for evaluating whole house ventilation strategies for manufactured homes. In general, airflow through homes, and its impact on building performance and homeowner comfort, is one of the most difficult building science phenomenons to quantify and predict. Research is proposed to establish whether or not existing whole house ventilation systems, once installed and operating in typical manufactured homes, exchange air with the outdoors at the rate that is specified in the HUD code and to consider options to improve system performance and cost efficiency. The development of a 'best practices' manual for whole house ventilation systems design, installation and operation is also proposed. Finally, follow-up research is proposed to determine if ventilation targets are being met.
NTIS
Ventilation; Buildings; Strategy

32
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*.

20030037110 Helsinki Univ. of Technology, Espoo (Finland)
Evolutionary Approach to Organizing after Market Services for Mobile Phones in Asia Pacific
Linnarinne, H.; Nov. 2001; 166 pp.
Report No.(s): PB2003-101274; REPT-15; Copyright; Avail: National Technical Information Service (NTIS)

After market services for mobile phones has grown in size and importance, 'in the shadow' of the mobile phone business. Today it is both a significant motive in customer behavior and an immense cost factor to the mobile phone supplier. Nevertheless, after market services have not been given sufficient recognition in business concepts. Furthermore, there are only a limited number of studies done on after markets services in industrial environment. This study concentrates on the evolution in after market services in mobile phone business. The aim is to identify the optimal after market service approach in regard to the maturity of the mobile phone market.
NTIS
Commerce; Costs; Telecommunication

20030037157 National Telecommunications and Information Administration, Washington, DC
Electronic Signatures in Global and National Commerce Act. Section 105(a)
Jun. 2001; 26 pp.
Report No.(s): PB2003-102783; No Copyright; Avail: CASI; A03, Hardcopy

Section 105(a) of the Electronic Signatures in Global and National Commerce Act (ESIGN Act) directs the Department of Commerce (Department) to conduct an inquiry and report to Congress on the effectiveness of electronic mail in the delivery of records, as compared with the delivery of records via the USA Postal Service and private express mail services. While the term effectiveness is not defined in the ESIGN Act or its legislative history, the Department's analysis of public comments reveals specific distinctions between electronic and traditional mail delivery systems that impact the delivery of records. These distinguishing factors highlight four issues: universal access, reliability, authentication, and privacy and security.
NTIS
Signatures; Commerce; Internets; Computer Information Security

20030037158 National Telecommunications and Information Administration, Washington, DC
Assessment of the Viability of Accommodating Advanced Mobile Wireless (3G) Systems in the 1710-1770 MHz and 2110-2170 MHz Bands
Jul. 22, 2002; In English
Report No.(s): PB2003-102785; No Copyright; Avail: National Technical Information Service (NTIS)

Consideration for spectrum for advanced mobile wireless services started with the World Administrative Radio Conference (WARC) in 1992 and was further delineated at the World Radiocommunication Conference (WRC) in 2000. The quest for 3G spectrum in the U.S. began when the Federal Communications Commission (FCC) released their Spectrum Policy statement in 1999. In October 2000, the previous Administration directed that a plan be developed to select spectrum for 3G by October 20, 2000 that would result in the allocation of additional spectrum for 3G services by July 2001 and the auction for licensing 3G wireless providers by September 30, 2002. In December 2000, the FCC adopted a Notice of Proposed Rulemaking (ET Docket No. 00-258) to amend Part 2 of the Commission's rules to allocate spectrum below 3GHz for mobile and fixed services to support the introduction of new advanced wireless services including 3G based on the FCCs Spectrum Policy Statement and petitions from the Cellular Telecommunications and Internet Association (CTIA).
NTIS
Telecommunication; Wireless Communication; Policies

20030038851 Helsinki Univ. of Technology, Espoo (Finland)
Sixteenth Nordic Teletraffic Seminar NTS 16. Proceedings held in Espoo, Finland on August 21-23, 2002
Jul. 2002; 372 pp.
Report No.(s): PB2003-102045; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: (Session 1) Cellular Networks; (Session 2) Traffic Handling in IP Networks; (Session 3)

Queueing Models; (Session 4) Traffic Measurements; (Session 6) Overload Control; (Session 7) QoS and DiffServ I; (Session 8) Networks; (Session 9) Wireless Networks; (Session 10) QoS and DiffServ II; and (Session 11) Performance Measurements.
NTIS
Telecommunication; Communication Networks; Conferences

20030038887 Sandia National Labs., Albuquerque, NM
Performance Impacts of Lower-Layer Cryptographic Methods in Mobile Wireless Ad Hoc Networks
Van Leeuwen, B. P.; Torgerson, M. D.; Nov. 2002; In English
Report No.(s): DE2002-805840; No Copyright; Avail: National Technical Information Service (NTIS)

In high consequence systems, all layers of the protocol stack need security features. If network and data-link layer control messages are not secured, a network may be open to adversarial manipulation. The open nature of the wireless channel makes mobile wireless mobile ad hoc networks (MANETs) especially vulnerable to control plane manipulation. The objective of this research is to investigate MANET performance issues when cryptographic processing delays are applied at the data-link layer. The results of analysis are combined with modeling and simulation experiments to show that network performance in MANETs is highly sensitive to the cryptographic overhead. This research examines security features from an efficiency point of view. We examine network performance issues that arise from increasing message sizes to account for authentication as well as those issues associated with applying processing delays of standard security protocols to routing messages. Our findings indicate that in many cases cryptographic delays destroy network functionality.
NTIS
Cryptography; Computer Information Security; Communication Networks

20030038922 Center for Mathematics and Computer Science, Amsterdam
State-Dependent M/G/1 Type Queueing Analysis for Congestion Control in Data Networks. Probability, Networks and Algorithms (PNA)
Altman, E.; Avrachenkov, K.; Barakat, C.; Nunez Queija, R.; Jul. 21, 2000; 38 pp.
Report No.(s): PB2003-102643; PNA-R0005; Copyright; Avail: National Technical Information Service (NTIS)

Aviation experts believe that building runways is one key way to address airport capacity issues and prevent delays that can affect the entire U.S. economy, but runway projects are often controversial and time-consuming. GAO was asked to examine how much time airports spend completing runways, what challenges airports and other stakeholders experience during this process, and what airports and other stakeholders have done to address challenges related to runway projects. GAO analyzed the results of surveys from 30 airports on 32 runway projects and visited 5 airports in order to interview numerous runway project stakeholders.
NTIS
Congestion; Mathematical Models; Internets; Queueing Theory; Probability Theory; Analysis (Mathematics)

20030045778 Physics and Electronics Lab. TNO, The Hague, Netherlands
Voice Over IP Transit Layer for the MTDN: Threats and Measures
Coolen, R.; OpdeBeek, S. S.; October 2002; 44 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32216
Report No.(s): FEL-02-A125; TD00-01-0309; Copyright; Avail: Other Sources

The report gives an overview of threats and measures for a Voice-over-IT transit layer for the MDTN.
Author
Computer Information Security; Communication Networks; Voice Communication; Computer Networks; Protocol (Computers); Telephones

20030045789 Physics and Electronics Lab. TNO, The Hague, Netherlands
Compact HF Antennas for Operational Use
vanderList, J.; Overduin, R.; March 2003; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): V008; TNO Proj. 015.30764
Report No.(s): FEL-02-A277; TD02-0212; Copyright; Avail: Other Sources

In this study TNO-FEL co-operated with the RNLA to investigate which HF-user groups could benefit from compact HF-antennas. Further, fundamental limits and other technical backgrounds have been retreived from open-source literature. Also specific compact antenna types, encountered in the most recent decennium, have been identified, analyzed and considered

for their operational usability. Although offering less performance, compact antennas that are based on conventional structures seem more practical for implementation than the newly developed, 3-dimensional structures.
Author
High Frequencies; Antennas; Communication Equipment

20030045794 Helsinki Univ. of Technology, Espoo (Finland)
AD HOC Networks Design and Performance Issues
Anton, J. F. R.; May 2002; 126 pp.
Report No.(s): PB2003-101687; REPT-2/2002; Copyright; Avail: National Technical Information Service (NTIS)

The fast development wireless networks have been experiencing recently offers a set of different possibilities for mobile users, that are bringing us closer to voice and data communications 'anytime and anywhere'. Some outstanding solutions in this field are Wireless Local Area Networks, that offer high-speed data rate in small areas, and Wireless Wide Area Networks, that allow a greater mobility for users. In some situations, like in military environment and emergency and rescue operations, the necessity of establishing dynamic communications with no reliance on any kind of infrastructure is essential. Then, the ease of quick deployment ad hoc networks provide becomes of great usefulness. Ad hoc networks are formed by mobile hosts that cooperate with each other in a distributed way for the transmissions of packets over wireless links, their routing, and to manage the network itself.
NTIS
Wireless Communication; Voice Communication; Packets (Communication); Performance Tests; Communication Networks

20030051480 Technische Univ., Eindhoven, Center for Mathematics and Computer Science, Amsterdam
Tandem Fluid Queue with Gradual Input
Scheinhardt, W. R. W.; Zwart, B.; Jan. 2001; 26 pp.; In English
Report No.(s): PB2003-102235; MEMO-1563; No Copyright; Avail: CASI; A03, Hardcopy

For a two-node tandem fluid model with gradual input, the authors compute the joint steady-state buffer-content distribution. The authors' proof exploits martingale methods developed by Kella & Whitt. For the case of finite buffers, the authors use an insightful sample-path argument to find a proportionality result.
NTIS
Queueing Theory; Martingales; Mathematical Models; Communication Networks

20030051561 Executive Office of the President, Washington, DC
National Strategy to Secure Cyberspace, February 2003
Feb. 2003; In English
Report No.(s): PB2003-103084; No Copyright; Avail: National Technical Information Service (NTIS)

This document outlines an initial framework for both organizing and prioritizing efforts. It provides direction to the federal government departments and agencies that have roles in cyberspace security. It also identifies steps that state and local governments, private companies and organizations, and individual Americans can take to improve our collective cybersecurity. The strategy highlights the role of public-private engagement. The document provides a framework for the contributions that we all can make to secure our parts of cyberspace. The dynamics of cyberspace will require adjustments and amendments to the strategy over time.
NTIS
Computer Information Security; Computer Networks; Vulnerability; Communication Networks

20030051574 Utrecht Rijksuniversiteit (Netherlands), Technische Univ. Twente, Enschede (Netherlands)
Algorithms for the Radio Link Frequency Assignment Problem
Aardal, K.; Lenstra, J. K.; Tiourine, S.; Nov. 05, 1999; 24 pp.; In English
Report No.(s): PB2003-103128; No Copyright; Avail: CASI; A03, Hardcopy

The radio link frequency assignment problem occurs when a network of radio links has to be established. Each link must be assigned an operating frequency from a given domain. The assignment has to satisfy certain restrictions so as to limit the interference between links. The number of frequencies used is to be minimized.
NTIS
Algorithms; Frequency Assignment; Radio Frequencies; Data Links

20030051577 Technische Univ. Twente, Enschede (Netherlands)
Dialogues with a Talking Face for Web-Based Services and Transactions
Hulstijn, J.; Nijholt, A.; Hondorp, H.; van den Berk, M.; van Hessen, A.; 2003; 14 pp.
Report No.(s): PB2003-103126; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we discuss our research on interactions in a virtual theatre that has been built using VRML and therefore can be accessed through Web pages. In the virtual environment we employ several agents. The virtual theatre allows navigation input through keyboard and mouse, but there is also a navigation agent which listens to typed input and spoken commands. Feedback of the system is given using speech synthesis. We also have an information agent which allows a natural language dialogue with the system where the input is keyboard-driven and the output is both with tables as with template driven natural language generation. In development are several talking faces for the different agents in the virtual world. At this moment an avatar with a cartoon-like talking face driven by a text-to-speech synthesizer can provide users with information about performances in the theatre.
NTIS
World Wide Web; Internets; Virtual Reality; Natural Language (Computers)

20030051594 Technische Univ., Eindhoven
Stochastic Single Node Service Provision Problem
Dye, S.; Stougie, L.; Tomasgard, A.; Aug. 1999; 28 pp.
Report No.(s): PB2003-101949; MEMO-COSOR-99-13; No Copyright; Avail: CASI; A03, Hardcopy

The service provision problem described in this paper comes from an application of distributed processing in telecommunications networks. The objective is to maximize a service provider's profit from offering computational based services to customers. The service provider has limited capacity of some resources and therefore must choose from a set of software applications those he would like to offer. This can be done in a dynamic manner taking into consideration that demand for the different services is uncertain. This problem is examined in the framework of stochastic integer programming. Approximations and complexity are examined for the case when demand is described by a discrete probability distribution and one resource limits the number of software applications that may be installed. For the deterministic counterpart a fully polynomial approximation scheme is known. The authors show that introduction of stochasticity makes the problem strongly NP-hard, implying that the existence of such a scheme for the stochastic problem is highly unlikely.
NTIS
Telecommunication; Communication Networks; Distributed Processing

20030051606 Helsinki Univ. of Technology, Espoo (Finland)
Adaptive Methods for Blind Equalization and Signal Separation in MIMO Systems
Enescu, M.; 2002; 100 pp.
Report No.(s): PB2003-103142; REPT-36; No Copyright; Avail: CASI; A05, Hardcopy

This thesis addresses the problems of blind source separation (BSS) and blind and semi-blind communications channel equalization. In blind source separation, signals from multiple sources arrive simultaneously at a sensor array, so that each sensor output contains a mixture of source signals. Sets of sensor outputs are processed to recover the source signals from the mixed observations. The term blind refers to the fact that specific source signal values and accurate parameter values of a mixing model are not known a priori. Application domains for the material in this thesis include communications, biomedical, and sensor array signal processing. The goal of this thesis is development of blind and semi-blind algorithms which require little or no prior information about source signal or mixing system parameter values in order to process the data.
NTIS
Mimo (Control Systems); Signal Processing

20030052123 Technische Univ., Eindhoven
Two-Level Traffic Shaper for an On-Off Source
Adan, I. J. B. F.; Resing, J. A. C.; Apr. 1999; 26 pp.
Report No.(s): PB2003-101970; MEMO-COSOR-99-07; No Copyright; Avail: CASI; A03, Hardcopy

This paper studies a two-level traffic shaper. The cell arrival process is modeled by an on-off fluid source. The output rate of the shaper is regulated by the content of a finite token bank. The authors' interest focuses on the stationary joint distribution of the content of the cell buffer and the content of the token bank, from which various performance measures such as the steady-state cell delay and burst duration can be obtained. The system is analyzed using an approximative model based on a

stochastic discretization of the content of the token bank. The authors believe that this discretization technique has much wider applicability. Numerical results show the quality of the approximation and demonstrate the effect of the shaping mechanism.
NTIS
Cells (Biology); Models; Fluid Flow

20030052124 Technische Univ., Eindhoven
Control Perspective on Communication Using Chaotic Systems
Huijberts, H. J.; Nijmeijer, R.; Willems, R. M. A.; Aug. 1998; 14 pp.
Report No.(s): PB2003-101974; RANA-98-16; No Copyright; Avail: CASI; A03, Hardcopy

Secure communication using chaotic systems is considered from a control point of view. It is shown that a synchronization-based scheme for secure communication described in the literature may in fact be interpreted as an adaptive identification scheme. Two examples where the existing scheme fails to achieve the reconstruction of an encoded message are treated using adaptive identification techniques.
NTIS
Cryptography; Information Transfer; Chaos

20030052132 National Defence Research Establishment, Stockholm
Annual Report 2001 on FOI's Research on Command, Control, Communication and Information Technology (C3I)
Gundmark, T.; Jan. 2002; 38 pp.; In Swedish
Report No.(s): PB2003-103193; FOI-R-0353-SE; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes briefly the research at FOI during 2001 in the area of Command, Control and Communication including Information Technology. The content and the aim of the research area are reported. Also the national and the international evolution are described. Research topics and results accomplished are reported by the project. A major part of the research comprehend new for the Swedish Armed Forces important disciplines such a IT-security, Information Fusion (within decision support) and Mobile Ad Hoc Networks (within telecommunication). In these cases the research is only partly on the road to the established objectives. In other cases support has been given explicitly to the Swedish Armed Forces development of Command and Control as well as of Command training. In summary the results of the research of 2001 provide a foundation for the future support of the Swedish Armed Forces when developing into a Network Based Defense.
NTIS
Command And Control; Information Systems; Telecommunication

20030052159 Physics and Electronics Lab. TNO, The Hague, Netherlands
FSS Integrated Antennas, Part 1
Monni, S.; October 2002; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 29413
Report No.(s): FEL-02-A129-Pt-1; TD01-0335-Pt-1; Copyright; Avail: Other Sources

Frequency Selective Surfaces (FSS) are two-dimensional arrays of passive patch or aperture elements, used to obtain a particular frequency selectivity behaviour. Historically Frequency Selective Surfaces have been designed as standing alone elements and, just in a second phase, associated to the antenna. The performances of an array antenna can be greatly improved by integrating the FSS with the antenna itself. This concept of Integrated Antenna Design is very challenging, because it allows taking both the antenna and the FSS into account since the very beginning of the design project with better control on every step of the work. It perfectly matches the idea of Integrated Topside Design of a ship and offers the advantages of a more compact structure antenna-FSS, with lower RCS (Radar Cross Section), and with a better control of electromagnetic interferences between antenna and FSS. The aim of this study is the development of an Integrated Design Technique, in terms of know-how on technology and analysis/synthesis tools, that allows analysing multi-layer structures where Frequency Selective Surfaces are integrated with the antennas, for next generation of phased array radar. In this report the aperture case has been studied and illustrated with a number of results.
Author
Antenna Arrays; Antenna Design; Apertures; Frequencies; Selective Surfaces; Integral Equations; Technology Utilization

20030052270 Swedish Defence Research Agency, Stockholm. Div. of Defence Analysis
Use of Satellites for Communications in the New Warfare
Dec. 2001; 64 pp.; In Swedish
Report No.(s): PB2003-102114; FOI-R-0284-SE; No Copyright; Avail: CASI; A04, Hardcopy

In this report the usefulness of satellite communications in the new warfare is treated from aspects as time coverage, data rates, and possibilities to communicate timely, transfer security, frequencies and jamming. Two epochs, namely 2005 and 2010, are specially taken into consideration. The study discusses which satellite systems best satisfy the communication needs. Satellite communication shall in many cases be regarded as one means of communication among several others and can constitute a complement or reserve to existing fixed networks. In the new warfare, satellite communication is suitable for broadcasting, IP traffic, as a link in general (especially between sensors), and from sensors to HQs. Commercial satellite usage is primarily for peace situations, unjammed conditions, and in international operations. In connections with natural disasters, satellite communication is in many cases the only possible way of communicating to and from the area. In the new warfare, satellites of Swedish interest are Swedish satellites, satellites in GEO, and satellites with global continuous coverage. Future LEO systems may become useful for transmission of data for combat command and for transmission of situation imagery. Some questions, as data transmission from ground sensors and the sensor-to-shooter problem, need further investigation.
NTIS
Satellite Communication; Warfare; Time Measurement

20030052273 Swedish Defence Research Establishment, Linkoeping
Some Issues Concerning Antennas for HPM
Holmgren, T.; Jan. 2002; 30 pp.; In Swedish
Report No.(s): PB2003-102118; FOI-R-0362-SE; No Copyright; Avail: CASI; A03, Hardcopy
This report tries to give estimations of the performance achievable in antennas designed for (mobile) HPM systems, including limitations due to the high power levels. In particular, this is done for one alternative, a vircator or similar generation of microwaves in vacuum. Other issues, such as possible power levels in structures consisting of metallic conductors, and impulse radiating antennas (IRA). This report does not contain an answer as the project has been searching for the right questions. However, it would seem that there are interesting power levels and carriers that are not compatible.
NTIS
Antennas; Conductors; Cathodes

20030052286 Technische Univ. Twente, Enschede (Netherlands)
Results of The SURFnet4 Management Project 1997
van Beijnum, B. J.; Pras, A.; Sprenkels, R. A. M.; van der Waaij, B. D.; 2002; 52 pp.
Report No.(s): PB2003-103136; No Copyright; Avail: CASI; A04, Hardcopy
This technical report bundles the five reports that were written for two SURFnet4 projects in 1997. The binding factor for the reports is that each reports treats a different research aspect of the SURFnet4 ATM network. Each of the five reports is covered in a separate section of this technical report.
NTIS
Asynchronous Transfer Mode; Networks; Management; Architecture (Computers)

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*.

20030037053 National Renewable Energy Lab., Golden, CO
Deep-Level Transient Spectroscopy in InGaAsN Lattice-Matched
Johnston, S. W.; Ahrenkiel, R. K.; Friedman, D. J.; Kurtz, S. R.; May 2002; 12 pp.; In English
Report No.(s): DE2002-15000982; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Gallium Arsenides; Semiconductors (Materials)

20030037174 Lawrence Livermore National Lab., Livermore, CA

Estimated Costing of an EUV Mask Inspection Microscope. Report 4 for AIM Design Study

Barty, A.; Taylor, J. S.; Aug. 20, 2002; 14 pp.; In English

Report No.(s): DE2002-15002103; No Copyright; Avail: Department of Energy Information Bridge

This document is the fourth sub-report of the EUV AIM design study being conducted at LLNL on behalf of International SEMATECH (ISMT) and addresses the issue of preliminary system costing. The purpose of the LLNL study, as identified in section 1.2 of the statement of work, is to research the basic user requirements of an actinic defect characterization tool, potential design configurations and top-level specifications. The objectives of this design study specifically identified in section 1.3 of the statement of work were to 1. Determine the user requirements of an actinic defect characterization tool; 2. Determine if an EUV AIM tool is an appropriate platform for actinic defect characterization; 3. Determine possible design configurations and top-level performance specifications; 4. Identify potential technical issues and risks of different technical approaches; 5. Provide estimates of cost relating to different technical approaches; and 6. Provide simulated performance for key subsystems and the entire system. There are 10 subsections of the study; this report addresses item 8, system costing, and is provided as a separate report so that its content can be kept confidential at the discretion of ISMT. In this analysis we cost two systems - one based on normal-incidence multilayer-coated optics and another based on zone plate optics. The costing of these two systems are provided separately because the fabrication costs and technical challenges associated with each approach are different in areas relating to optics fabrication, and are highlighted by providing separate costing for the two approaches.

NTIS

Extreme Ultraviolet Radiation; Cost Estimates

20030038871 Sandia National Labs., Albuquerque, NM

Tangential Velocity Measurement using Interferometric MTI Radar

Doerry, A. W.; Mileshosky, B. P.; Bickel, D. L.; Nov. 2002; 30 pp.; In English

Report No.(s): DE2002-805861; No Copyright; Avail: Department of Energy Information Bridge

An Interferometric Moving Target Indicator radar can be used to measure the tangential velocity component of a moving target. Multiple baselines, along with the conventional radial velocity measurement, allow estimating the true 3-D velocity vector of a target.

NTIS

Interferometry; Moving Target Indicators

20030038980 National Inst. of Standards and Technology (EEEL), Gaithersburg, MD

Electronics and Electrical Engineering Laboratory, Optoelectronics Division: Programs, Activities and Accomplishments

Jan. 2003; 50 pp.; In English

Report No.(s): PB2003-102836; NISTIR-6627; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: From the Division Chief; About the Opteoelectronics Division; Primary Standards for Laser Radiometry; Optoelectronics Division Staff; CW Laser Radiometry; Pulsed-Laser Radiometry; High-Speed Measurements; Interferometry and Polarimetry; Spectral and Nonlinear Properties; Optical Materials Metrology; Nanostructure Fabrication and Metrology; Semiconductor Growth and Devices; (Appendix A) Major Laboratory Facilities; (Appendix B) NRC Post-Doctoral and Other Research Opportunities; (Appendix C) Conferences and Workshops; (Appendix D) Calibration Services; and (Appendix E) Standard Reference Materials.

NTIS

Laboratories; Optoelectronic Devices; Research Projects

20030038987 National Inst. of Standards and Technology (EEEL), Gaithersburg, MD

Electronics and Electrical Engineering Laboratory, Electricity Division: Programs, Activiites, and Accomplishments

Jan. 2003; 74 pp.

Report No.(s): PB2003-102837; NISTIR-6953; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Welcome; Division Programs; Electricity Highlights; The Electronic Kilogram; Voltage Metrology; Metrology of the Ohm; Single Electron Tunneling; AC-DC Difference Standards and Measurement Techniques; Farad and Impedance Metrology; Pulse Metrology and Time Domain Measurements; Electric Power Metrology; Flat Panel Display Metrology; Infrastructure for Integrated Electronic Design & Manufacturing; Knowledge Facilitation; Electricity

Division Staff Recognition; Electricity Division Calibration Services; Post-Doctoral Research Associateships; SURFing the Electronics and Electrical Engineering Laboratory; NIST's Gaithersburg, Maryland Campus and Surrounding Area; NITS Advanced Measurement Laboratory; and Electricity Division Organization.
NTIS
Laboratories; Electronics; Electrical Engineering; Research Projects

20030038989 National Inst. of Standards and Technology, Gaithersburg, MD
Electronics and Electrical Engineering Laboratory, Electromagnetic Technology Division: Programs, Activities, and Accomplishments
Jan. 2003; 58 pp.
Report No.(s): PB2003-102838; NISTIR-6626; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Welcome; Quantum Standards; Quantum Voltage; Johnson Noise Thermometry; Single Electronics for Standards and Metrology; Physics of Quantum Hall Resistance Standards; Quantum Information; Quantum Computing; Quantum Communication; Quantum Measurements; Cyrogenic Sensors; Terahertz Technology; Emerging Electronic Materials; Nanoscale Fabrication; Topics Covered by Organizational Units; (Appendix A) Experimental Systems and Instruments; (Appendix B) Post-Doctoral Opportunities; (Appendix C) Awards and Recognition; (Appendix D) Electromagnetic Technology Division Staff.
NTIS
Laboratories; Electromagnetism; Research Projects

20030038996 National Inst. of Standards and Technology (EEEL), Gaithersburg, MD
Electronics and Electrical Engineering Laboratory, Semiconductor Electronics Division, Programs, Activities, and Accomplishments
Jan. 2003; 60 pp.; In English
Report No.(s): PB2003-102840; NISTIR-6933; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Welcome; Mission; Vision; Values; Goals; Semiconductors: Backbone of the Electronic/Digital Revolution; Semiconductor Electronic Division Organization; Scanning-Probe Microscope Metrology; Advanced MOS Device Reliability and Characterization; Nanoelectronic Device Metrology; Thin-Film Process Metrology; Power Semiconductor Device and Thermal Metrology; MicroElectroMechanical Systems; Electrical Test Structure Metrology; Major Facilities/Laboratories; Microfabrication Process Facility; National Research Council (NRC) Post-Doctoral Opportunities; 2003 International Conference on Characterization and Metrology for ULSI Technology, Mar. 24-28, 2003, Austin TX; Gaitan Receives DoC Silver Medal Award; Division Teamwork Team Receives DoC Bronze Medal Award; Integrated Circuit Gas Sensing System Technology Valuable for Homeland Security; SPS Intern Contributes to the University of Puerto Rico at Mayaguez Strengthens Power Electronics Research; Educational Outreach by Division Staff; Future NIST Cleanroom Facility on Track for Spring 2003 Completion; and NIST's Gaithersburg, Maryland Campus and Surrounding Area.
NTIS
Laboratories; Semiconductor Devices; Research Projects

20030039003 National Inst. of Standards and Technology, Gaithersburg, MD
Electronics and Electrical Engineering Laboratory, Magnetic Technology Division: Programs, Activities, and Accomplishments
Jan. 2003; 64 pp.
Report No.(s): PB2003-102839; NISTIR-6628; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Welcome; Introduction to Technical Programs; Magnetic Technology Division Staff; Magnetic Recording Measurements; Magnetodynamics; Nanoprobe Imaging; Magnetic Thin Films and Devices; Standards for Superconductor Characterization; Superconductor Electromagnetic Measurements; (Appendix A) Laboratory Facilities; (Appendix B) Post-Doctoral Research Associateships; (Appendix C) Units for Magnetic Properties; and (Appendix E) Symbols for the Chemical Elements.
NTIS
Laboratories; Nanotechnology; Magnets; Research Projects

20030045798 Helsinki Univ. of Technology, Espoo (Finland)
Circuit Techniques for Low-Voltage and High-Speed A/D Converters
Waltari, M.; Jun. 2002; 300 pp.
Report No.(s): PB2003-101692; REPT-33; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction; Low Voltage Issues; Sample-and-Hold Operation; A/D Converters; S/H Circuit Architectures; Sampling with a MOS Transistor Switch; Operational Amplifiers; Clock Generation; Double-Sampling; Switched Opamp Technique; Other Low Voltage Techniques and Building Blocks; Prototypes and Experimental Results.
NTIS
Analog To Digital Converters; Operational Amplifiers; Circuits

20030051446 Foersvarets Forskningsanstalt, Linkoeping (Sweden)
Target Identification and Terrain Modelling Using Laser Radar Data
Ahlberg, S.; Carlsson, C.; Hoerling, P.; Dec. 1999; In Swedish
Report No.(s): PB2003-102036; FOA-R-99-01303-408-SE; No Copyright; Avail: National Technical Information Service (NTIS)

At the Swedish Defense Research Establishment (FOA) data from a scanning, direct detecting, airborne laser radar system have been studied in several projects. This report gives an overview of the work in these projects and shows the multiple usage of laser radar data. The report describes the principles of the above mentioned laser radar system and the characteristics of data from such a system. Typical registrations of some objects (buildings, vehicles and trees) are described and how they can be applied in target detection, target classification and terrain modeling. Possibilities for data fusion of laser radar data itself and combinations of laser radar data and IR data are mentioned. Finally, continuing work is overviewed.
NTIS
Target Acquisition; Target Recognition; Optical Radar

20030051573 Physics and Electronics Lab. TNO, The Hague, Netherlands
Operational Aging; A First Exploration of a Model
Koole, J.; March 2003; 31 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): V045; TNO Proj. 015.30734
Report No.(s): FEL-02-A307; TD03-0015; Copyright; Avail: Other Sources

This report describes relevant definitions, related with the subject 'operational degradation' and a method, how to monitor 'operational degradation'.
Author
Degradation; Operations Research

20030051608 Lawrence Livermore National Lab., Livermore, CA
Temperature Profile of IR Blocking Windows Used in Cryogenic X-ray Spectrometers
Friedrich, S.; Funk, T.; Drury, O.; Labov, S. E.; Aug. 08, 2000; 14 pp.; In English
Report No.(s): DE2002-793984; UCRL-JC-137360; No Copyright; Avail: Department of Energy Information Bridge

Cryogenic high-resolution X-ray spectrometers are typically operated with thin IR blocking windows to reduce radiative heating of the detector while allowing good x-ray transmission. We have estimated the temperature profile of these IR blocking windows under typical operating conditions. We show that the temperature in the center of the window is raised due to radiation from the higher temperature stages. This can increase the infrared photon flux onto the detector, thereby increasing the IR noise and decreasing the cryostat hold time. The increased window temperature constrains the maximum window size and the number of windows required. We discuss the consequences for IR blocking window design.
NTIS
X Ray Spectrometers; Radiant Heating; Infrared Radiation; Cryostats; Tunnel Junctions; Superconducting Devices

20030052001 National Inst. of Standards and Technology (TS), Gaithersburg, MD
Symposium on Optical Fiber Measurements: Collected Papers, 1980-2000 (on CD-ROM)
2003; In English
Report No.(s): PB2003-500016; No Copyright; Avail: National Technical Information Service (NTIS)

The Symposium on Optical Fiber measurement was established in 1980 by the National Institute of Standards and Technology (then the National Bureau of Standards), to provide a forum for the presentation of the latest research results on the characterization of optical fiber and other optoelectronic components. The Symposium has continued, biennially, and its Technical Digests, containing summaries of the papers presented, provide one of the best archival records of the evolution of

the field. This CD-ROM contains, in searchable form, summaries of all the papers presented at the Symposium from 1980 through 2000.
NTIS
Optical Fibers; Optoelectronic Devices

20030052233 Lawrence Berkeley National Lab., CA, California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering, Purdue Univ., West Lafayette, IN
Band Anticrossing in Highly Mismatched Group II-VI Semiconductor Alloys
Yu, K. M.; Wu, J.; Walukiewicz, W.; Beeman, J. W.; Ager, J. W.; 2002; In English
Report No.(s): DE2002-803853; No Copyright; Avail: National Technical Information Service (NTIS)

We have successful synthesized highly mismatched Cd1-yMnyOxTe1-x alloys by high dose implantation of O ions into Cd1-yMnyTe crystals. In crystals with y greater than 0.02, incorporation of O causes a large decrease in the band gap. The band gap reduction increases with y; the largest value observed is 190 meV in O-implanted Cd(0.38)Mn(0.62)Te. The results are consistent with the band anticrossing model which predicts that a repulsive interaction between localized states of O located above the conduction band edge and the extended states of the conduction band causes the band gap reduction. A best fit of the measured band gap energies of the O ion synthesized Cd1-yMnyOxTe1-x alloys using the band anticrossing model for y less than 0.55 suggests an activation efficiency of only approximately 5\% for implanted O in Cd1-yMnyTe.
NTIS
Semiconductors (Materials); Oxygen Ions; Electronic Structure; Selenium Alloys; Energy Gaps (Solid State); Cadmium Tellurides; Manganese; Zinc Tellurides

20030052283 National Inst. of Standards and Technology (EEEL), Gaithersburg, MD
Electronics and Electrical Engineering Laboratory. Office of Microelectronics Programs: Programs, Activities, and Accomplishments
Jan. 2003; 28 pp.
Report No.(s): PB2003-102855; NISTIR-6934; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Welcome and Introduction; Vision; Values; Mission; Goals; Funding; Office of Microelectronics Programs Organization; Lithography Metrology Program; Critical Dimension and Overlay Metrology Program; Thin Film and Shallow Junction Metrology Program; Interconnect and Packaging Metrology Program; Wafer Characterization and Process Metrology Program; Test Metrology Program; Manufacturing Support; and Technical Contacts.
NTIS
Microelectronics; Research; Lithography; Metrology; Thin Films

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*.

20030037165 Pacific Northwest National Lab., Richland, WA
Version 2.0 Visual Sample Plan (VSP): Models and Code Verification
Gilbert, R. O.; Wilson, J. E.; O'Brien, R. F.; Carlson, D. K.; Bates, D. J.; Aug. 2002; 112 pp.; In English
Report No.(s): DE2002-15001019; No Copyright; Avail: Department of Energy Information Bridge

Visual Sample Plan (VSP) is a software tool under development at the Pacific Northwest National Laboratory (PNNL) with support from the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Defense (DoD). VSP is used to select the right number and location of environmental samples in order to achieve various sampling objectives with required performance. Version 2.0 of VSP provides formulas and statistical algorithms to compute the number of samples needed for specific statistical tests, estimations, an, evaluations appropriate for the following environmental sampling goals: comparing an average or proportion to a fixed threshold value; comparing an average or proportion to a reference area average or proportion; constructing a confidence interval on a mean; estimating a

mean or a proportion within specified cost and variance; constraints; locating a hot spot; and finding a UXO target area (not yet peer-reviewed).
NTIS
Software Engineering; Program Verification (Computers); Computer Systems Programs; Mathematical Models; Information Management

20030037178 Lawrence Livermore National Lab., Livermore, CA
Calculation of Shock Hugoniot Curves of Precompressed Liquid Deuterium
Militzer, B.; Nov. 18, 2002; In English
Report No.(s): DE2002-15002120; UCRL-JC-150587; No Copyright; Avail: National Technical Information Service (NTIS)
Path integral Monte Carlo simulations have been used to study deuterium at high pressure and temperature. The equation of state has been derived. A series of shock Hugoniot curves is computed for different initial compressions in order to compare with current and future shock wave experiments using liquid deuterium samples precompressed in diamond anvil cells.
NTIS
Deuterium; Hugoniot Equation Of State; High Pressure

20030038813 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Analysis of Solid Oxide Fuel Cell Based Hybrid Gas Turbine System
Gorla, Rama S. R.; Pai, Shantaram S.; Rusick, Jeffrey J.; April 2003; 12 pp.; In English; Turbo Expo 2003, 16-19 Jun. 2003, Atlanta, GA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAG3-2745; WBS 22-704-04-01
Report No.(s): NASA/TM-2003-211995; E-13666; NAS 1.15:211995; GT-2003-38046; No Copyright; Avail: CASI; A03, Hardcopy
The emergence of fuel cell systems and hybrid fuel cell systems requires the evolution of analysis strategies for evaluating thermodynamic performance. A gas turbine thermodynamic cycle integrated with a fuel cell was computationally simulated and probabilistically evaluated in view of the several uncertainties in the thermodynamic performance parameters. Cumulative distribution functions and sensitivity factors were computed for the overall thermal efficiency and net specific power output due to the uncertainties in the thermodynamic random variables. These results can be used to quickly identify the most critical design variables in order to optimize the design and make it cost effective. The analysis leads to the selection of criteria for gas turbine performance.
Author
Solid Oxide Fuel Cells; Design Analysis; Probability Distribution Functions; Thermodynamic Efficiency; Sensitivity Analysis

20030038997 Lawrence Livermore National Lab., Livermore, CA
Experimental Design for Laser Produced Shocks in Diamond Anvil Cells
Moon, S. J.; Cauble, R.; Collines, G. W.; Celliers, P. M.; Hicks, D.; Jun. 10, 2001; 10 pp.; In English
Report No.(s): DE2002-15002090; UCRL-JC-144185; No Copyright; Avail: Department of Energy Information Bridge
Laser driven shock measurements have been performed on pre-compressed samples. A diamond anvil cell (DAC) has been used to statically compress water to I GPa and then strong shocked with an energetic laser. The use of intense laser irradiation can drive shocks in targets making it possible to study the equation of state (EOS) of somples well into the hundreds of GPQ regime. Generally. such experiments employ a somple initially at normal density and stmdard pressure, therefore providing data on the principal Hugoniot. In this experiment the initial state of the sample was varied to provide data off the principal Hugoniot. We report the work that was done on the Vulcan laser and describe a method to achieve off principal Hugoniot dots.
NTIS
Shock Waves; Lasers

20030039167 Lawrence Livermore National Lab., Livermore, CA
Hybrid Nodal Method for Time-Dependent Incompressible Flow in Two-Dimensional Arbitrary Geometries
Toreja-Lawrence, A. J.; Uddin, R.; Oct. 21, 2002; 22 pp.; In English
Report No.(s): DE2002-15002115; UCRL-JC-150454; No Copyright; Avail: Department of Energy Information Bridge
In this paper, the hybrid method is formally developed and an application of the NI-FAM to fluid flow in an enclosed

cavity is presented. Results are compared with those obtained using a commercial computational fluid dynamics code.
NTIS
Computational Fluid Dynamics; Navier-Stokes Equation; Incompressible Flow

20030045731 Lawrence Livermore National Lab., Livermore, CA
Transport Properties of Fluid Mixtures at High Pressures and Temperatures. Application to the Detonation Products of HMX
Bastea, S.; Jun. 11, 2002; 16 pp.; In English
Report No.(s): DE2002-15002370; UCRL-JC-145102; No Copyright; Avail: Department of Energy Information Bridge

The detonation of modern high explosives (HE) leaves behind a mixture of fluid and dispersed solid phases at high pressures and temperatures. The last decades have witnessed tremendous progress in the equation of state modeling of realistic fluid mixtures and mixed phases, that has been already successfully applied to the prediction of HE detonation properties. The calculation of transport properties on the other hand, e.g. viscosity and thermal conductivity, has advanced at a much slower pace due to inherent theoretical and computational difficulties. We show here, with the help of molecular dynamics simulations, that the Enskog transport theory can be successfully used to predict the viscosity and thermal conductivity of realistically modeled hot, dense fluid mixtures, such as those obtained after the detonation of HMX. We also analyze the effect of the resulting carbon clusters on the transport properties of the post-detonation multiphase system, and find that their contribution is very significant.
NTIS
Hmx; Transport Properties; Fluid Dynamics

20030052012 Lawrence Livermore National Lab., Livermore, CA
Preconditioning Newton-Krylov Methods for Variably Saturated Flow
Jones, J. E.; Woodward, C. S.; Jan. 07, 2000; 12 pp.; In English
Report No.(s): DE2002-791027; UCRL-JC-137011; No Copyright; Avail: Department of Energy Information Bridge

In this paper, we compare the effectiveness of three preconditioning strategies in simulations of variably saturated flow. Using Richards' equation as our model, we solve the nonlinear system using a Newton-Krylov method. Since Krylov solvers can stagnate, resulting in slow convergence, we investigate different strategies of preconditioning the Jacobian system. Our work uses a multigrid method to solve the preconditioning systems, with three different approximations to the Jacobian matrix. One approximation lags the nonlinearities, the second results from discarding selected off-diagonal contributions, and the third matrix considered is the full Jacobian. Results indicate that although the Jacobian is more accurate, its usage as a preconditioning matrix should be limited, as it requires much more storage than the simpler approximations. Also, simply lagging the nonlinearities gives a preconditioning matrix that is almost as effective as the full Jacobian but much easier to compute.
NTIS
Newton Methods; Simulation; Approximation; Multigrid Methods

20030052048 Alabama Univ., Huntsville, AL, USA
Properties of Cusp Diamagnetic Cavities
Sheldon, Robert B.; [2003]; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-9741
Report No.(s): UAH-5-21050; No Copyright; Avail: CASI; A01, Hardcopy

Progress can be reported in two areas related to characterizing the properties of cusp diamagnetic cavities. Laboratory terrella experiments have been conducted for the purpose of using neutral gas excitation as a tracer of trapped electron populations in the presence of two dipoles that are used to develop a magnetic cusp topology. Figure 1 and 2 show top and side views of two configurations. Dipole trapped electron populations appear as the two luminous annular rings. Other populations are the most intense regions are shown. Interspersed between these regions are narrow regions that represent the topological cusps in these configurations. That they contain luminous gas is evidence for cusp trapping similar to what we believe exists in the terrestrial magnetosphere. The asymmetry of these cusp regions as seen in Figure 1 is the result of a relative tilt between the two dipoles suggestive of what would be expected in space. It is in these regions that particle observations were sought, so as to validate the realization of proposed and laboratory achieved trapping in a diamagnetic cusp. Figure 3 shows particle trajectories in a modeled cusp magnetic topology for three particle energies. Blue, green, and red traces

correspond to increasing energies. Due to factors discussed outside of this final report, a thorough exploration of relevant satellite observations have not been achieved.
Author
Diamagnetism; Cavities; Cusps (Landforms); Particle Energy; Electron Density (Concentration)

20030052209 Lawrence Livermore National Lab., Livermore, CA
Direct Numerical Simulation DNS: Maximum Error as a Function of Mode Number
Jameson, L.; Jun. 01, 2000; In English
Report No.(s): DE2002-793962; UCRL-JC-139441; No Copyright; Avail: National Technical Information Service (NTIS)
Numerical errors can be characterized in terms of algebraic polynomial approximation of a sine wave. The magnitude of the error will, therefore, depend on the energy at each mode in a Fourier expansion. Flows with a great deal of energy in the highest modes, such as Turbulence, are therefore the most difficult to approximate.
NTIS
Computational Fluid Dynamics; Direct Numerical Simulation; Mathematical Models; Approximation; Errors

20030052212 Lawrence Livermore National Lab., Livermore, CA
Comparison of Staggered-Mesh Lagrange Plus Remap and Cell-Centered Direct Eulerian Godunov Schemes for Eulerian Shock Hydrodynamics
Pember, R. B.; Anderson, R. W.; Nov. 22, 2000; In English
Report No.(s): DE2002-792822; UCRL-JC-139820; No Copyright; Avail: National Technical Information Service (NTIS)
Shock capturing methods have always played a central role in the computational modeling of compressible flows. Consequently there has always been interest in assessing the relative accuracy and performance of the various algorithms employed in the field. Sixteen years ago there appeared one such assessment in a review article by Woodward and Colella. They compare three general methodologies--namely, the Godunov, the artificial viscosity, the linear hybridization approaches--and six particular methods for modeling compressible flow in an Eulerian frame. The methods are assessed from an examination of the computational results for a series of one- and two-dimensional problems characterized by strong shocks.
NTIS
Algorithms; Compressible Flow; Hydrodynamics

20030052216 Lawrence Livermore National Lab., Livermore, CA
Numerical Tokamak Turbulence Project
Cohen, B. I.; Dawson, J. M.; Reynders, J. V. W.; Decyk, V. K.; Dorland, W. D.; Dec. 09, 1999; 10 pp.; In English
Report No.(s): DE2002-793937; UCRL-ID-136616; No Copyright; Avail: Department of Energy Information Bridge
The primary research objective of the Numerical Tokamak Turbulence Project (NTTP) is to develop a predictive ability in modeling turbulent transport due to drift-type instabilities in the core of tokamak fusion experiments, through the use of three-dimensional kinetic and fluid simulations and the derivation of reduced models.
NTIS
Tokamak Devices; Nuclear Fusion; Turbulence; Magnetohydrodynamic Stability

20030052224 Lawrence Livermore National Lab., Livermore, CA
Numerical Experiments Using a Convective Flux Limiter on a Turbulent Single-Mode Rayleigh-Taylor Instability
Cloutman, L. D.; Jul. 10, 2000; 40 pp.; In English
Report No.(s): DE2002-793972; UCRL-ID-139735; No Copyright; Avail: Department of Energy Information Bridge
Direct numerical simulation and large eddy simulations are powerful tools for studying turbulent flows. Unfortunately, they are computationally demanding in terms of run times, storage, and accuracy of the numerical method used. In particular, high order methods promise high accuracy on a given grid, but they often fail to deliver the expected accuracy due to dispersive truncation errors that appear as unphysical oscillations in the numerical solutions. This report describes a nonlinear flux limiter that has been applied to the second-order tensor viscosity method and markedly reduces the dispersive truncation errors. A Rayleigh-Taylor instability is simulated to show how well the flux limiter works.
NTIS
Turbulent Flow; Computerized Simulation; Numerical Analysis

20030052243 Colorado Univ., Boulder, CO, USA

Influence of Solutocapillary Convection on Macrovoid Defect Formation in Polymeric Membranes

Greenberg, Alan R.; Krantz, William B.; Todd, Paul; May 12, 2003; 7 pp.; In English

Contract(s)/Grant(s): NAG8-I475; No Copyright; Avail: CASI; A02, Hardcopy

The focus of this research project involved the dry-cast process for polymeric membrane formation, whereby evaporation of solvent from an initially homogeneous polymer/solvent/ nonsolvent solution results in phase separation and the formation of polymer-rich and polymer-lean phases. Under certain conditions the polymer-lean phase gives rise to very large and usually undesirable, tear-drop-shaped pores (size approx. 10 - 50 microns) termed macrovoids (MVs). Although in many cases the presence of MV pores has deleterious effects on membrane performance, there are a number of innovative applications where the presence of such pores is highly desirable. Although researchers have proposed a variety of mechanisms for MV formation over the past three decades, two main hypotheses are currently favored: one asserts that MV growth can be attributed solely to diffusion (the diffusive growth hypothesis), whereas the other states that solutocapillary convection (the SC hypothesis) at the MV interface contributes to growth. The overall goal of this research was to obtain a more comprehensive understanding of the fundamental mechanism of MV growth. This research incorporates a coupled modeling and experimental approach to test a solutocapillary convection hypothesis for the growth of macrovoid pores in polymeric membranes. Specifically, we utilized a modification of the first principles model developed by two of the PIs (ARG and WBK) for dry-cast CA membranes. For the experimental component, two separate and mutually complementary approaches were used to study MV growth. In the first, membranes cast in a zero-g environment aboard the NASA KC-135 aircraft were compared with those cast on the ground to assess the effect of the buoyancy force on membrane morphology and MV size and shape. In the second approach, videomicroscopy flow visualization (VMFV) was utilized to observe MV formation and growth in real time and to assess the effect of surface tension on the MV growth dynamics. As a result of these fundamental studies, our research group advanced a new hypothesis for MV pore development in polymeric membranes.

Author

Capillary Flow; Convection; Microporosity; Polymers; Membranes

20030052272 Swedish Defence Research Establishment, Stockholm

Implementation of Local Preconditioning Methods in EURANUS

Peng, S.-H.; Dec. 2001; 44 pp.

Report No.(s): PB2003-102116; FOI-R-0332-SE; No Copyright; Avail: CASI; A03, Hardcopy

The implementation of local preconditioning in the CFD code EURANUS is briefly addressed. Several preconditioning methods have been taken into account, including those developed respectively by Turkel Choi and Merkle and by Hakimi. The main motivation of using local preconditioning is to improve the computational performance of the compressible code based on time-searching techniques when applied to solving for low-speed compressible and incompressible flows. The implementation strategies are presented and discussed in association with the corresponding modifications resulted from the preconditioned equation system, such as the artificial dissipation and the boundary conditions. It is demonstrated through several application examples that all the implemented preconditioners show very promising performance to accelerate the convergence rate in computations of external inviscid and viscous flows. For incompressible internal flows, moreover, the use of local preconditioning exercises also rather encouraging performance as compared with solutions obtained from an incompressible code using pressure-based schemes. It is expected that this report can be used as a supplemental reference when local preconditioning is employed in computations using the EURANUS code.

NTIS

Computational Fluid Dynamics; Viscous Flow; Boundary Conditions

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; 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 and Astrionics*.

20030038808 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Application of Matrix-Assisted Laser Desorption/ionization to On-line Aerosol Time-of-Flight Mass Spectrometry

Kientz, Ch. E.; December 2002; 20 pp.; In English; In Dutch

Contract(s)/Grant(s): A98/D/420; TNO Proj. 014.12830; Proj. V013

Report No.(s): PML-2002-A81; TD-2002-0155; Copyright; Avail: Other Sources

Matrix-assisted laser desorption/ionization (MALDI) mass spectra were obtained from a single biological aerosol particles using an aerosol time-of-flight mass spectrometer (ATOFMS). The inlet to the ATOFMS was coupled with an evaporation/condensation flow cell that allowed the aerosol to be coated with matrix material as the sampled stream entered the spectrometer. Mass spectra were generated from aerosol composed either of gramicidin S or erythromycin, two small biological molecules, or from aerosolized spores of Bacillus subtilis var niger. Three different matrices were used: 3-nitrobenzylalcohol, picolinic acid and sinapinic acid. A spectrum of gramicidin S was generated from approximately 250 attomoles of material using a molar ration of 3-nitrobenzylalcohol to analyte of approximately 20:1. A single peak, located at 1224 Da, was obtained from the bacterial spores. The washing liquid and extract solution from the spores were analyzed using electrospray mass spectrometry and subsequent MS/MS product ion experiments. This independent analysis suggests that the measured species represent part of the B. subtilis peptidoglycan. The on-line addition of matrix allows quasi-real-time chemical analysis of individual, aerodynamically sized particles, with an overall system residence time of less than 5 seconds. These results suggest that MALDI ATOFMS can provide nearly teal time identification of biological aerosols.
Author
Aerosols; Desorption; Ionization; Lasers; Time Of Flight Spectrometers; Mass Spectrometers

20030038897 CH2M Hill Hanford Group, Inc., Richland, WA
Process Test Plan for Fourth Generation Hanford Corrosion Monitoring System
Norman, E. C.; Jun. 20, 2000; 12 pp.; In English
Report No.(s): DE2002-804243; No Copyright; Avail: Department of Energy Information Bridge
This Engineering Task Plan (ETP) describes the activities associated with the installation of cabinets containing corrosion monitoring equipment on tanks 241-AN-102 and 241-AN-107. The new cabinets (one per tank) will be installed adjacent to existing corrosion probes already installed in riser WST-RISER-016 on both tanks. The corrosion monitoring equipment to be installed utilizes the technique of electrochemical noise (EN) for monitoring waste tank corrosion. Typically, EN consists of low frequency (4 Hz) and small amplitude signals that are spontaneously generated by electrochemical reactions occurring at corroding or other surfaces. EN analysis is well suited for monitoring and identifying the onset of localized corrosion, and for measuring uniform corrosion rates.
NTIS
Radioactive Wastes; Corrosion; Electrochemistry; Sensors

20030038999 NASA Glenn Research Center, Cleveland, OH, USA
Microchemical and Gaseous Sensors Using Carbon Nanotubes and MEMS Fabrication Technology
Liu, Chung-Chiun; Vander Wal, Randy; Hunter, Gary; April 2003; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU-708-87-23
Report No.(s): NASA/TM-2003-212209; NAS 1.15:212209; E-13817; Copyright; Avail: CASI; A03, Hardcopy
The objective of this research is to use a combination of carbon nanotubes and silicon-based microfabrication and micromachining processes to produce unique micro-sized chemical and gaseous sensors. Polished quartz substrate is used. Interdigitated structure is used for the sensing elements. Metallic catalysts for the growth of the carbon nanotube include copper, iron, nickel, and cobalt. Various thicknesses of the metallic catalysts are used in this study varying between 5 to 20 microns. Depositing of the metallic catalyst is accomplished using an ion-beam sputtering thin film technique and a shadow mask. Single wall carbon nanotubes are successfully formed over the metallic catalyst layer. Preliminary measurements of the carbon nanotubes show this nanotube contained film over the sensing elements which had a resistance value of 400 ohms at room temperature. This is a more conductive film comparing to metal oxide films, such as SnO2 or ZnO, that are now widely used in gaseous sensor research. Evaluation of the carbon nanotube film for potential gaseous sensing will be carried out.
Author
Carbon Nanotubes; Sensors; Micromachining; Nanofabrication; Gas Detectors; Quartz

20030045729 Institute for Human Factors TNO, Soesterberg, Netherlands
Paint the Night: Applying Daytime Colours to Night-Time Imagery
Toet, A.; July 12, 2002; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 013.62011; TNO Proj. 786.2
Report No.(s): TM-02-B006; TD-2002-0109; Copyright; Avail: Other Sources
Current night-vision cameras produce monochrome (greylevel or greenish) images. This makes it difficult to obtain a good

impression of the scene, and may give rise to illusions and a loss of situational awareness. In the context of fundamental research the management of TNO Human Factors would like to know if it is possible to give night-time imagery a daytime appearance by applying a colour transform. We applied a recently introduced method to transfer one image s colour characteristics to another to give RGB false-colour night-time imagery the appearance of daylight colour photographs. We recorded the night-time imagery both with a dual band (visual and near infrared) image intensified low-light CCD camera (DII) and with a thermal middle wavelength band (3-5 pm) infrared (IR) camera. Results: The method effectively gives night-time imagery a daytime colour appearance. Only the first order colour characteristics are required (6 numbers). The contrast of the resulting colour imagery can be improved by mapping a greyscale fused representation of the individual image bands to the luminance component of the resulting colour images. The method can be applied to an arbitrary number of input bands by using a principal component analysis. The colour transfer method can be used to give night-time imagery a daytime colour appearance. The transformation is simple and can therefore be implemented in hardware. Since the colour distribution of a scene can be approximated by only 6 numbers, a system can use a lookup table of values that are characteristic for a large number of different scenes. Further research is required to establish how these numbers vary between different scenes and environmental conditions.
Author
Human Factors Engineering; Night Vision; Color Infrared Photography; Daytime

20030045772 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
The Development of a Bio-Aerosol Alarm Based on Mass Spectrometry: A Status Report
Kientz, Ch. E.; vanBaar, B. L. M.; deJong, A. L.; vanWuijckhuijse, A. L.; Stowers, M. A.; March 2003; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A98/D/420; TNO Proj. 014.12830
Report No.(s): PML-2002-A80; TD02-0154; Copyright; Avail: Other Sources

This report describes the further development of a new experimental laboratory bio-aerosol alarm capable of detecting air-borne bio-aerosols in real-time (meaning: in seconds). The system is based on a smart sampling system combining laser particle sizing; laser induced fluorescence and nearly synchronous laser ionization linear time-of-flight mass spectrometry (TOWS) of individual aerosol particles sampled directly from atmospheric air. The different parts of the system, the ATOFMS and the 'smart sampling' (fluorescence) system were tested separately. The ATOFMS system was considerably modified with regard to the mass range and detectability, in order to produce selective information (particle size and mass spectrum) for single aerosol particles of peptides, small proteins and Bacillus subtilis spores. Moreover, supporting static MALDI-TOFMS work is reported on matrix materials and biomarkers. The results obtained with the smart sampling system prove that it is possible to measure selective UV absorbance of single particles in the presence of an aerosol background indicating its potential as preselection method.
Author
Biological Weapons; Aerosols; Mass Spectroscopy; Warning Systems

20030051528 Geological Survey, Tacoma, WA, Utah State Univ., Logan, Washington State Dept. of Ecology, Olympia
Characterization of Instream Hydraulic and Riparian Habitat Conditions and Stream Temperatures of the Upper White River Basin, Washington, Using Multispectral Imaging Systems
Black, R. W.; Haggland, A.; Crosby, G.; 2003; In English
Report No.(s): PB2003-103564; USGS/WRI-03-4022; No Copyright; Avail: National Technical Information Service (NTIS)

Land subsidence associated with ground- water-level declines has been recognized as a potential problem in parts of the Mojave Desert, California. Ground water has been the primary source of domestic, agricultural, and municipal water supplies in the desert since the early 1900s. Pumping of ground water from the Mojave River and Morongo ground-water basins in the southwestern Mojave Desert resulted in water-level declines of more than 30 meters (100 feet) between the 1950s and the 1990s. A Global Positioning System (GPS) survey of a geodetic network was used to determine the location, extent, and magnitude of vertical land-surface changes in Lucerne Valley in the Morongo ground-water basin. The GPS survey was conducted in 1998 to estimate historical elevation changes by comparing GPS-derived elevations with historical elevations (which were available for some of the monuments in the network as early as 1944) and to establish baseline values that can be used for comparisons with future GPS surveys. The GPS measurements indicated that about 600 millimeters (2 feet) (plus or minus 1,500 millimeters (5 feet)) of subsidence occurred at three of the monuments between 1969 and 1998 but that very little to no vertical change in position occurred at seven other monuments in the network. Water levels in the area of subsidence in Lucerne Valley declined about 15 meters (50 feet) during 1970-98. Interferometric synthetic aperture radar (InSAR)

methods were used to characterize vertical land-surface changes in the Mojave River and Morongo ground-water basins during various intervals of time between 1992 and 1999.
NTIS
Hydrology; Streams; Multispectral Photography

20030051576 Michigan Technological Univ., Houghton, Bureau of Mines, Washington, DC
Apparatus for Measuring Diesel Tailpipe Emissions in Underground Mines
Carlson, D. H.; Taubert, T. R.; Johnson, J. H.; 1992; 24 pp.; In English
Report No.(s): PB2003-103262; BUMINES-RI-9422; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Bureau of Mines and Michigan Technological University (MTU) are collaborating to develop an apparatus for measuring diesel tailpipe emissions in underground mines. A tailpipe emission measurement apparatus (EMA) is described that dilutes diesel exhaust and measures the concentrations of diesel particulate matter (DPM), CO, CO(2), NO, and NO(2) at known dilution ratios. The EMA was evaluated by side-by-side comparison of its measurements with those by laboratory-grade instruments. Concentration of CO and CO(2) measured by the EMA were usually plus or minus 14 percent of concentrations measured by laboratory-grade instruments for CO and plus or minus 20 percent for CO(2). EMA-measured DPM concentrations were, on average, 29 percent lower than those measured by laboratory-grade instruments, with the differences being fairly consistent. The CO and CO(2) differences are related to the method of calculating the EMA's dilution ratio, and the difference in DPM concentrations is attributed to thermophoretic and/or condensation losses related to the EMA's unheated sample probe. Preliminary analysis of data obtained with a heated sampling probe and modifications in the sampling procedures have indicated reduced variability in DPM and in the calculated dilution ratios.
NTIS
Mines (Excavations); Air Pollution; Pollution Monitoring; Diesel Engines; Exhaust Emission

20030052114 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Development of Facilities and Methods for Evaluation of Equipment for B-Detection
Broekhuijsen, M. P.; Polhuijs, M.; Tuinman, I. L.; Gerritse, K.; November 2002; 35 pp.; In Dutch; Original contains black and white illustrations
Contract(s)/Grant(s): B9/KL/4FA; TNO Proj. 014.12828
Report No.(s): PML-2002-A84; TD02-0158; Copyright; Avail: Other Sources

Despite the increasing threat of the use of biological warfare agents by nations or separate groups of terrorists, there is a lack of facilities and methods to evaluate modern biological warfare agent sensors, filters and other protective means. In this report we describe which facilities are necessary and which methods and techniques are required for a correct evaluation of biological warfare agent sensors. To expose detection equipment to biological warfare agents it is necessary that the agents can be dispersed as an aerosol cloud. Methods for the controlled generation of wet bio-aerosols for both spores and vegetative cells have been developed. However, to cover the full spectrum of bio aerosol generation the current facilities need to be improved and extended. In addition, to make it possible to generate pathogenic aerosols it is necessary to realise a level C-II (BSL-3) biocontainment.
Author
Biological Weapons; Detection; Microorganisms; Research Facilities; Measuring Instruments

20030052219 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Overview of the Earth Observing System Moderate Resolution Imaging Spectroradiometer (MODIS) Data Products and Availability for Environmental Applications and Global Change Studies
Salomonson, V. V.; [2003]; 1 pp.; In English; ASPRS 2003 Annual Conference, 5-9 May 2003, Anchorage, AK, USA; No Copyright; Avail: Other Sources; Abstract Only

The Moderate Resolution Imaging Spectroradiometer (MODIS) on the Earth Observing System (EOS) Terra Mission began to produce data in February 2000. The Terra MODIS is in a sun-synchronous orbit going north to south in the daylight portion of the orbit crossing the equator at about 1030 hours local time. The spacecraft, instrument, and data systems are performing well and are producing a wide variety of data products useful for scientific and applications studies in relatively consistent fashion extending from November 2000 to the present. Within the approximately 40 MODIS data products, several are new and represent powerful and exciting capabilities such the ability to provide observations over the globe of fire occurrences, microphysical properties of clouds and sun-stimulated fluorescence from phytoplankton in the surface waters of the ocean. The remainder of the MODIS products exceeds or, at a minimum, matches the capabilities of products from heritage

sensors such as, for example, the Advanced Very High Resolution Radiometer (AVHRR). Efforts are underway to provide data sets for the greater Earth science community and to improve access to these products at the various Distributed Active Archive Centers (DAACs) or through Direct Broadcast (DB) stations. The EOS Aqua mission was launched successfully May 4,2002 with another MODIS on it. The Aqua spacecraft operates in a sun-synchronous orbit going south to north in the daylight portion of the orbit crossing the equator at approximately 1330 hours local time. Subsequently the Aqua MODIS observations will substantially add to the capabilities of the Terra MODIS for environmental applications and global change studies.
Author
Earth Observing System (Eos); Advanced Very High Resolution Radiometer; Data Systems; Environment Management; Global Warming; Imaging Spectrometers

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*.

20030045723 Lawrence Livermore National Lab., Livermore, CA
Modeling of Material Removal by Solid State Heat Capacity Lasers
Boley, C. D.; Rubenchik, A. M.; Apr. 17, 2002; 10 pp.; In English
Report No.(s): DE2002-15002358; UCRL-JC-146480; No Copyright; Avail: Department of Energy Information Bridge

Pulsed lasers offer the capability of rapid material removal. Here we present simulations of steel coupon tests by two solid state heat capacity lasers built at LLNL. Operating at 1.05 micrometers, these deliver pulse energies of about 80 J at 10 Hz, and about 500 J at 20 Hz. Each is flashlamp-pumped. The first laser was tested at LLNL, while the second laser has been delivered to HELSTF White Sands Missile Range. Liquid ejection appears to be an important removal mechanism. We have modeled these experiments via a time-dependent code called THALES, which describes heat transport, melting, vaporization, and the hydrodynamics of liquid, vapor, and air. It was previously used, in a less advanced form, to model drilling by copper vapor lasers.
NTIS
Pulsed Lasers; Heat Transfer; Solid State Lasers

20030045776 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Feasibility Study Neutralization Landmines and UXO by Means of Laser
Meuken, B.; March 2003; 47 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A/00/KL/465; TNO Proj. 014.12570
Report No.(s): PML-2003-A30; TD-2002-0204; Copyright; Avail: Other Sources

Within the Ministry of Defense exists a need for a procedure to neutralize landmines from a safe distance. One way to do so is by supplying thermal energy to the landmine by a (high power) laser. The research is concentrated on the feasibility of neutralization of landmines and unexploded ordnance by means of a high power diode laser. The laser will start a reaction in the explosive after weakening the casing. This preferably leads to a burning reaction and not detonation. The work is carried out in cooperation with TNO-Industry under contract from LBBKL/Munitiebedrijf. The neutralization of landmines and grenades with synthetic casings by means of the laser was a success. By weakening/melting the casing over a large area and igniting the explosive below, a mild reaction was caused and a detonation was prevented. To be able to apply this technique to munitions with metal casings, an improvement of the optics is needed, because in that case a larger power density is required to be able to vaporize the metal.
Author
Mines (Ordnance); High Power Lasers; Laser Applications; Thermal Energy; Semiconductor Lasers; Combustion

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*.

20030038814 NASA Glenn Research Center, Cleveland, OH, USA
Permanent Magnetic Bearing for Spacecraft Applications
Morales, Wilfredo; Fusaro, Robert; Kascak, Albert; March 2003; 16 pp.; In English; 2003 Annual Meeting and Exhibition, 28 Apr. - 1 May 2003, New York City, NY, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 22-708-90-01
Report No.(s): NASA/TM-2003-211996; E-13668; NAS 1.15:211996; No Copyright; Avail: CASI; A03, Hardcopy

A permanent, totally passive magnetic bearing rig was designed, constructed, and tested. The suspension of the rotor was provided by two sets of radial permanent magnetic bearings operating in the repulsive mode. The axial support was provided by jewel bearings on both ends of the rotor. The rig was successfully operated to speeds of 5500 rpm using an air impeller. Radial and axial stiffnesses of the permanent magnetic bearings were experimentally measured and then compared to finite element results. The natural damping of the rotor was measured and a damping coefficient was calculated.
Author
Magnetic Bearings; Stiffness; Damping; Spin Tests

20030038845 Pennsylvania State Univ., University Park. Energy Inst
Impact of DME-Diesel Fuel Blend Properties on Diesel Fuel Injection Systems
Chapman, E. M.; Boehman, A. L.; Wain, K.; Lloyd, W.; Perez, J. M.; Jul. 2002; 20 pp.; In English
Report No.(s): DE2002-802864; No Copyright; Avail: Department of Energy Information Bridge

The objectives of this research program are to develop information on lubricity and viscosity improvers and their impact on the wear mechanisms in fuel injectors operating on blends of dimethyl ether (DME) and diesel fuel. The report provides summaries of the progress toward completion of both experimental systems and a summary of the plan for completion of the project objectives.
NTIS
Fuel Injection; Methyl Compounds; Ethers; Diesel Fuels

20030038943 California Univ., Riverside, CA, Minnesota Univ., Saint Paul, MN
Chemical Analysis of Diesel Nanoparticles Using a Nano-DMA/Thermal Desorption Particle Beam Mass Spectrometer. Final Report for Phase 2
Apr. 2002; In English
Report No.(s): PB2003-102767; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the results of Phase 2 of our project, Chemical Analysis of Diesel Nanoparticles Using a Nano-DMA/Thermal Desorption Particle Beam Mass Spectrometer, CRC Contract No. E-43-4. The project was a collaboration between the research groups of Professor Paul Ziemann at the University of California, Riverside (UCR) and Professor Peter McMurry at the University of Minnesota (UMN) and covered the period 9/8/2000-12/31/2001. Professor David Kittelson, also from UMN, was a key collaborator on the project but was not funded by this grant. The primary activities of Phase 2 involved two studies of diesel nanoparticles carried out at the University of Minnesota Center for Diesel Research (UMNCDR), one on a Caterpillar engine and the other on a Cummins engine. The primary objective of this project was to use the Nano-DMA/TDPBMS to obtain information on the chemical composition of diesel nanoparticles formed in a laboratory environment under various engine operating conditions. The focus was to be on the chemistry of nucleation-mode particles, but larger particles would also be analyzed for comparison.
NTIS
Chemical Analysis; Diesel Engines; Chemical Composition; Particle Size Distribution

20030045793 Institute of Industrial Technology TNO, Apeldoorn, Netherlands
Additional Investigation on the Ductility of Material from Full Scale Panel Material KM2
Lont, M. A.; Krom, A. H. M.; August 10, 2001; 52 pp.; In Dutch; Original contains black and white illustrations
Contract(s)/Grant(s): A99/KM/167
Report No.(s): TNO-011-01200/LON/VIS; TD-2001-0209; Copyright; Avail: Other Sources

Fatigue crack growth measurements have been performed on four stiffened large-scale panels followed by fracture testing. The fracture tests showed unexpected brittle fracture, which gave questions about the material quality needed to prevent brittle fracture. The material used in the test showed lower yield strength and lower ductility compared to the material normally used by the Dutch navy for surface ships. Additional Charpy-V CTOD (static) and dynamic tear testing was performed. Dynamic CTOD testing was performed at two different loading rates. The highest loading rate on the drop weight-testing machine gave much oscillation on the recorded load and displacement curves. Dynamic CTOD testing at 0.5 m/s on a compression-testing machine gave useful measuring signals. The main conclusions are: Static CTOD testing on 5B compared to 2B specimens gives a value of delta which is 1.5x larger; Dynamic CTOD testing at a loading rate of 3.10(exp 4) MPa.m(exp 1/2)./s gave a minimum fracture toughness of 125 MPa.m(exp 1/2) at about 0 C.
Author
Ductility; Brittleness; Panels; Fatigue (Materials); Crack Propagation; Yield Strength; Fracturing

20030045795 Pittsburgh Univ., PA
Impermeable Thin Al(2)O(3) Overlay for TBC Protection from Sulfate and Vanadate Attack in Gas Turbines
2000; In English
Report No.(s): DE2002-802865; No Copyright; Avail: National Technical Information Service (NTIS)
In order to improve the hot corrosion resistance of conventional YSZ TBC system, a dense and continues overlay of Al(2)O(3) coating of about 25 micrometers thick was deposited on the surface of TBC by EB-PVD and high velocity oxy-fuel (HVOF) spray techniques. Hot corrosion tests were carried out on the TBC with and without Al(2)O(3) coating in molten salts mixtures at 950 degrees C for 10h. The microstructures of TBC and overlay before and after exposure were examined by means of scanning electron microscopy (SEM), energy-dispersive X-ray spectrometer (EDX), X-ray diffraction (XRD) and secondary ion mass spectrometry (SIMS).
NTIS
Thermal Protection; Protective Coatings; Gas Turbines; Corrosion Resistance; Vanadates; Sulfates

20030052215 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Kinematic, Kevlar(registered) Suspension System for an ADR
Voellmer, George M.; Jackson, Michael L.; Shirron, Peter J.; Tuttle, James G.; [2003]; 24 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy
The High Resolution Airborne Wideband Camera (HAWC) and the Submillimeter And Far Infrared Experiment (SAFIRE) will use identical Adiabatic Demagnetization Refrigerators (ADR) to cool their bolometer detectors to 200mK and 100mK, respectively. In order to minimize thermal loads on the salt pill, a Kevlar@ suspension system is used to hold it in place. An innovative, kinematic suspension system is presented. The suspension system is unique in that it consists or two parts that can be assembled and tensioned offline, and later bolted onto the salt pill. The resulting assembly constrains each degree of freedom only once, yielding a kinematic, tensile structure.
Author
Adiabatic Demagnetization Cooling; Refrigerators; Kevlar (Trademark); Kinematics; Magnetic Suspension

20030052288 Texas Univ. at Austin. Center for Transportation Research
Emulsified Diesel Fuels: Literature Review and Consolidation of Lubrizol Recommendations
Matthews, R. D.; Oct. 2002; 60 pp.; In English
Report No.(s): PB2003-103573; No Copyright; Avail: CASI; A04, Hardcopy
The objective of this document is to summarize the available findings by Lubrizol and by third parties on the effects of PuriNOx on a variety of diesel engines operating over a variety of conditions. The information was obtained from the 19 documents provided by Lubrizol and additional documents obtained from the Engineering Library at the University of Texas. It is obvious from this synthesis that the available literature exhibits conflicting data, conclusions, and recommendations about the benefits of emulsified diesel fuels. However, it can be concluded with relative certainty that emulsified diesel fuels always provide benefits in terms of NOx and PM emissions when tested over any cycle. The magnitude of the advantage from using emulsified diesel fuels is, however, largely a function of the engine type, the operating conditions, the properties of the baseline diesel fuel, and the properties of the diesel fuel that is blended into the emulsion. In addition, it is known that emulsions offer a benefit in terms of thermal efficiency and lubricity. Questions relating to the cost effectiveness of using PuriNOx and engine

durability were not adequately addressed in the available literature. The results from this synthesis will allow for an informed discussion of the scope of the current study.
NTIS
Diesel Fuels; Diesel Engines; Emulsions; Recommendations

38
QUALITY ASSURANCE AND RELIABILITY

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

20030037106 National Inst. of Standards and Technology (TS), Gaithersburg, MD
Index to the Reports of the National Conference on Weights and Measures from the First to the Eighty-Fifth (1905 to 2000)
Koenig, J.; Newrock, G.; Grimes, T.; Jan. 2001; 88 pp.; In English
Report No.(s): PB2001-102392; NIST/SP-964; No Copyright; Avail: CASI; A05, Hardcopy

Since the inception of the National Conference on Weights and Measures (NCWM) in 1905, a great deal of information on a wide variety of weights and measures subjects has been published in the Reports of the Annual Meetings of the NCWM. This publication is designed to assist those who use the NCWM Reports in finding information on specific subjects or Conference presentations. It contains a subject index and a speaker index covering the proceedings of the Annual Meetings from the First in 1905 through the Eighty-Fifth in 2000. This publication supersedes NBS Special Publication 769, which was an index of the Proceedings from the First through the Seventy-Third. The information from the First through the Fifty-Sixth was compiled by Frances Bell; from the Fifty-Seventh through the Sixty-Ninth by William G. Mott; from the Seventieth through the Seventy-Third by Nancy H. Chaconas; and from the Seventy-Fourth through the Eighty-Fifth by Gail Newrock (Subject Index) and Joan Koenig (Speaker Index).
NTIS
Conferences; Indexes (Documentation); Weight Measurement; Metrology

20030037167 Lawrence Livermore National Lab., Livermore, CA
Measurement of the Variations in Thickness and Refractive Index of NIF Crystals
Sommargren, G. E.; Phillion, D. W.; Johnson, M. A.; Bradsher, L. S.; Jan. 29, 2002; In English
Report No.(s): DE2002-15002093; UCRL-ID-147764; No Copyright; Avail: National Technical Information Service (NTIS)

This report discusses one method of characterizing the variations in the physical thickness and refractive index of NIF doubler, tripler and switch crystals that are relatively thin (10mm thick). These particular measurements are difficult to perform with standard laser interferometers when the front and back substrate surfaces are near-parallel. A complicated interference pattern is formed from the interference of more than two beams due to the temporal coherence of the laser source. There are a number of methods that can be used to minimize this problem. They are referenced in a paper by Peter de Groot. In this report we discuss a method that eliminates the problem completely and show the results of measurements of two crystals.
NTIS
Refractivity; Crystals

20030037170 Lawrence Livermore National Lab., Livermore, CA
Recent Results in the Development of Fast Neutron Imaging Techniques
Hall, J.; Dietrich, F.; Logan, C.; Rusnak, B.; Sep. 11, 2000; In English
Report No.(s): DE2002-15002096; UCRL-MI-140345; No Copyright; Avail: National Technical Information Service (NTIS)

We are continuing with the development of fast neutron imaging techniques for use in NDE applications. Our goal is to develop a neutron imaging system capable of detecting sub-mm-scale cracks, cubic-mm-scale voids and other structural defects in heavily-shielded low-Z materials within thick sealed objects. The final system will be relatively compact (suitable for use in a small laboratory) and capable of acquiring both radiographic and full tomographic image sets. The design of a prototype imaging detector will be reviewed and results from several recent imaging experiments will be presented. The concurrent development of an intense, accelerator-driven neutron source suitable for use with the final production imaging system will also be discussed.
NTIS
Fast Neutrons; Neutron Radiography

20030038807 Lawrence Livermore National Lab., Livermore, CA
Handbook for the Manybeam Velocimeter
Strand, T.; Feb. 06, 2002; 132 pp.
Report No.(s): DE2002-15002225; UCRL-ID-147167; No Copyright; Avail: Department of Energy Information Bridge

Partial Contents: Lasers (Laser room, Class IV pulsed laser, Imbedded CW laser); Fibers (Types and specifications, Transmission, Jackets); Probes (General information, Centering cylinder, Nested lens, Surface preparation); Analyzer table (Geometry, Simplified optics, Fiber chuck types, Fiber chuck angle polish, Shaper, Etalons); Streak cameras (General information, Foreoptics, Tube Geometry, Sweep Settings, Film Layout, Suggestions for coverage); Film/filters (Polaroid, Hard film, Neutral density filters, Bandpass filters); Data analysis (Velocity, Timing); Basic optics (with examples on the analyzer table) (Index of refraction, Snell's law, Lens equation for thin lenses, Magnification, Divergence, Depth of focus, Reflectance at normal incidence); Useful information (Geometry formulas, Trig identities); Useful formulas; Outline.

NTIS
Velocity Measurement; Laser Doppler Velocimeters; Laser Applications; Handbooks

20030038878 Fluor Hanford, Richland, WA
Perform Ultrasonic Testing on Cs Capsule Overpacks
Davis, S. J.; Apr. 06, 2000; 18 pp.; In English
Report No.(s): DE2002-802988; No Copyright; Avail: Department of Energy Information Bridge

This procedure provides a safe, uniform method for the performance of the ultrasonic weld inspection of the Cesium capsule overpacks. The inspection system will detect cracks, lack of fusion, and lack of penetration. This computer controlled automated system will perform the examination once the capsule overpack has been placed in the pool cell. Examination of the capsule overpacks will be in accordance with drawing H-283014, REV. 0, and a certified NDE examiner will perform the test procedure, provide analysis, and test documentation.

NTIS
Nondestructive Tests; Ultrasonic Tests; Cesium; Welded Joints

20030038889 CH2M Hill Hanford Group, Inc., Richland, WA
Failure and Reliability Analysis for the Master Pump Shutdown System
Bevins, R. R.; Aug. 29, 2000; 330 pp.; In English
Report No.(s): DE2002-804762; No Copyright; Avail: Department of Energy Information Bridge

The Master Pump Shutdown System (MPSS) will be installed in the 200 Areas of the Hanford Site to monitor and control the transfer of liquid waste between tank farms and between the 200 West and 200 East areas through the Cross-Site Transfer Line. The Safety Function provided by the MPSS is to shutdown any waste transfer process within or between tank farms if a waste leak should occur along the selected transfer route. The MPSS, which provides this Safety Class Function, is composed of Programmable Logic Controllers (PLCs), interconnecting wires, relays, Human to Machine Interfaces (HMI), and software. The purpose of this failure and reliability analysis is to address the following design issues of the Project Development Specification (PDS) for the MPSS/SYS (HNF 2000a): (1) Single Component Failure Criterion, (2) System Status Upon Loss of Electrical Power, (3) Physical Separation of Safety Class cables, (4) Physical Isolation of Safety Class Wiring from General Service Wiring, and (5) Meeting the MPSS/PLC Option 1b (RPP 1999) Reliability estimate. The failure and reliability analysis examined the system on a component level basis and identified any hardware or software elements that could fail and/or prevent the system from performing its intended safety function

NTIS
Pumps; Shutdowns; Control; Pipes (Tubes); Liquid Wastes

20030038951 National Inst. of Standards and Technology (BFRL), Gaithersburg, MD
Virtual Cement and Concrete Testing Laboratory Consortium Annual Report, 2002
Bullard, J. W.; Jan. 2003; In English
Report No.(s): PB2003-102298; NISTIR-6962; No Copyright; Avail: National Technical Information Service (NTIS)

The Virtual Cement and Concrete Testing Laboratory (VCCTL) Consortium was formed in January 2001. The VCCTL Consortium Oversight Board, consisting of one representative from each member organization and the VCCTL Consortium Manager from NIST (National Institute of Standards and Technology), governs the activities and direction of the consortium. The ultimate goal of the consortium is to address durability and service life prediction, but the members recognized that first efforts must be concentrated towards enhancing the current microstructure models and property calculations. Therefore, the

three major initial research topics of the consortium were: (1) enhancements to the cement hydration and microstructure development model to consider additional supplementary materials such as slags and limestones and the prediction of pore solution concentrations, (2) computation of the elastic properties (elastic modulus, creep, shrinkage) of three-dimensional microstructures, and (3) experimental measurement and computer modeling of the rheological properties (viscosity, yield stress) of cement-based materials. This document reports the activities of the VCCTL Consortium in 2002.
NTIS
Cements; Concretes

20030045824 Lawrence Livermore National Lab., Livermore, CA
Enhanced Ultrasonic Characterization of Assemblies, TLL 19
Thomas, G.; Chinn, D.; Feb. 22, 2000; In English
Report No.(s): DE2002-791734; UCRL-ID-131699-R1; No Copyright; Avail: National Technical Information Service (NTIS)

The solid state bonded joint between two components; called an autoclave bond, is critical to the performance of a weapon system. A nondestructive method to assess the integrity of these joints is needed to certify the weapon for extended life. This project is developing ultrasonic technologies for bond quality assessment. Existing ultrasonic technology easily maps totally unbonded areas in a bond line. We enhanced this technology to quantify the mechanical properties of a bond. There are situations when a bond interface appears intact by existing inspection methods, but fails under minimal loading. We developed an ultrasonic technique to eliminate this problem and assess the durability of the bond. Our approach is based on advanced signal processing and artificial intelligence techniques that extract information from the ultrasonic signal after it interacts with the bondline. We successfully demonstrated this technique on surrogate samples. We also designed and began assembly of an ultrasonic system to evaluate weapon components. Our next step is to acquire ultrasonic data on real parts and tailor the bond classification algorithm to detect and image defective bond regions.
NTIS
Autoclaves; Bonded Joints; Ultrasonic Tests; Bonding

20030051435 National Inst. of Standards and Technology (CSTL), Gaithersburg, MD
Proceedings of the Workshop on Measurement Traceability for Clinical Laboratory Testing and In Vitro Diagnostic Test Systems
Beary, E. S.; May 2001; In English
Report No.(s): PB2001-105506; NISTIR-6742; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the workshop is to actively involve all interested parties in the solution to establishing the means and processes for assuring measurement traceability and reference systems for the healthcare community.
NTIS
Conferences; In Vitro Methods And Tests; Laboratories

20030051440 Ohio Dept. of Transportation, Columbus, OH
Laboratory Characterization of Materials and Data Management for Ohio - SHRP Projects (U.S. 23) (on CD-ROM)
Jan. 2002; In English
Report No.(s): PB2002-500100; FHWA/OH-2001/07; No Copyright; Avail: National Technical Information Service (NTIS)

About a decade ago, the Federal Highway Administration (FHWA) set up a national study called the Long-Term Pavement Performance (LTPP) under the Stretegic Highway Research Program (SHRP) to extend pavement life through investigation of different pavement designs under various loading, environmental, subgrade soil, and maintenance conditions. The study involved many different materials and stressed the importance of collecting field and laboratory test data on their mechanistic properties. In the current study, mechanistic properties of the pavement materials involved in the Ohio-SHRP project were measured according to the SHRP Protocols. The test program encompassed a wide array of materials and their properties, ranging from basic index properties of the subgrade soils to resilient modulus of soils and asphalt concrete to static modulus of Portland cement concrete and creep modulus of asphalt concrete. Any trends observed in the test results were pointed out to enhance our understanding of how each pavement material behaves. In some cases, previously published empirical relationships correlating basic and advanced material properties wre reevaluated in light of the latest test results. A need for integrating a large volume of data that existed for the Ohio-SHRP project was recognized even prior to the initiation of the current study. As a result, a computer-based database was developed, packaged into a CD-ROM disk, and attached to this

report. This user-friendly database allows a fast and easy access to all the mechanistic properties presented in this report as well as general information related to the Ohio-SHRP project.
NTIS
Pavements; Mechanical Properties

20030051544 National Inst. of Standards and Technology, Gaithersburg, MD
Selected Laboratory and Measurement Practices, and Procedures to Support Basic Mass Calibrations
Harris, G. L.; Torres, J. A.; 2003; 186 pp.
Report No.(s): PB2003-103355; NISTIR-6969; No Copyright; Avail: CASI; A09, Hardcopy

This NIST (National Institute of Standards and Technology) IR of Selected Publications has been compiled as an interim update for a number of Good Laboratory Practices, Good Measurement Practices, Standard Operating Procedures, Statistical Techniques and Reference Tables. This interim publication will be used as a reference document for the CD-ROM Mass Metrology Course being prepared by the NIST Weights and Measures Division. Many of these procedures are updates to procedures that were originally published in NBS Handbook 145, Handbook for the Quality Assurance of Metrological Measurements, in 1986, by Henry V. Oppermann and John K. Taylor. The updates have incorporated many of the requirements noted for procedures in ISO Guide 25, ANSI/NCSL Z 540-1-1994, and ISO/IEC 17025 laboratory quality systems. The major changes incorporate (1) uncertainty analyses that comply with current international methods and (2) measurement assurance techniques using check standards.
NTIS
Calibrating; Standards; Laboratories

20030052279 National Inst. of Standards and Technology (EEEL), Gaithersburg, MD
Electronics and Electrical Engineering Laboratory. Office of Law Enforcement Standards: Programs, Activities, and Accomplishments
Jan. 2003; 60 pp.
Report No.(s): PB2003-102854; NISTIR-6952; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Welcome; Mission; Weapons and Protective Systems; Detection, Inspection, and Enforcement Technologies; Chemical Systems and Materials; Forensic Sciences; Public Safety Communication Standards; Critical Incident Technologies; and Office of Law Enforcement Standards Organization.
NTIS
Weapon Systems; Safety; Chemical Composition; Research Projects

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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 structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20030038859 Virginia Transportation Research Council, Charlottesville, VA
Testing of Selected Metallic Reinforcing Bars for Extending the Service Life of Future Concrete Bridges: Summary of Conclusions and Recommendations
Clemena, G. G.; Dec. 2002; 22 pp.; In English
Report No.(s): PB2003-102160; VTRC-03-R7; FHWA/VTRC-03-R7; Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the major conclusions drawn from its companion reports, which described investigations conducted using a stainless steel-clad bar, selected stainless steel bars (304, 316LN, and duplex 2205), and a carbon steel bar in concrete and in simulated concrete pore solutions (with various concentrations of chloride and pH) to assess the comparative corrosion resistance of the clad bar.
NTIS
Reinforcement (Structures); Bars; Bridges (Structures); Service Life; Concrete Structures; Corrosion Resistance

20030039007 Iowa State Univ. of Science and Technology, Ames, IA, General Electric Aircraft Engines, Cincinnati, OH
Fundamental Studies: Inspection Properties for Engine Titanium Alloys
Margetan, F. J.; Gigliotti, M.; Brashe, L.; Leach, W.; Dec. 2002; 168 pp.; In English
Report No.(s): PB2003-102881; No Copyright; Avail: CASI; A08, Hardcopy

A crack tip element approach to predict delamination growth is reviewed and then used to predict delamination growth in two stiffened-skin geometries that are typical of aircraft configurations. Predictions by this approach are then compared with experimental results. Test specimens were fabricated from T800H/3900-2, which is a graphite/epoxy material system toughened by a thermoplastic interlayer. Experiments were then performed, and predictions were compared to the observed results. Predictions that incorporated previously generated toughness data gave poor correlation to experiments. It was found that the fracture behavior of those specimens used to determine the toughness versus mode mix data was significantly different than that observed in the stiffened-skin elements. Specifically, the thermoplastic interlayer was relatively thin and dispersed in the interply regions of the skin-stringer elements, and delamination advance occurred through the low toughness base matrix and/or through the base resin/thermoplastic interlayer interface. Through scanning electron microscope observations, two distinct reasons were found to be the cause of lack of thermoplastic layer in the stiffened-skin specimens. The first of these is that the noncritical end of the delamination (i.e., away from the crack tip) terminated at a free surface that was reasonably close to the crack tip. This provided a path through which, during manufacture of the specimens, the toughening material could flow out of the inter-ply region. The second contributing factor was the relative angle of the plies bounding the delamination as compared to the direction of delamination advance. The fibers in these bounding plies compress the thermoplastic interlayer into a sinusoidal grid whose peaks and valleys are not aligned with the direction of crack growth.
NTIS
Aircraft Configurations; Crack Tips; Delaminating

20030045702 Institute of Industrial Technology TNO, Apeldoorn, Netherlands
Simulation of Dynamic Loaded Notched Bars for the Failure Criteria of Blast Panels
Krom, A. H. M.; Dillingh, E. C.; June 10, 2002; 80 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/KM/165; TNO Proj. 007.60314/01.01
Report No.(s): Rept-011-01224/KRO; TD-2001-0211; Copyright; Avail: Other Sources

Notched tensile bars are developed which simulate the different stress state and microstructure in a welded joint of blast panels. The tensile bars are tested in high speed tensile bars. Forces and displacements of the notch are registered and used for the finite element simulation of the tensile tests. From the tests and the simulation data are derived for the failure criteria of the different location in a welded joint. The criteria are based on the work of Lemaitre. The failure criteria will be used for the development of dedicated element in which the failure properties of the welded joint are adopted. Finally this element can be used to study the failure behavior of a blast panel.
Author
Finite Element Method; Microstructure; Panels; Simulation; Dynamic Loads; Mechanical Properties; Structural Failure; Notches; Blast Loads; Tensile Strength

20030045769 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Characterisation of the Ballistic Resistance of Personal Armour Through V(sub 0) and V(sub 50): Experiments and Statistical Analysis
vanderMeer, B. J.; March 2003; 61 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/KL/471; TNO Proj. 014.12937
Report No.(s): PML-2003-A3; TD2002-0177; Copyright; Avail: Other Sources

Protection performance of personal body armour against impacting fragments is usually characterised by the V(sub 50), which is the impact velocity of the fragment having a chance of 50\% of perforating the material. These parameters are assessed by conducting go/no-go techniques like the Kneubuhl method. The V(sub 50) (and sometimes the V(sub 0)) is usually quoted as a point value. In his report the ballistic limit method is applied and the influence of the scatter of the residual velocities on the V(sub 50) and the V(sub 0) is given. It is shown that the point value V(sub 0) is actually a V(sub 50). The data are compared with the data obtained from Kneubuhl's method and the method described in Stanag 2920. Both V(sub 0) and V(sub 50) can be assessed from one series of experiments at a chosen confidence. However, there is still an unresolved discrepancy between V(sub 50)s obtained from the ballistic limit method and the Kneubuhl method.
Author
Armor; Impact Velocity; Statistical Analysis; Impact Resistance

20030051481 Illinois Univ. at Urbana-Champaign. Dept. of Civil and Environmental Engineering

Evaluation of Elastomeric Bridge Bearings for Seismic Design

Ash, C.; Schwartz, J.; Aschheim, M.; Hawkins, N.; Gamble, B.; Nov. 2002; 260 pp.; In English

Report No.(s): PB2003-102197; ITRC-FR-99-4; No Copyright; Avail: CASI; A12, Hardcopy

Elastomeric bridge bearings have been used by various states in the mid-American region to accommodate thermal movement of bridge decks for over thirty years. Their potential role for mitigating damage in the infrequent but high consequence earthquakes that characterize the central USA is explored in this project. The potential protective role of conventional elastomeric bearings is critically influenced by material properties such as shear modulus, known to be temperature dependent. The degree of influence at low temperatures is determined through experimental studies. Slip characteristics of in-service aged and contaminated Teflon interfaces are determined. Full-scale bearings taken from existing bridges in addition to new bearing form the basis of these tests. Materials tests performed on the elastomer characterize the properties of aged bearings. The influence of these physical on possible bridge damage caused by earthquake ground shaking is assessed through computational simulations. A retrofit bearing with improved details for seismic isolation is designed and tested. An apparatus for testing the bearings was developed to simulate actual loading conditions. The apparatus provides a temperature-controlled chamber to allow for low temperature testing. Test protocols are developed to address the influence of testing parameters such a low temperature exposure and compressive stress. The prototype retrofit bearing design was also tested in this setup. The seismic response of a representative bridge is assessed by computational simulations conducted using the nonlinear analysis software DRAIN-2DX.

NTIS

Elastomers; Low Temperature; Stiffness; Bridges (Structures); Vibration Isolators

20030051484 Utah Univ., Salt Lake City. Dept. of Mechanical Engineering

Tabbing Guide for Composite Test Specimens

Adams, D. O.; Adams, D. F.; Oct. 2002; 80 pp.; In English

Report No.(s): PB2003-102193; No Copyright; Avail: CASI; A05, Hardcopy

This document provides guidelines for selecting suitable tabbing configurations for composite material test specimens. Additionally, a practical methodology is detailed for preparing and applying tabs to composite test specimens. This document is based on research performed within the Mechanical Engineering Department at the University of Utah and previously by the Composite Materials Research Group (CMRG) at the University of Wyoming, both sponsored by the Federal Aviation Administration. The use of composite materials as a material of choice for structural applications has seen tremendous growth over the last several decades. This growth has resulted in a proliferation of both commercial and in-house composite material testing facilities. A reoccurring problem in the process of materials testing is the proper selection of tabbing configuration and the proper bonding of end tabs onto test specimens. This is a fundamental and a critical step in the testing process since the tabs protect the specimen as well as introduce the load into the specimen. Those who perform composite material testing on a routine basis have presumably developed tabbed specimen configurations and tabbing procedures that provide accurate and repeatable results. The suggested procedures offered here can be compared with those already being used. For those users who do material testing less frequently, this Guide should be especially useful.

NTIS

Composite Materials; Configuration Management; Methodology; Mechanical Properties

20030051613 Lawrence Livermore National Lab., Livermore, CA

Numerical Integration of Elastoviscoplasticity Model with Stiff Hardening and Softening

Vorobiev, O. Y.; Lomov, I. N.; Glenn, L. A.; Rubin, M. B.; Feb. 01, 2000; 12 pp.; In English

Report No.(s): DE2002-791038; UCRL-JC-136877; No Copyright; Avail: Department of Energy Information Bridge

The constitutive equations for viscoplasticity typically are stiff differential equations and require special numerical methods to integrate them efficiently. The objective of this paper is to propose a class of rate-dependent viscoplastic constitutive equations which can be integrated by an efficient explicit scheme that includes the first order effect of pressure and plastic strain hardening.

NTIS

Elastoplasticity; Viscoplasticity; Numerical Analysis

42
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 42 through 48*.

20030037101 Westinghouse Savannah River Co., Aiken, SC
FY2002 P Well Report
Noonkester, J. V.; Nichols, R. L.; Betivas, C. R.; Simmons, J. L.; Aug. 27, 2002; 21 pp.; In English
Report No.(s): DE2002-805615; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Aquifers; Hydrogeology; Pumps

20030037130 Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters
Minnesota's Water Supply: Natural Conditions and Human Impacts
Sep. 2000; In English
Report No.(s): PB2003-102701; No Copyright; Avail: National Technical Information Service (NTIS)
The fair and wise allocation of the water supply in light of increasing, competing demands is one of the greatest challenges facing the Minnesota Department of Natural Resources (DNR). Withdrawals for public water supplies, domestic uses, irrigation, industrial processing, or power production can conflict with the need to maintain adequate streamflows and water levels for recreation, fish and wildlife habitat, and reliable ground water supplies. A significant increase in the amount of water available for competing needs is not feasible. Therefore, expectations for future water use and demands must be managed using sound water resource information and a profound understanding of the relationship between human activities and natural conditions. Included in this report are discussions of the following key topics: current water budget and human impacts; an overview of water resource management concerns that are being addressed statewide and by geographic and hydrogeologic areas; and current strategies for water supply management, and planning and development suggestions.
NTIS
Water Management; Water Resources; Management Planning; Earth Resources; Irrigation

20030037135 Environmental Protection Agency, Washington, DC
Proven Alternatives for Aboveground Treatment of Arsenic in Groundwater. Engineering Forum Issue Paper (Revised)
Oct. 2002; 72 pp.
Report No.(s): PB2003-102717; EPA/542/S-02/002; No Copyright; Avail: CASI; A04, Hardcopy
This issue paper identifies and summarizes experiences with proven aboveground treatment alternatives for arsenic in groundwater, and provides information on their relative effectiveness and costs.
NTIS
Arsenic; Ground Water

20030037140 Geological Survey, Charleston, WV
Estimating the Magnitude of Annual Peak Discharges with Recurrence Intervals between 1.1 and 3.0 Years for Rural, Unregulated Streams in West Virginia
Wiley, J. B.; Atkins, J. T.; Newell, D. A.; 2002; In English
Report No.(s): PB2003-102722; USGS/WRI-02-4164; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Abstract; Introduction; Development of low-recurrence- intervalpeak-discharge estimating equations; Estimating discharge for gaged and ungaged locations; Accuracy of low-recurrence-interval peak-discharge estimating equations; Limitations of low-recurrence-interval peak-discharge estimating equations; Summary; References cited; Appendix1. Fortran program for calculating frequency factors; Appendix 2. Accuracy of estimating equations; Plate; Figures and Table.
NTIS
Streams; Rural Areas; West Virginia; Estimating

20030037143 Geological Survey, Denver, CO

Evaluation of Water Quality, Suspended Sediment, and Stream Morphology with an Emphasis on Effects of Stormflow on Fountain and Monument Creek Basins, Colorado Springs and Vicinity, Colorado, 1981 through 2001

Edelmann, P.; Ferguson, S. A.; Stogner, R. W.; August, M.; Payne, W. F.; 2002; In English

Report No.(s): PB2003-102724; USGS/WRIR-02-4104; No Copyright; Avail: National Technical Information Service (NTIS)

This report documents water quality and suspended sediment with an emphasis on evaluating the effects of stormflow on Fountain Creek Basin in the vicinity of Colorado Springs, Colorado. Water-quality data collected at ll sites between l981 and 2001 were used to evaluate the effects of stormflow on water quality. Suspended-sediment data collected at seven sites from 1998 through 2001 were used to evaluate effects of stormflow on suspended-sediment concentrations, discharges, and yields. Data were separated into three flow regimes: base flow, normal flow, and stormflow.

NTIS

Sediments; Water Quality

20030037145 Geological Survey, Menlo Park, CA, California State Dept. of Water Resources, Sacramento

Salinity and Temperature in South San Francisco Bay, California, at Dumbarton Bridge: Results from the 1999-2002 Water Years and an Overview of Previous Data

Schemel, L. E.; Brown, R. L.; Bell, N. W.; Jan. 2003; In English

Report No.(s): PB2003-102725; USGS/WRI-03-4005; No Copyright; Avail: National Technical Information Service (NTIS)

Salinity and temperature were measured in near-surface waters at Dumbarton Bridge in South San Francisco Bay during the 1999-2002 water years (1999WY-2002WY). The complete data set from this site, which included 1990WY-1993WY and 1995WY-1998WY, provided a time-series of observations covering a wide range of hydrologic conditions. These conditions included critically dry years and years with above normal and near-record precipitation and discharges from the major rivers and local streams. Data collection at 15-minute intervals allowed resolution of variability associated with daily tides and other short-term phenomena. Both local stream discharges to South San Francisco Bay and Sacramento-San Joaquin River discharges to North San Francisco Bay affected salinity at Dumbarton Bridge. Salinity at Dumbarton Bridge varied with the daily tides, and the lowest salinity values (annual) coincided with precipitation and freshwater inflows usually in winter. Short-term and seasonal variations in temperature at Dumbarton Bridge typically followed changes in air temperature and solar irradiance.

NTIS

San Francisco Bay (Ca); Salinity; Water Temperature

20030037159 Joint Oceanographic Institutions, Inc., Washington, DC, Texas A and M Coll., College Station, Rice Univ., Dept. of Earth Sciences, Houston, TX

Technical Progress Report Number 3

Rack, F. R.; Diiickens, G.; Ford, K.; Schroeder, D.; Stroms, M.; Aug. 2002; 44 pp.; In English

Report No.(s): DE2002-803201; No Copyright; Avail: Department of Energy Information Bridge

The primary accomplishments of the JOI Cooperative Agreement with DOE/NETL in this quarter was the preparation of tools and measurement systems for deployment, testing and use on ODP Leg 204, which will study hydrate deposits on Hydrate Ridge, offshore Oregon. Additional accomplishments were related to the post-cruise evaluation of tools and measurements systems used on ODP Leg 201 along the Peru margin from January through March, 2002.

NTIS

Hydrates; Methane; Marine Environments; Gases; Lithosphere

20030037163 Corps of Engineers, Portland, OR

Water Quality Annual Report 2000, Corps of Engineers Northwestern Division

2002; 90 pp.; In English

Report No.(s): PB2003-102721; No Copyright; Avail: CASI; A05, Hardcopy

No abstract available

NTIS

Engineers; Water Quality; Pacific Ocean; Management Planning

20030037173 Lawrence Livermore National Lab., Livermore, CA

Multi-Isotope (B, Sr, O, H, C) and Age Dating ((3)H-(3)He,(14)C) Study of Ground Water from Salinas Valley California: Hydrochemistry, Dynamics, and Contamination Processes

Vengosh, A.; Gill, J.; Davisson, M. L.; Hudson, G. B.; Aug. 01, 2001; 48 pp.

Report No.(s): DE2002-15002099; UCRL-JC-147271; No Copyright; Avail: Department of Energy Information Bridge

The chemical and isotopic (11B/10B, 87Sr/86Sr, 180/160, 2H/H, 13C/12C, 14C, 3He/3H) compositions of groundwater from the upper aquifer system of the Salinas Valley in coastal central California were invesugated in order to delineate the origin and processes of groundwater contamination in this complex system. The Salinas Valley has a relatively deep, confined '400-foot' aquifer, overlain by a '180-foot' aquifer, and a shallower perched aquifer, all made up of alluvial sand, gravel, and clay deposits. Groundwater from the aquifers have different t4C ages; fossil (14C=21.3 pmc) for the 400-foot, and modern (14C=72.2 to 98.2 pmc) for the 180-foot. Fresh groundwater in all aquifers is recharged naturally and artificially and through the Salinas River. The two modes of recharge can be distinguished chemically.

NTIS

Ground Water; Geochemistry; California; Contamination; Radioactive Isotopes

20030037185 Lawrence Livermore National Lab., Livermore, CA

Effects of Fluid Distribution on Measured Geophysical Properties for Partially Saturated, Shallow Subsurface Conditions

Berge, P. A.; Jun. 11, 2002; 10 pp.; In English

Report No.(s): DE2002-15002136; UCRL-ID-148954; No Copyright; Avail: Department of Energy Information Bridge

Our goal is to improve geophysical imaging of the vadose zone. We are achieving this goal by providing new methods to improve interpretation of field data. The purpose of this EMSP project is to develop relationships between laboratory measured geophysical properties and porosity, saturation, and fluid distribution, for partially saturated soils. Algorithms for relationships between soil composition, saturation, and geophysical measurements will provide new methods to interpret geophysical field data collected in the vadose zone at sites such as Hanford, WA.

NTIS

Geophysics; Surface Properties; Fluid Flow

20030038792 Lawrence Livermore National Lab., Livermore, CA

Analysis of Radionuclide Migration through a 200-m Vadose Zone following a 16-year Infiltration Event

Tompson, A. F. B.; Smith, D. K.; Hudson, G. B.; Jan. 31, 2002; In English

Report No.(s): DE2002-15002146; UCRL-ID-146979; No Copyright; Avail: National Technical Information Service (NTIS)

The CAMBRIC nuclear test was conducted beneath Frenchman Flat at the Nevada Test Site on May 14, 1965. The nuclear device was emplaced in heterogeneous alluvium, approximately 70 m beneath the ambient water table, which is itself 220 m beneath the ground surface. Approximately 10 years later, groundwater adjacent to the test was pumped steadily for 16 years to elicit information on radionuclide migration in the saturated zone. The pumping well effluent containing mostly soluble radionuclides such as tritium, 14C, 36Cl, 85Kr, 129I, and 106Ru was monitored, discharged to an unlined ditch, and allowed to flow towards Frenchman Lake just over one kilometer away. Water discharged into the ditch infiltrated into the ground during flow along the ditch. This created an unexpected and remarkable second experiment in which the migration of the effluent through the 220 meters of unsaturated media, or vadose zone, back to the water table, could be studied. In this paper, the pumping and effluent data are being utilized in conjunction with a series of geologic data, new radionuclide measurements, isotopic age-dating estimates, and vadose zone flow and transport models to better understand the movement of radionuclides between the ditch and the water table. Measurements of radionuclide concentrations in water samples produced from a water table monitoring well 100m away from the ditch indicate rising levels of tritium since 1993.

NTIS

Radioactive Isotopes; Migration; Ground Water

20030038793 Minerals Management Service, New Orleans, LA

Atlantic Outer Continental Shelf, Georges Bank: Compilation of Continental Offshore Stratigraphic Test (COST) and Industry Exploration Drilling, 1976-1982

2002; In English

Report No.(s): PB2002-500098; MMS-2000-040-CD; No Copyright; Avail: National Technical Information Service (NTIS)

Ten wells were drilled offshore from New England on Georges Bank from 1976 through 1982. The first two wells were

Continental Offshore Stratigraphic Test (COST) wells, drilled during 1976 and 1977 by energy company consortiums to gain geologic information prior to the initial offshore lease sale. After leases were awarded, eight industry exploration wells were drilled in 1982 and 1981. The disc captures this historic data. The U.S. Geological Survey released reports on the two COST wells in 1980 as an open file report. The Minerals Management Service (MMS) has now completed reports on each of the petroleum exploration wells drilled by industry. The MMS reports are taken from Agency files and contain no recent analysis. These reports contain information on drilling operations, sonic well velocities, litho logic and biostratigraphic interpretations, well log analyses, well temperatures, kerogen analyses, petroleum geochemistry, and geologic thermal history. All the MMS and both the USGS studies are contained on the disc, which includes selected operator-submitted original well data as PDF and TIF files, as well longs as TIF images and LAS files.
NTIS
Continental Shelves; Geology; Atlantic Ocean; Offshore Energy Sources; Stratigraphy

20030038805 Lawrence Livermore National Lab., Livermore, CA
Analysis of Site Response at U1A Hole at the Nevada Test Site from Weak Motion Recordings
Hutchings, L.; Furrey, L.; May 21, 2002; 36 pp.
Report No.(s): DE2002-15002159; UCRL-ID-148493; No Copyright; Avail: Department of Energy Information Bridge
We utilize weak motion recordings to evaluate the site response at the U1A hole, Nevada Test site to determine the effect on potential ground motion at the drift of the U1A hole 962 ft deep. We estimated the site response amplification of ground motion at the surface relative to the drift with the spectral ratio method. We utilized Fourier amplitude and absolute acceleration response spectra, and confined our study to frequencies of 0.5 to 25.0 Hz (.04 to 2.0 s periods). We identified 8 earthquakes in the area that were recorded at the bottom and top of the hole that were used for spectral ratios. We calculated the average and one standard deviation of ratios from all the events.
NTIS
Earthquakes; Seismology; Nevada

20030038870 Lawrence Livermore National Lab., Livermore, CA
Marmousi-2: An Updated Model for the Investigation of AVO in Structurally Complex Areas
Martin, G. S.; Marfurt, K. J.; Larsen, S.; Apr. 30, 2002; 10 pp.; In English
Report No.(s): DE2002-803186; UCRL-JC-148373; No Copyright; Avail: Department of Energy Information Bridge
We have generated an updated elastic version of the IFP Marmousi model for distribution to the international geophysical research community. In addition to shot gather synthetics useful for AVO, vector imaging, and converted wave tomography algorithm calibration, we have released the model grids, horizons, and layer definitions for those who wish to improve upon our modeling effort.
NTIS
Amplitudes; Geophysics; Exploration; Models

20030038885 Geological Survey, Baltimore, MD, Aberdeen Proving Ground, MD
Changes in Ground-Water Quality in the Canal Creek Acquifer Between 1995 and 2000-2001, West Branch Canal Creek Area, Aberdeen Proving Ground, Maryland
Phelan, D. J.; Fleck, W. B.; Lorah, M. M.; Olsen, L. D.; 2002; In English
Report No.(s): PB2003-102057; USGS/WRI-02-4076; No Copyright; Avail: National Technical Information Service (NTIS)
Since 1917, Aberdeen Proving Ground, Maryland has been the primary chemical-warfare research and development center for the U.S. Army. Ground-water contamination has been documented in the Canal Creek aquifer because of past disposal of chemical and ordnance manufacturing waste. Comprehensive sampling for volatile organic compounds in ground water by the U.S. Geological Survey in the West Branch Canal Creek area was done in June-October 1995 and June-August 2000. The purpose of this report is (1) to compare volatile organic compound concentrations and determine changes in the ground-water contaminant plumes along two cross sections between 1995 and 2000, and (2) to incorporate data from new piezometers sampled in spring 2001 into the plume descriptions.
NTIS
Ground Water; Water Quality; Aquifers

20030038901 Alabama Univ., Tuscaloosa
Overview of Finite Difference Modeling of Hydrodynamic Systems
Raney, D. C.; 1983; 76 pp.; In English
Report No.(s): PB2003-101598; No Copyright; Avail: CASI; A05, Hardcopy

A numerical model basically consists of a numerical algorithm which has been developed from the differential equations governing the physical phenomena. Several methods exist for developing the numerical algorithm, falling generally into two types of formulation; finite difference and finite element. Finite element techniques are used extensively in solid mechanics but to a much smaller extent in fluid mechanics. For a variety of reasons finite difference techniques have gained greater acceptance in hydrodynamic modeling and will be used exclusively in this treatment of numerical modeling of hydrodynamic systems. The term 'hydrodynamic systems' is a general term intended to denote a body of water with a free surface such as an estuary, lake or river. A one-dimensional, two-dimensional or three-dimensional model formulation may be required depending on the individual problem to be considered.
NTIS
Hydrodynamics; Finite Element Method

20030038906 Geological Survey, Denver, CO, Department of Energy, Washington, DC
Results of Hydraulic Tests in Miocene Tuffaceous Rocks at the C-Hole Complex, 1995-1997, Yucca Mountain, Nye County, Nevada
Geldon, A. L.; Umari, A. M. A.; Fahy, M. F.; Earle, J. D.; Gemmell, J. M.; 2002; In English
Report No.(s): PB2003-102058; USGS/WRI-02-4141; No Copyright; Avail: National Technical Information Service (NTIS)
Four hydraulic tests were conducted by the U.S. Geological Survey at the C-hold complex at Yucca Mountain, Nevada, between May 1995 and November 1997. These tests were conducted as part of ongoing investigations to determine the hydrologic and geologic suitability of Yucca Mountain as a potential site for permanent underground storage of high-level nuclear waste.
NTIS
Radioactive Wastes; Hydraulics; Rocks

20030038908 Geological Survey, Tallahassee, FL, Saint Johns River Water Management District, Palatka, FL, South Florida Water Management District, West Palm Beach, FL
Hydrogeology and Water-Quality Characteristics of the Lower Floridan Aquifer in East-Central Florida
O'Reilly, A. M.; Spechler, R. M.; McGurk, B. E.; 2002; In English
Report No.(s): PB2003-102059; USGS/WRI-02-4193; No Copyright; Avail: National Technical Information Service (NTIS)
The hydrogeology and water-quality characteristics of the Lower Floridian aquifer and the relation of the Lower Floridan aquifer to the framework of the Floridan aquifer system were evaluated during a 6-year (1995-2001) study.
NTIS
Aquifers; Hydrogeology; Water Quality

20030038915 Northeastern Research Station, Newtown Square, PA, Pennsylvania Dept. of Conservation and Natural Resources, Harrisburg. Bureau of Forestry
Annual Inventory Report for Pennsylvania's Forests: Results from the First Two Years
McWilliams, W. H.; Alerich, C. A.; Devlin, D. A.; Lister, T. W.; Sterner, S. L.; 2002; 80 pp.; In English
Report No.(s): PB2003-102536; FSRB-NE-156; No Copyright; Avail: CASI; A05, Hardcopy
In 2000, the USDA Forest Service's Forest Inventory and Analysis (FIA) program implemented a new system for inventory and monitoring Pennsylvania's forest resources. The most salient feature of the new inventory process will be a nearly threefold improvement in timeliness. This report summarizes the results of the first 2 years of annual inventory measurements. The area of forest land in Pennsylvania has remained stable since a previous inventory in 1989. The Keystone State's forests continue to mature as larger trees and an increase in inventory volume were recorded. A separate study of tree seedlings revealed a general lack of regeneration in one-third to one-half of stands in which regeneration should be adequate.
NTIS
Pennsylvania; Forest Management; Timber Inventory; Ecology; Geology

20030038916 Chinese Inst. of Engineers, Taipei
Journal of the Chinese Institute of Engineers, Volume 25, No. 4, July 2002. Transactions of the Chinese Institute of Engineers, Series A. Special Issue: Commemoration of Chi-Chi Earthquake (I)
Chen, S. T.; Jul. 2002; Volume 25, No. 4
Report No.(s): PB2003-101754; Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Special Issue: Commemoration of Chi-Chi Earthquake; Foreword; Spectral Story Drift

Demand Analysis for Building Structures during the 1999 Chi-Chi Taiwan Earthquake; Seismic Jacketing of RC Columns for Enhanced Axial Load Carrying Performance; Adaptive Robust Control for Seismically Excited Structures: The Chi-Chi Earthquake; A Neural Network Based Methodology for Estimating Bridge Damage after Major Earthquakes; Evaluating the Bond-Loss of Reinforcing Bar in New Concrete Construction Subjected to Earthquake Using the Impact-Echo Method; Two-Dimensional Numerical Modeling for Near Source Strong Ground Motions of the Chelunpu Fault during the 1999 Chi-Chi Taiwan Earthquake; Modeling of Phase Spectrum to Simulate Design Ground Motions; Surface Wave Excitation in the Western Coastal Plain of Taiwan during the 1999 Chi-Chi Earthquake; A Direct Displacement-Based Seismic Design Procedure to Fulfill Multiple Performance Objectives; Roles of Non-Structural Walls in Chi-Chi Earthquake; and Earthquake Damage to the Strength of Newly Placed Concrete.
NTIS
Earthquake Damage; Earthquakes; Structural Engineering

20030038918 North Central Research Station, St. Paul, MN
Wisconsin's Forest Resources in 2000
Vissage, J. S.; 2002; 12 pp.
Report No.(s): PB2003-102184; FSRN-NC-380; No Copyright; Avail: CASI; A03, Hardcopy
The North Central Research Station's Forest Inventory and Analysis program began fieldwork for the sixth forest inventory of Wisconsin in 2000. This initiates a new annual inventory system. This Research Note contains estimates of Wisconsin's forest resources derived from data gathered during the first year of the inventory.
NTIS
Wisconsin; Forest Management

20030038927 North Central Research Station, St. Paul, MN
Indiana's Forest Resources in 2000
Schmidt, T. L.; Mielke, M. E.; Marshall, P. T.; 2002; 36 pp.
Report No.(s): PB2003-102647; FSRB-NC-206; No Copyright; Avail: CASI; A03, Hardcopy
The North Central Research Station's Forest Inventory and Analysis Program (NCFIA) began fieldwork for the fifth forest inventory of Indiana's forest resources in 1999. This inventory initiated the new annual inventory system in which one-fifth of the field plots in the State are measured each year. A complete inventory consists of measuring and compiling the data for all plots. This fifth inventory of Indiana's forest resources will be completed in 2004. However, because each year's sample is a systematic sample of the State's forest and because timely information is needed about Indiana's forest resources, estimates have been prepared from data gathered during the first 2 years of the inventory. Because of the limited number of field plots measured, sampling errors are large and data in this report should be used with caution. Future estimates that incorporate data in this report are subject to change when ensuing annual inventories are completed and data compiled. Results presented are estimates based on sampling techniques. As additional annual inventories are completed, the precision of the estimates will increase and additional data will be released.
NTIS
Forests; Resources Management

20030038931 Geological Survey, Baltimore, MD, Dover Air Force Base, DE
Distribution and Mass Loss of Volatile Organic Compounds in the Surficial Aquifer at Sites FT03, LF13, and WP14/LF15, Dover Air Force Base, Delaware, November 2001-February 2002
Barbaro, J. R.; Neupane, P. P.; 2001; In English
Report No.(s): PB2003-102726; USGS/WRI-02-4121; No Copyright; Avail: National Technical Information Service (NTIS)
Ground-water and surface-water sampling was conducted in the natural attenuation study area in the East Management Unit of Dover Air Force Base, Delaware to determine the distributions of volatile organic compounds in the vicinity of four sites-Fire Training Area Three, the Rubble Area Landfill, the Receiver Station Landfill, and the Liquid Waste Disposal Landfill. This work was done by the U.S. Geological Survey, in cooperation with the U.S. Air Force, as part of an ongoing assessment of the effectiveness of natural attenuation at these sites. The specific objectives of the study were to (1) determine the areal and vertical extent of the contaminant plumes and source areas, (2) measure volatile organic compound concentrations in ground-water discharge areas and in surface water under base-flow conditions, (3) evaluate the potential for off-site migration

of the mapped plumes, and (4) estimate the amount of mass loss down gradient of the Liquid Waste Disposal and Receiver Station Landfills.
NTIS
Aquifers; Volatile Organic Compounds

20030038934 Geological Survey, Lawrence, KS
Quality of Shallow Ground Water in Areas of Recent Residential and Commercial Development, Wichita, Kansas, 2000
Pope, L. M.; Bruce, B. W.; Rasmussen, P. P.; Milligan, C. R.; 2002; In English
Report No.(s): PB2003-102727; USGS/WRI-02-4228; No Copyright; Avail: National Technical Information Service (NTIS)
Water samples from 30 randomly distributed monitoring wells in areas of recent residential and commercial development (1960 - 96), Wichita, Kansas, were collected in 2000 as part of the High Plains Regional Ground-Water Study conducted by the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program. The samples were analyzed for about 170 water-quality constituents that included chlorofluorocarbons, physical properties, dissolved solids and major ions, nutrients and dissolved organic car-bon, trace elements, pesticide compounds, and volatile organic compounds. The purpose of this report is to provide an assessment of water quality in recharge to shallow ground water underlying areas of recent residential and commercial development and to determine the relation of ground-water quality to overlying urban land use.
NTIS
Water Quality; Ground Water; Geological Surveys; Chlorofluorocarbons

20030038944 Geological Survey, Denver, CO, Bureau of Land Management, Washington, DC
Using Water-Quality Profiles to Characterize Seasonal Water Quality and Loading in the Upper Animas River Basin, Southwestern Colorado
Leib, K. J.; Mast, M. A.; Wright, W. G.; 2003; In English
Report No.(s): PB2003-102752; USGS/WRI-02/4230; No Copyright; Avail: National Technical Information Service (NTIS)
One of the important types of information needed to characterize water quality in streams affected by historical mining is the seasonal pattern of toxic trace-metal concentrations and loads. Seasonal patterns in water quality are estimated in this report using a technique called water-quality profiling. Water-quality profiling allows land managers and scientists to assess priority areas to be targeted for characterization and(or) remediation by quantifying the timing and magnitude of contaminant occurrence. Streamflow and water-quality data collected at 15 sites in the upper Animas River Basin during water years 1991-99 were used to develop water-quality profiles. Data collected at each sampling site were used to develop ordinary least-squares regression models for streamflow and constituent concentrations. Streamflow was estimated by correlating instantaneous streamflow measured at ungaged sites with continuous streamflow records from streamflow-gaging stations in the subbasin. Water-quality regression models were developed to estimate hardness and dissolved cadmium, copper, and zinc concentrations based on streamflow and seasonal terms. Results from the regression models were used to calculate water-quality profiles for streamflow, constituent concentrations, and loads.
NTIS
Colorado; River Basins; Streams; Water Quality; Annual Variations

20030038958 Geological Survey, Denver, CO
Crustal Structure of the Coastal and Marine San Francisco Bay Region, California
Parsons, T.; 2002; In English
Report No.(s): PB2003-102797; PP-1658; No Copyright; Avail: National Technical Information Service (NTIS)
This volume thus contains mostly structural information about the San Francisco Bay region, much of it gathered through exploratory geophysical experiments. The volume is organized 'top down' from studies in the shallowest crust to the base the crust. The first three chapters are linked through their use of novel geophysical techniques to study earthquake effects, coseismic slip, and shallow stratigraphy. Kayen and others examine crustal structure at very high resolution and demonstrate the use of ground-penetrating-radar tomography to measure the liquefaction potential of coastal sedimentary deposits. The last four chapters are dedicated to studies of fault-related structure of the seismogenic crust in and around the San Andreas Fault system in the San Francisco Bay region. The last two chapter present the results of the seismic data that have been analyzed.
NTIS
Earthquakes; Geophysics; Earth Crust

20030038968 Geological Survey, Northborough, MA, Massachusetts Dept. of Environmental Protection, Boston
Simulation of Reservoir Storage and Firm Yields of Three Surface-Water Supplies, Ipswich River Basin, Massachusetts
Zarriello, P. J.; 2002; In English
Report No.(s): PB2003-102800; No Copyright; Avail: National Technical Information Service (NTIS)

A Hydrologic Simulation Program FORTRAN (HSPF) model previously developed for the Ipswich River Basin was modified to simulate the hydrologic response and firm yields of the water-supply systems of Lynn, Peabody, and Salem Beverly. The updated model, expanded to include a portion of the Saugus River Basin that supplies water to Lynn, simulated reservoir system storage over a 35-year period (196195) under permitted withdrawals and hypothetical restrictions designed to maintain seasonally varied streamflow for aquatic habitat. A firm yield was calculated for each system and each withdrawal restriction by altering demands until the system failed. This is considered the maximum withdrawal rate that satisfies demands, but depletes reservoir storage.

NTIS

Computerized Simulation; Massachusetts; Potable Water; Water Management

20030038991 Lawrence Livermore National Lab., Livermore, CA
Fracture Deformation Measurements in the Large Block Test
Carlson, S. R.; Blair, S. C.; Wagoner, J. L.; Mar. 08, 2002; 12 pp.; In English
Report No.(s): DE2002-15002030; UCRL-JC-145522; No Copyright; Avail: Department of Energy Information Bridge

Fracture deformations were measured in a 3m x 3m x 4.5m block of TopopahSpring tuff as part of a larger effort to characterize coupled thermal-hydrologic-mechanical-chemical processes in an isolated rock mass subjected to a one-dimensional thermal gradient. The fracture deformations were measured in three orthogonal directions at 17 points on the vertical faces of the block over a time span of 19 months. Eight fractures, including a major sub-horizontal fracture near the top of the block and five large, sub-vertical fractures, were selected for study. The data provide point measurements of apparent aperture change and slip motions parallel and perpendicular to the block faces. The fracture aperture and slip motions, though only a few tenths of a millimeter, form a significant portion of the total block deformation. The data reveal some fairly complex behaviors, such as nonuniform slip motions along individual fractures and sub-vertical fractures that sometimes open and close simultaneously at different elevations. Slip motions along sub-vertical fractures near the heater plane were relatively large and well correlated with temperature. The heating phase deformations were only partially recovered during cool-down. The fracture deformation data show that fractures deformed in conjunction with water movements and associated temperature fluctuations during the test. Simultaneous slip and aperture data also provide estimates of fracture dilation angle.

NTIS

Temperature Gradients; Fractures (Materials); Deformation; Fracture Mechanics; Rock Mechanics

20030045703 Lawrence Livermore National Lab., Livermore, CA
Multiscale Thermohydrologic Model Analysis of Heterogeneity and Thermal-Loading Factors for the Proposed Repository at Yucca Mountain
Glascoe, L. G.; Buscheck, T. A.; Gansemer, J.; Sun, Y.; Lee, K.; Nov. 04, 2002; 14 pp.; In English
Report No.(s): DE2002-15002260; UCRL-JC-150011; No Copyright; Avail: Department of Energy Information Bridge

The MultiScale ThermoHydrologic Model (MSTHM) predicts thermohydrologic (TH) conditions in emplacement drifts and the adjoining host rock throughout the proposed nuclear-waste repository at Yucca Mountain. The MSTHM is a computationally efficient approach that accounts for TH processes occurring at a scale of a few tens of centimeters around individual waste packages and emplacement drifts, and for heat flow at the multi-kilometer scale at Yucca Mountain. We present recent MSTHM simulations that address the influence of repository-scale thermal-conductivity heterogeneity and the influence of preclosure operational factors affecting thermal-loading conditions. We can now accommodate a complex repository layout with emplacement drifts lying in non-parallel planes using a superposition process that combines results from multiple mountain-scale submodels. This development, along with other improvements to the MSTHM, enables more rigorous analyses of preclosure operational factors. These improvements include the ability to (1) predict TH conditions on a drift-by-drift basis, (2) represent sequential emplacement of waste packages along the drifts, and (3) incorporate distance- and time-dependent beat-removal efficiency associated with drift ventilation.

NTIS

Heterogeneity; Multiscale Models; Hydrology Models; Thermodynamic Properties; Mountains; Loads (Forces)

20030045712 Lawrence Livermore National Lab., Livermore, CA

Lawrence Livermore National Laboratory Site Seismic Safety Program: Summary of Findings

Savy, J. B.; Foxall, W.; Apr. 2002; In English

Report No.(s): DE2002-15002343; UCRL-53674-R-2; No Copyright; Avail: National Technical Information Service (NTIS)

The Lawrence Livermore National Laboratory (LLNL) Site Seismic Safety Program was conceived in 1979 during the preparation of the site Draft Environmental Impact Statement. The impetus for the program came from the development of new methodologies and geologic data that affect assessments of geologic hazards at the LLNL site; it was designed to develop a new assessment of the seismic hazard to the LLNL site and LLNL employees. Secondarily, the program was also intended to provide the technical information needed to make ongoing decisions about design criteria for future construction at LLNL and about the adequacy of existing facilities. This assessment was intended to be of the highest technical quality and to make use of the most recent and accepted hazard assessment methodologies.

NTIS

Earthquakes; Design Analysis; Safety; Environmental Surveys

20030045743 Lawrence Livermore National Lab., Livermore, CA

Hydrologic Resources Management Program and Underground Test Area Fy 1999 Progress Report

Smith, D. K.; Eaton, G. F.; Rose, T. P.; McAninch, J. E.; Kersting, A. B.; Jul. 01, 2000; 122 pp.; In English

Report No.(s): DE2002-15002374; UCRL-ID-139226; No Copyright; Avail: Department of Energy Information Bridge

This report presents the results from fiscal year (FY) 1999 technical studies conducted by Lawrence Livermore National laboratory (LLNL) as part of the Hydrology and Radionuclide Migration Program (HRMP) and Underground Test Area (UGTA) work-for-others project.

NTIS

Hydrology; Underground Explosions

20030045783 Lawrence Livermore National Lab., Livermore, CA

Tank Leak Experiment at the Mock Tank Site, 200 East Area: Electrical Resistance Tomography: Preliminary Results

Ramirez, A. L.; Daily, W. D.; Binley, A.; Sep. 15, 2002; 42 pp.; In English

Report No.(s): DE2002-803161; UCRL-ID-145662; No Copyright; Avail: Department of Energy Information Bridge

Electrical resistance measurements were used to monitor several releases of brine from the Mock Tank Test site at the 200 East Area. Each of the three different types of methods was able to detect the presence of what appeared to be conductive plumes forming beneath the tank. The results suggest the following: (1) The minimum detectable leak volume is of the order of a few hundred gallons; (2) A procedure involving the use of reciprocal data can be used to evaluate the reliability of the results and minimize the potential for false-positive and false-negative conclusions; (3) The dry wells may be used as long electrodes to obtain 2D images of the plume under the tank; (4) 3D electrical resistance tomography (ERT) images provide information that can be used to determine the released volume, the speed and direction of plume movement, the regions of the soil that are being contaminated, and the approximate location of the hole in the tank; (5) It may be possible to map pre-existing plumes when no pre-spill data exists; (6) A 'quick look' calculation that can be used in the field can reliably detect the occurrence of a leak.

NTIS

Electrical Resistance; Leakage; Tomography; Storage Tanks

20030045799 Forest Service, Washington, DC

USDA Forest Service National Fire Plan, Research and Development. 2002 Business Summary

Feb. 2003; In English

Report No.(s): PB2003-103620; MISCELLANEOUS PUB-1588; No Copyright; Avail: National Technical Information Service (NTIS)

The National Fire Plan (NFP), initiated in 2001 in response to the devastating fire season of 2000, has helped to jump-start much needed fire management and fire research activities. Over the past two years the Forest Service and the agencies of the Department of the Interior have made considerable progress in reducing hazardous fuels and assisting interface communities in preparing for fire. The fire research community that includes Forest Service Research and Development (R&D) and the Joint Fire Science Program (JFSP) has accelerated efforts to improve the science base for fire management. A strong science foundation is key to managing the wildfire hazard and supporting management decisions in the most cost-effective and environmentally sensitive way. Supported by scientific knowledge, decision makers are better equipped to more reliably

forecast or prevent damaging fires and to understand the consequences of their decisions for society and for forest and rangeland health. The benefits of NFP research are multifaceted-not just journal publications, but also interpretation, science synthesis, development of useful models and decision support tools, critical advice in postfire response, education of managers and citizens, and connection with the larger science community. Under the NFP, research progress is being made to improve firefighting effectiveness, enhance recovery of burned ecosystems, improve programs for hazardous fuels reduction, and enhance community preparedness.
NTIS
Forest Fires; Forest Management

20030045814 Environmental Protection Agency, Research Triangle Park, NC
USEPA's Regional Vulnerability Assessment Program: A Research Strategy for 2001-2006
Smith, E. R.; O'Neill, R. V.; Wickham, J. D.; Jones, K. B.; Jackson, L.; Apr. 2000; 52 pp.
Report No.(s): PB2003-102734; No Copyright; Avail: CASI; A04, Hardcopy

The goal of ORD's Regional Vulnerability Assessment (ReVA) Program is to develop approaches to quantifying regional ecological vulnerabilities so that risk management activities can be targeted and prioritized. ReVA's focus is to develop a set of methods that are applicable to the range of data available in regions (e. g., physiography, land use/cover change, change in climate, air pollution, non-indigenous species (NIS), the distribution and condition of resources, and others) and provide information to facilitate decision-making at the regional, watershed, and local scale. Information will be integrated to allow an assessment of the cumulative risks associated with multiple stressors on multiple resources, to identify the specific geographic areas of concern, and to evaluate the particular stressors that offer the greatest sources of vulnerability. The application of the tools developed by ReVA should allow decision-makers to put environmental issues in perspective and will provide the spatial context necessary to improve decision making at the watershed and community level.
NTIS
Vulnerability; Risk; Ecology; Environmental Monitoring

20030045827 Forest Service, Portland, OR
Site Index Equations and Mean Annual Increment Equations for Pacific Northwest Research Station Forest Inventory and Analysis Inventories, 1985-2001
Hanson, E. J.; Azuma, D. L.; Hiserote, B. A.; Dec. 2002; 30 pp.
Report No.(s): PB2003-103035; FSRN-PNW-533; No Copyright; Avail: CASI; A03, Hardcopy

Site index equations and mean annual increment equations used by the Forest Inventory and Analysis Program at the Portland Forestry Sciences Laboratory, Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture. The equations are for 24 tree species in California, Oregon, and Washington.
NTIS
Forest Management; Inventories

20030045828 Forest Service, Portland, OR
Projecting National Forest Inventories for the 2000 RPA Timber Assessment
Mills, J. R.; Zhou, X.; 2003; In English
Report No.(s): PB2003-103037; FSGTR-PNW-568; PNW-568; No Copyright; Avail: National Technical Information Service (NTIS)

National forest inventories were projected in a study that was part of the 2000 USDA Forest Service Resource Planning Act (RPA) timber assessment. This paper includes an overview of the status and structure of timber inventory of the National Forest System and presents 50-year projections under several scenarios. To examine a range of possible outcomes, results are shown for five removals scenarios that incorporate assumptions from both current and past studies of wood flows and harvesting on national forests. In addition, two projections were developed to examine the effects of volume reductions associated with large-scale disturbance events, such as fires, insects, and disease. Projections were made by region and forest type by using the aggregated timberland assessment system and plot-level inventory data with methods consistent with procedures followed for private timberlands in the assessment. The results of projected inventory volume differ across regions, but the total inventory of both softwood and hardwood forest types is shown to increase in all scenarios. One result is a shift in area to older age classes. Initially, 15 percent of the timberland is classified as stands older than 150 years; under the base

scenario with disturbance, this area will increase to 32 percent by 2050. This shift means that in the future, a larger share of U.S. timberland is projected to support mature and old forest conditions.
NTIS
Timber Inventory; Wood; Forest Management

20030051401 Pacific Northwest National Lab., Richland, WA
Dynamics of Vadose Zone Transport: A Field and Modeling Study using the Vadose Zone Observatory
Carrigan, C. R.; Jan. 01, 2001; 14 pp.; In English
Report No.(s): DE2002-15001983; No Copyright; Avail: Department of Energy Information Bridge

A stated need of the DOE Electromagnetic (EM) program is a better understanding of basic vadose zone fluid flow and contaminant transport processes for the purpose of making improved estimates of contaminant release rates and fluxes across the vadose zone to the water table at DOE sites such as the tank farms at Hanford. We investigate details of the modes of contaminant transport with the aid of infiltration experiments designed to elucidate how vadose zone characteristics such as preferential pathways, heterogeneities, and relative permeabilities influence the transport of contamination in liquid, gas and colloidal phases to the water table. Beyond enhancing our basic understanding of vadose zone transport processes, this EMSP project is designed result ina vadose-zone-transport- characterization methodology that can be generalized to other DOE sites.
NTIS
Fluid Flow; Vadose Water; Characterization

20030051404 Pacific Northwest National Lab., Richland, WA
Second Quarter Hanford Seismic Report for Fiscal Year 2000
Hartshorn, D. C.; Reidel, S. P.; Rohay, A. C.; Jun. 2000; 44 pp.; In English
Report No.(s): DE2002-15001500; No Copyright; Avail: Department of Energy Information Bridge

Hanford Seismic Monitoring provides an uninterrupted collection of high quality raw and processed seismic data from the Hanford Seismic Network (I-KIN')for the U. S. Department of Energy and its contractors. Hanford Seismic Monitoring also locates and identifies sources of seismic activity and monitors changes in the historical pattern of seismic activity at the Hanford Site. The data are compiled, archived, and published for use by the Hanford Site for waste management, Natural Phenomena Hazards assessments, and engineering design and construction. In addition, the seismic monitoring organization works with the Hanford Site Emergency Services Organization to provide assistance in the event of a significant earthquake on the Hanford Site.
NTIS
Seismology; Data Acquisition; Geophysics; Earth Sciences

20030051406 Lawrence Livermore National Lab., Livermore, CA
Feasibility of Monitoring Rock Fall in Yosemite Valley Using Seismic Methods
Myers, S. C.; Rock, D.; Mayeda, K.; Mar. 02, 2000; 24 pp.
Report No.(s): DE2002-15001990; No Copyright; Avail: Department of Energy Information Bridge

Public awareness of rock-fall hazard in Yosemite Valley has heightened after events in 1996 and 1999. Reports of audible blasts prior to rock-fall events suggest that rock cracking may in some instances precede the detachment a block from the cliff face. Seismic methods may be used to detect and locate small, inaudible rock cracking events, resulting in a catalog that outlines active areas and quantifies the level of activity. In order to test the feasibility of monitoring rock-fall activity with seismic methods, the Test Yosemite Rock-Fall Network (TYRN) was operated in the late summer and fall of 1999.
NTIS
Rocks; Seismology

20030051436 Minerals Management Service, Washington, DC
Evaluation of Sub-Sea Physical Environmental Data from the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database
Jun. 2002
Report No.(s): PB2002-500084; No Copyright; Avail: National Technical Information Service (NTIS)

This study, published on CD-ROM, represents a comprehensive database that synthesizes spatial and attribute information collected during shallow geological and geophysical surveys of the Federal Outer Continental Shelf in the Beaufort Sea, Alaska. The surveys were conducted on the Beaufort Sea Continental Shelf between Barrow, Alaska in the west and the

Canadian border to the east. All the database and user documentation is provided on the CD-ROM. Included on the CD are the Geohazards Database, the Geohazards Extension for the ArcView program, the User Manual, and the Database documentation. The ArcView Geohazards Extension has a Graphical User Interface that allows the user to query and view information from the database in map form. The User Manual provides an overview of tasks performed in compiling the database; a description of the data set types; a summary of regional geology; a description of the data collected for each survey; and a tutorial describes how to load the ArcView Geohazards Extension and query the database.
NTIS
Beaufort Sea (North America); Geographic Information Systems; Geophysics

20030051472 Ecological Rsearch and Investigations Group, Denver, CO
Chemical and Physical Limnology of the Salton Sea, California-1999
Holdren, G. C.; Montano, A.; Dec. 2002; In English
Report No.(s): PB2003-102171; No Copyright; Avail: National Technical Information Service (NTIS)

The primary objective of this study is to assess the current chemical and physical conditions in the Salton Sea. Samples were analyzed for general physical conditions and water quality variables, nutrients, major cations and anions, trace metals and organic compounds.
NTIS
Salton Sea (Ca); Geochemistry; Models; Limnology

20030051517 Geological Survey, Washington, DC
Water Resources Data, Florida Water Year 2000. Volume 4: Northwest Florida
Sep. 2001; In English
Report No.(s): PB2003-500022; USGS-WDR-FL-00-4-CD; No Copyright; Avail: National Technical Information Service (NTIS)

This volume of the annual hydrologic data report of Florida is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface and ground-water data collection networks in each State, Puerto Rico, and the Trust Territories. These records of stream flow, ground-water levels, and quality of water provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. This volume (Volume 4, Northwest Florida), contains records of continuous or daily discharge for 54 streams, periodic discharge for 1 stream, continuous or daily stage for 15 streams, periodic stage for 1 stream, peak stage or discharge for 30 streams, continuous or daily elevations for 1 lake, periodic elevations for 1 lake, continuous ground-water levels for 2 wells, periodic ground-water levels for 0 wells, and quality-of-water for 4 surface-water sites and 0 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida.
NTIS
Surface Water; Ground Water; Water Quality; Chemical Analysis; Flow Velocity

20030051546 Environmental Protection Agency, Cincinnati, OH, Groundwater Services, Inc., Houston, TX, Texas Southern Univ., Houston
Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies. Ground Water Issue
Newell, C. J.; Rifai, H. S.; Wilson, J. T.; Connor, J. A.; Aziz, J. A.; Jun. 2002; 30 pp.; In English
Report No.(s): PB2003-103055; EPA/540/S-02/500; No Copyright; Avail: CASI; A03, Hardcopy

This issue paper explains when and how to apply first-order attenuation rate constant calculations in monitored natural attenuation (MNA) studies. First-order attenuation rate constant calculations can be an important tool for evaluating natural attenuation processes at ground-water contamination sites. Specific applications identified in U.S. EPA guidelines (U.S. EPA, 1999) include use in characterization of plume trends (shrinking, expanding, or showing relatively little change), as well as estimation of the time required for achieving remediation goals. However, the use of the attenuation rate data for these purposes is complicated as different types of first-order rate constants represent very different attenuation processes: 'Concentration vs. time' rate constants are used for estimating how quickly remediation goals will be met at a site; 'Concentration vs. distance' bulk attenuation rate constants (k) are used for estimating if a plume is expanding, showing relatively little change, or shrinking due to the combined effects of dispersion, biodegradation, and other attenuation processes;

and 'Biodegradation rate constants' are used in solute transport models to characterize the effect of biodegradation on contaminant migration.
NTIS
Ground Water; Attenuation; Biodegradation; Contamination; Reaction Kinetics; Constants

20030051553 Geological Survey, Augusta, ME
Ground-Water Levels and Water-Quality Data from Monitoring Wells in Windham, Maine Water Years 1997-2001
Caldwell, J. M.; 2002; 28 pp.
Report No.(s): PB2003-103660; USGS/OFR-02-145; No Copyright; Avail: CASI; A03, Hardcopy

Ongoing data collection in an established well network in Windham, Maine, serves as an indicator of the hydrologic and water-quality conditions in the aquifer. This report presents data collected from 1997 through 2001, including ground-water levels, measurements of water-quality field parameters, and concentrations of nutrients and arsenic.
NTIS
Ground Water; Water Quality; Data Acquisition

20030051578 Northeastern Research Station, Newtown Square, PA
Forest Volume-to-Biomass Models and Estimates of Mass for Live and Standing Dead Trees of U.S. Forests
Smith, J. E.; Health, L. S.; Jenkins, J. C.; Jan. 2003; 66 pp.
Report No.(s): PB2003-103568; FSGTR-NE-298; No Copyright; Avail: CASI; A04, Hardcopy

We present methods and equations for nationally consistent estimates of tree-mass density at the stand level (Mg/ha) as predicted by growing-stock volumes reported in USDA USA Department of Agriculture) Forest Service surveys for forests of the conterminous USA. Developed for use in FORCARB, a carbon budget model for U.S. forests, the equations also are useful for converting stand-, plot-, and regional-level forest merchantable volumes to estimates of total mass. Tree biomass is about 50 percent carbon, so carbon estimates can be derived from estimates of biomass by multiplying by 0.5. We include separate equations for live and standing dead trees. Similarly, separate equations predict the components of aboveground only vs. full trees (including coarse roots) and hardwood vs. softwood species. Equations are developed for broad forest types by region and are applicable to large-scale forest-inventory data. Example estimates are provided for regional tree-mass totals using summary forest statistics for the USA.
NTIS
Forests; Trees (Plants); Biomass

20030051593 Geological Survey, Madison, WI
Nutrient, Trace-Element, and Ecological History of Musky Bay, Lac Courte Oreilles, Wisconsin, as Inferred from Sediment Cores
Fitzpatrick, F. A.; Garrison, P. J.; Fitzgerald, S. A.; Elder, J. F.; 2003; In English
Report No.(s): PB2003-103624; USGA/WRI-02-4225; No Copyright; Avail: National Technical Information Service (NTIS)

The main purpose of this report is to document the findings from the nutrient-history analysis and geochemical characterization of Musky Bay, Lac Courte Oreilles. Specific objectives of the study were to answer the following questions about Musky Bay: (1) Have sedimentation rates increased. (2) Have minor- and trace-element concentrations in sediment changed over time. (3) Have increased nutrient inputs caused Musky Bay to become more eutrophic. (4) Have the diatom and plant community, including wild rice (Zizania palustris L.), changed over time. (5) Have nutrient inputs increased as a result of changes in land cover since European settlement. This report describes all aspects of the study.
NTIS
Water Quality; Sediments; Wisconsin; Bays (Topographic Features)

20030052002 Geological Survey, Washington, DC
Water Resources Data, Florida Water Year 2001. Volume 4: Northwest Florida
Sep. 2002; In English
Report No.(s): PB2003-500021; USGS-WDR-FL-01-04-CD; No Copyright; Avail: National Technical Information Service (NTIS)

This volume of the annual hydrologic data report of Florida is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface and ground-water data collection networks in each State, Puerto Rico, and the Trust Territories. These records of stream flow, ground-water levels, and quality of water provide the hydrologic

information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. Volume 4, Northwest Florida, contains records of continuous or daily discharge for 65 streams, periodic discharge for 1 stream, continuous or daily stage for 18 streams, periodic stage for 2 streams, peak stage or discharge for 0 streams, continuous or daily elevations for 1 lake, periodic elevations for 1 lake, continuous ground-water levels for 2 wells, periodic ground-water levels for 3 wells, and quality-of-water for 3 surface-water sites and 0 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida.
NTIS
Surface Water; Ground Water; Geological Surveys

20030052007 Lawrence Livermore National Lab., Livermore, CA
Using Laboratory Measurements of Electrical and Mechanical Properties to Assist Interpretation of Field Data from Shallow Geophysical Measurements
Bertete-Aguirre, H.; Berge, P. A.; Roberts, J. J.; Nov. 30, 2001; In English
Report No.(s): DE2002-15002006; UCRL-JC-144947; No Copyright; Avail: National Technical Information Service (NTIS)
Reconstruction of shallow subsurface structure from geophysical data is a central problem for many environmental and engineering applications. We observe that for shallow soil distributions, seismic data alone or electrical data alone may provide a good reconstruction of the subsurface. We show that using joint seismic and electrical data will improve the reconstruction of shallow structure. Our results emphasize that the availability of techniques for making laboratory measurements of ultrasonic velocities at low pressures in unconsolidated materials and the ability to measure complex impedance in similar samples are key elements of this approach.
NTIS
Electrical Properties; Mechanical Properties; Environmental Engineering

20030052011 Lawrence Livermore National Lab., Livermore, CA
Origin of Groundwater Discharge at Burney Falls, Shasta Co., California
Rose, T. P.; Feb. 09, 2000; 14 pp.; In English
Report No.(s): DE2002-15002378; UCRL-ID-137488; No Copyright; Avail: Department of Energy Information Bridge
This report discusses stable isotope data for water samples that were gathered from this region by the author in the mid-1990's. The intent is to provide impartial scientific evidence that may assist in the environmental risk assessment process.
NTIS
Ground Water; Isotope Ratios; Water Sampling; California

20030052029 Geological Survey, Sacramento, CA, National Geodetic Survey, Sacramento, CA, Rosenstiel School of Marine and Atmospheric Science, Miami, FL
Detection and Measurement of Land Subsidence Using Interferometric Synthetic Aperture Radar and Global Positioning System, San Bernardino County, Mojave Desert, California
Sneed, M.; Ikehara, M. E.; Stork, S. V.; Amelung, F.; Galloway, D. L.; 2003; In English
Report No.(s): PB2003-103563; USGS/WRI-015; No Copyright; Avail: National Technical Information Service (NTIS)
Land subsidence associated with ground- water-level declines has been recognized as a potential problem in parts of the Mojave Desert, California. Ground water has been the primary source of domestic, agricultural, and municipal water supplies in the desert since the early 1900s. Pumping of ground water from the Mojave River and Morongo ground-water basins in the southwestern Mojave Desert resulted in water-level declines of more than 30 meters (100 feet) between the 1950s and the 1990s. A Global Positioning System (GPS) survey of a geodetic network was used to determine the location, extent, and magnitude of vertical land-surface changes in Lucerne Valley in the Morongo ground-water basin. The GPS survey was conducted in 1998 to estimate historical elevation changes by comparing GPS-derived elevations with historical elevations (which were available for some of the monuments in the network as early as 1944) and to establish baseline values that can be used for comparisons with future GPS surveys. The GPS measurements indicated that about 600 millimeters (2 feet) (plus or minus 1,500 millimeters (5 feet)) of subsidence occurred at three of the monuments between 1969 and 1998 but that very little to no vertical change in position occurred at seven other monuments in the network. Water levels in the area of subsidence in Lucerne Valley declined about 15 meters (50 feet) during 1970-98. Interferometric synthetic aperture radar (InSAR)

methods were used to characterize vertical land-surface changes in the Mojave River and Morongo ground-water basins during various intervals of time between 1992 and 1999.
NTIS
Position (Location); Ground Water; Global Positioning System; Synthetic Aperture Radar; Water Management; Detection

20030052039 Lawrence Livermore National Lab., Livermore, CA
Modeling Collapse Chimney and Spall Zone Settlement as a Source of Post-Shot Subsidence Detected by Synthetic Aperture Radar Interferometry
Foxall, W.; Jul. 24, 2000; 14 pp.; In English
Report No.(s): DE2002-791759; UCRL-JC-138986; No Copyright; Avail: Department of Energy Information Bridge

Ground surface subsidence resulting from the March 1992 JUNCTION underground nuclear test at the Nevada Test Site (NTS) imaged by satellite synthetic aperture radar interferometry (InSAR) wholly occurred during a period of several months after the shot (Vincent et al., 1999) and after the main cavity collapse event. A significant portion of the subsidence associated with the small (less than 20 kt) GALENA and DIVIDER tests probably also occurred after the shots, although the deformation detected in these cases contains additional contributions from coseismic processes, since the radar scenes used to construct the deformation interferogram bracketed these two later events. The dimensions of the seas of subsidence resulting from all three events are too large to be solely accounted for by processes confined to the damage zone in the vicinity of the shot point or the collapse chimney. Rather, the subsidence closely corresponds to the span dimensions predicted by Patton's (1990) empirical relationship between spall radius and yield. This suggests that gravitational settlement of damaged rock within the spall zone is an important source of post-shot subsidence, in addition to settlement of the rubble within the collapse chimney. These observations illustrate the potential power of InSAR as a tool for Comprehensive Nuclear-Test-Ban Treaty (CTBT) monitoring and on-site inspection in that the relatively broad ((approx) 100 m to 1 km) subsidence signatures resulting from small shots detonated at normal depths of burial (or even significantly overburied) are readily detectable within large geographical areas (100 km x 100 km) under favorable observing conditions. Furthermore, the present results demonstrate the flexibility of the technique in that the two routinely gathered satellite radar images used to construct the interferogram need not necessarily capture the event itself, but can cover a time period up to several months following the shot.
NTIS
Synthetic Aperture Radar; Interferometry; Detection; Seismology; Cavities; Spallation; Gravitational Collapse

20030052040 Lawrence Livermore National Lab., Livermore, CA
Regional Model Calibration for Improving Seismic Location
Swenson, J. L.; Schultz, C. A.; Myers, S. C.; Jul. 14, 2000; 16 pp.; In English
Report No.(s): DE2002-791758; UCRL-JC-138983; No Copyright; Avail: Department of Energy Information Bridge

Accurate seismic event location is integral to the effective monitoring of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), as well as being a fundamental component of earthquake source characterization. To account for the effects of crustal and mantle structure on seismic travel times, and to improve seismic event location in the Middle East and North Africa (MENA), we are developing a set of radially heterogeneous and azimuthally invariant travel-time models of the crust and upper mantle for each MENA seismic station. We begin by developing an average one-dimensional velocity model that minimizes the P-phase travel-time residuals from regional through teleseismic distance at each station. To do this we (1) generate a suite of 1-D velocity models of the earth, (2) compute travel times through the 1-D models using a tau-p formulation to produce standard travel-time tables, and (3) minimize the root-mean-square (rms) residuals between the P-phase arrivals predicted by each model and a groomed set of ISC P-phase arrival times. Once we have an average one-dimensional velocity model that minimizes the P-phase travel-time residuals for all distances, we repeat steps 1 through 3, systematically perturbing the travel-time model and using a grid search procedure to optimize models within regional, upper mantle, and teleseismic distance ranges. Regionalized models are combined into one two-dimensional model, using indicator functions and smoother methodologies to reduce distance and depth discontinuity artifacts between the individual models. Preliminary results of this study at a subset of MENA stations show that we are improving predictability with these models. Cross-validating the travel-time predictions with an independent data set demonstrates a marked reduction in the variance of the travel-time model error distributions. We demonstrate the improvement provided by these 2-D models by relocating the 1991 Racha aftershock sequence. We will extend our investigation to additional MENA stations, and will use our model in tandem with nonstationary empirical corrections (nonstationary Bayesian kriging) to further improve our ability to accurately predict travel times and locate seismic events in this region.
NTIS
Mathematical Models; Seismology; Africa; Middle East

20030052042 Lawrence Livermore National Lab., Livermore, CA
Highly-Resolved LES of the Stable Boundary Layer over Terrain
Calhoun, R. J.; Cederwall, R. T.; Stevens, D. E.; Street, R. L.; May 31, 2000; 10 pp.; In English
Report No.(s): DE2002-792809; UCRL-JC-137628; No Copyright; Avail: Department of Energy Information Bridge
One of the most important scenarios for atmospheric modelers is the stable boundary layer (SBL). Airborne material released near the ground will likely be trapped near the ground in high concentrations due to the reduced dispersion in the SBL. Hence the SBL is often the worst case scenario for studies of health impacts from routine or accidental release of toxic materials to the atmosphere conducted for the area around Salt Lake City, where several field activities are planned for the future. The study will be extended to the small scale terrain associated with the CASES-99 experiment, and comparisons made with observations.
NTIS
Atmospheric Models; Boundary Layers; Terrain

20030052049 Lawrence Livermore National Lab., Livermore, CA
Calibrated Maxey-Eakin Curve for the Fenner Basin of the Eastern Mojave Desert, California
Davisson, M. L.; Rose, T. P.; May 15, 2000; 8 pp.; In English
Report No.(s): DE2002-793862; UCRL-ID-139030; No Copyright; Avail: Department of Energy Information Bridge
Metropolitan Water District (MWD) of southern California and Cadiz Inc. investigated the feasibility of storing Colorado River water in groundwater aquifers of the eastern Mojave Desert as a future drought mitigation strategy. This culminated in the public release of the Cadiz Groundwater Storage and Dry-Year Supply Program Draft EIR, which included pilot percolation studies, groundwater modeling, and precipitation/runoff analysis in the Fenner groundwater basin, which overlies the proposed storage site. The project proposes to store and withdrawal Colorado River water over a 50-year period, but will not exceed the natural replenishment rates of the groundwater basin. Several independent analyses were conducted to estimate the rates of natural groundwater replenishment to the Fenner Groundwater Basin, which was included in the Draft EIR. The U.S. Geologic Survey, Water Resources Division (WRD) officially submitted comments during public review and concluded that the natural groundwater replenishment rates calculated for the Draft EIR were too high. In the WRD review, they provided a much lower recharge calculation based on a Maxey-Eakin estimation approach.
NTIS
California; Mojave Desert (Ca); Geological Surveys; Structural Basins; Ground Water

20030052063 Lawrence Livermore National Lab., Livermore, CA
Estimating Annual Precipitation in the Fenner Basin of the Eastern Mojave Desert, California
Davisson, M. L.; Rose, T. P.; May 15, 2000; 8 pp.; In English
Report No.(s): DE2002-793861; UCRL-ID-139029; No Copyright; Avail: Department of Energy Information Bridge
Metropolitan Water District (MWD) of southern California and Cadiz Inc. investigated the feasibility of storing Colorado River water in groundwater aquifers of the eastern Mojave Desert as a future drought mitigation strategy. This culminated in the public release of the Cadiz Groundwater Storage and Dry-Year Supply Program Draft EIR, which included pilot percolation studies, groundwater modeling, and precipitation/runoff analysis in the Fenner groundwater basin, which overlies the proposed storage site. The project proposes to store and withdrawal Colorado River water over a 50-year period, but will not exceed the natural replenishment rates of the groundwater basin. Several independent analyses were conducted to estimate the rates of natural groundwater replenishment to the Fenner Groundwater Basin, which was included in the Draft EIR.
NTIS
Aquifers; Mojave Desert (Ca); Colorado River (North America); Ground Water; Precipitation (Meteorology); Water; Underground Storage

20030052074 Bonneville Power Administration, Portland, OR, Washington Dept. of Fish and Wildlife, Olympia
Riparian Planting Projects Completed within Asotin Creek Watershed. 2000-2002 Asotin Creek Riparian Final Report of Accomplishments
May 2001; 26 pp.; In English
Report No.(s): DE2002-806229; No Copyright; Avail: Department of Energy Information Bridge
The Asotin County Conservation District (ACCD) is the primary entity coordinating habitat projects on both private and public lands within the Asotin Creek watershed. The watershed covers approximately 325 square miles in the Blue Mountains of southeastern Washington in Water Resource Inventory Area (WRIA) 35. The ACCD has been working with landowners and

numerous organizations to address habitat projects in Asotin County. ACCD began coordinating habitat projects in 1995 with the help of BPA funding. Approximately two hundred and seventy-six projects have been implemented as of 1999. The Asotin Creek Riparian Planting 2000-053-00 and Asotin Creek Riparian Fencing 2000-054-00 teamed BPA and the Governor's Salmon Recovery Funding to plant approximately 84,191 trees and shrubs in the Asotin Creek Watershed. In addition BPA and private cost-share dollars were utilized to drill 3 wells, provide 15 off-site alternative water developments (troughs), 5 spring developments, and 9, 100 feet of riparian fencing. The trees will provide shade and long-term LWD recruitment to the stream. The wells, alternative water developments, springs and fencing will reduce direct animal impacts on the stream.
NTIS
Conservation; Planting

20030052075 Lawrence Livermore National Lab., Livermore, CA
Preliminary Analysis of Saudi National Seismic Network Recordings of the November 1999 Dead Sea Explosions
Rodgers, A.; Dec. 01, 1999; 16 pp.; In English
Report No.(s): DE2002-793983; UCRL-ID-136697; No Copyright; Avail: Department of Energy Information Bridge

Two large chemical explosions were detonated in the Dead Sea on November 10 and 11, 1999 for the purposes of calibrating seismic travel times to improve regional network location. These explosions were large enough to be observed with good signal-to-noise ratios by seismic stations in northwestern Saudi Arabia (distances c 500 km). In this report, we present a preliminary analysis of the recordings from these shots.
NTIS
Chemical Explosions; Seismology

20030052153 Lawrence Livermore National Lab., Livermore, CA
LLNL Middle East and North Africa and Former Soviet Union Research Database
OBoyle, J. L.; Ruppert, S. D.; Hauk, T. F.; Dodge, D.; Firpo, M.; Jul. 14, 2000; In English
Report No.(s): DE2002-791761; UCRL-JC-138993; No Copyright; Avail: National Technical Information Service (NTIS)

The primary objective of the Lawrence Livermore National Laboratory (LLNL) Seismic Research Knowledge Base (SRKB) is to help coordinate the LLNL Ground-Based Nuclear Explosion Monitoring (GNEM) Middle East, North Africa (ME/NA) and Former Soviet Union (FSU) regionalization program. The LLNL SRKB provides efficient access to, and organization of, thousands of seismic events and associated waveforms, while also providing the framework to store, organize, and disseminate research results for delivery into the DOE KB. Reference event libraries and ground truth datasets showing space and time clustering of natural earthquake and mine events, phase blockage maps, and event characterization parameters are compiled from the SRKB. Sufficient metadata (including measurement procedures, codes, comments and measurement errors) are stored at each step in the analysis process to allow recreation or verification of results at any stage in the processing flow. Corrections and parameters distilled from the LLNL SRKB provide needed contributions to the Department of Energy (DOE) Knowledge Base (KB) for the ME/NA and FSU regions and will enable the USA National Data Center (NDC) to effectively verify Comprehensive Nuclear-Test-Ban Treaty (CTBT) compliance. The LLNL contributions support critical USNDC pipeline functions in detection, location, feature extraction, discrimination, and analyst review.
NTIS
Nuclear Explosions; Waveforms; Seismology; Pattern Recognition; Earthquakes; Data Bases

20030052182 Virginia Polytechnic Inst. and State Univ., Blacksburg. Office of Sponsored Programs
24-Channel Geophone Array for Horizontal or Vertical Boreholes
Westman, E. C.; Jul. 2002; 12 pp.; In English
Report No.(s): DE2002-802176; No Copyright; Avail: Department of Energy Information Bridge

This report describes the technical progress on a project to design and construct a multichannel geophone array that improves tomographic imaging capabilities in both surface and underground mines. Especially important in the design of the array is sensor placement. One issue related to sensor placement is addressed in this report: the development of simple, robust, MSHA-acceptable clamping unit. Improved imaging capabilities will produce energy, environmental, and economic benefits by increasing exploration accuracy and reducing operating costs.
NTIS
Seismology; Tomography; Geophysical Observatories

20030052185 Lawrence Livermore National Lab., Livermore, CA

Efficient Displacement Discontinuity Method Using Fast Multipole Techniques

Morris, J. P.; Blair, S. C.; Feb. 18, 2000; In English

Report No.(s): DE2002-791449; UCRL-JC-135851; No Copyright; Avail: National Technical Information Service (NTIS)

The Displacement Discontinuity method has been widely used in geomechanics because it accurately captures the behavior of fractures within a rock mass by explicitly accounting for discontinuities. Unfortunately, boundary element techniques require the interactions between all pairs of elements to be evaluated and traditional approaches to the Displacement Discontinuity method are computationally expensive for large problem sizes. Approximate summation techniques, such as the Fast Multipole Method (FMM), calculate the interactions between N entities in time proportional to N. We have implemented a modified Fast Multipole approach which performs the necessary calculations in optimal time and with reduced memory usage. Furthermore, the FMM introduces parameters which can be selected to give the desired trade-off between efficiency and accuracy.

NTIS

Multipoles; Rocks; Fractures (Materials)

20030052187 Virginia Polytechnic Inst. and State Univ., Blacksburg. Office of Sponsored Programs

24-Channel Geophone Array for Horizontal or Vertical Boreholes

Westman, E. C.; Aug. 2002; In English

Report No.(s): DE2002-802181; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the technical progress on a project to design and construct a multichannel geophone array that improves tomographic imaging capabilities in both surface and underground mines. Especially important in the design of the array is sensor placement. One issue related to sensor placement is addressed in this report: the method for clamping the sensor once it is emplaced in the borehole. If the sensors (geophones) are not adequately coupled to the surrounding rock mass, the resulting data will be of very poor quality. Improved imaging capabilities will produce energy, environmental, and economic benefits by increasing exploration accuracy and reducing operating costs.

NTIS

Boreholes; Seismology; Tomography; Sensors; Geophysics; Mining; Arrays

20030052196 Rocky Mountain Research Station, Ogden, UT

Wildland Fire in Ecosystems: Effects of Fire on Air

Sandberg, D. V.; Ottmar, R. D.; Peterson, J. L.; Core, J.; Dec. 2002; In English

Report No.(s): PB2003-103614; RMRS-GTR-42-V5; No Copyright; Avail: National Technical Information Service (NTIS)

This state-of-knowledge review about the effects of fire on air quality can assist land, fire, and air resource managers with fire and smoke planning, and their efforts to explain to others the science behind fire-related program policies and practices to improve air quality. Chapter topics include air quality regulations and fire; characterization of emissions from fire; the transport, dispersion, and modeling of fire emissions; atmospheric and plume chemistry; air quality impacts of fire; social consequences of air quality impacts; and recommendations for future research.

NTIS

Air Quality; Forest Fires

20030052295 North Central Research Station, St. Paul, MN

Missouri's Forest Resources in 2000

Leatherberry, E. C.; Treiman, T. B.; 2002; 36 pp.; In English

Report No.(s): PB2003-103566; FSRB-NC-209; No Copyright; Avail: CASI; A03, Hardcopy

The North Central Research Station's Forest Inventory and Analysis (NCFIA) program began fieldwork for the fifth forest inventory of Missouri's forest in 1999. This inventory initiated the new annual inventory system in which one-fifth of the total field plots (considered one panel) in the State are measured each year. A complete inventory consists of measuring and compiling the data for all plots (or five panels). Once all panels have been measured, each will be remeasured approximately every 5 years. For example, in Missouri, the field plots measured in the 2000 panel will be remeasured in 2005. In 2000, NCFIA continued the annual inventory effort with the second panel of the fifth forest inventory. This fifth inventory of Missouri's forest resources will be completed in 2003.

NTIS

Forests; Forest Management

20030052297 Northeastern Research Station, Newtown Square, PA

Characteristics of Mixed-Oak Forest Ecosystems in Southern Ohio Prior to the Reintroduction of Fire

Kennedy Sutherland, E.; Hutchinson, T. F.; 2002; In English

Report No.(s): PB2003-103569; FSGTR-NE-299; No Copyright; Avail: National Technical Information Service (NTIS)

Mixed-oak forests occupied much of the Unglaciated Allegheny Plateau region of southern Ohio at the onset of Euro-American settlement (ca. 1800). Historically, Native Americans used fire to manage the landscape and fire was frequent throughout the 19th and early 20th centuries during extensive forest harvesting and then re-growth. Today, though mixed-oak forests remain dominant across much of the region, oak regeneration is often poor as other tree species (e.g., maples) are becoming much more abundant. This shift has occurred concurrently with fire suppression policies that began in 1923. A multidisciplinary experiment was initiated in southern Ohio to explore the use of prescribed fire as a tool to improve the sustainability of mixed-oak forests. This report describes the experimental design and study areas, and provides baseline data on ecosystem characteristics prior to prescribed fire treatments. Chapters describe forest history, an integrated moisture index, geology and soils, understory light environments, understory vegetation, tree regeneration, overstory vegetation, foliar nutrient status, arthropods, and breeding birds.

NTIS

Forest Management; Trees (Plants); Ecosystems; Ohio

20030052299 Forest Service, Portland, OR

Strategic Survey Framework for the Northwest Forest Plan Survey and Manage Program

Molina, R.; McKenzie, D.; Lesher, R.; Ford, J.; Alegria, J.; Feb. 2003; 46 pp.

Report No.(s): PB2003-103611; FSGTR-PNW-573; No Copyright; Avail: CASI; A03, Hardcopy

This document outlines an iterative process for assessing the information needs for all Northwest Forest Plan (NWFP) survey and manage species, designing and implementing strategic surveys (including field surveys and other information-gathering processes), and analyzing that information for use in the NWFP annual species review and adaptive-management processes. The framework outlines a series of steps that provide guidance for development of (1) priority information needs, (2) evaluation and selection of information-gathering approaches, (3) implementation of annual work plans, and (4) management, reporting, and transfer of information to the annual species review process. Approaches include design-based statistical surveys, modeling, expert searches, and research that are anticipated to be used singly or in combination to address the priority survey and manage questions and information needs.

NTIS

Forests; Surveys; Statistical Analysis; Management Information Systems

20030052306 Geological Survey, Denver, CO

Geology and Hydrogeology of the Caribbean Islands Aquifer System of the Commonwealth of Puerto Rico and the U.S. Virgin Islands

Renken, R. A.; Ward, W. C.; Gill, I. P.; Gomez-Gomez, F.; Rodriguez-Martinez, J.; 2002; In English

Report No.(s): PB2003-103654; USGS/PP-1419; ISBH-0-607-99361-8; No Copyright; Avail: National Technical Information Service (NTIS)

Poorly lithified to unconsolidated carbonate and clastic sedimentary rocks of Tertiary (Oligocene to Pliocene) and Quaternary (Pleistocene to Holocene) age compose the South Coast aquifer and the North Coast limestone aquifer system of Puerto Rico; poorly lithified to unlithified carbonate rocks of late Tertiary (early Miocene to Pliocene) age make up the Kingshill aquifer of St. Croix, U.S. Virgin Islands. The South Coast aquifer, North Coast limestone aquifer system, and Kingshill aquifer are the most areally extensive and function as the major sources of ground water in the U.S. Caribbean Islands Regional Aquifer-System Analysis (CI-RASA) study area. In Puerto Rico's South Coast ground-water province, more than 1, 000 meters of clastic and carbonate rocks of Oligocene to Pliocene age infill the South Coast Tertiary Basin. The pattern of lithofacies within this basin appears to have been controlled by changes in base level that were, at times, dominated by tectonic movement (uplift and subsidence), but were also influenced by eustasy. Deposition of the 70-kilometer long and 3- to 8-kilometer wide fan-delta plain that covers much of the South Coast ground-water province occurred largely in response to glacially-induced changes in sea level and climate during the Quaternary period. Tectonic movement played a much less important role during the Quaternary.

NTIS

Hydrogeology; Geology

20030052310 Lawrence Livermore National Lab., Livermore, CA

Summary of Age-Dating Analysis in the Fenner Basin, Eastern Mojave Desert, California

Davisson, M. L.; Jun. 01, 2000; 10 pp.; In English

Report No.(s): DE2002-793966; UCRL-ID-139564; No Copyright; Avail: Department of Energy Information Bridge

Stable isotopes of oxygen (oxygen-18) and hydrogen (deuterium) in water were measured to determine recharge sources for Fenner Basin groundwater. The deuterium and oxygen-18 signatures (reported as (delta)D and (delta)(sup 18)O values) ranged from -11.9 to -9.3 per mil. The more negative values originate from high elevation recharge in the New York Mountains and were also observed in the northern and eastern parts of the groundwater basin. Less negative values were observed in the Providence Mountains along the western part of the basin. Groundwater collected in the Fenner Gap (i.e. Project Area) had signatures between -10.6 and -10.9 per mil, suggesting a mixture of recharge from both northern, western, and probably local recharge areas in the basin. The annual contribution of groundwater recharge to Fenner Gap from the Clipper, Marble, and Old Woman mountains is still inconclusive due to lack of isotopic data. Isotopic signatures of mean annual precipitation collected by Friendman and others (1992) at Mitchell Caverns, as well as recently recharged groundwater in the Providence and New York mountains, are similar to the isotopic values in Fenner Gap groundwater. This indicates that this groundwater has a Holocene age (less than 10,000 years old), since groundwater recharged during the Pleistocene had isotopic signatures significantly more negative than today due to past global cooling.

NTIS

Time Measurement; Chronology; Structural Basins; Isotopes; Oxygen 18; Hydrogen; Deuterium; Ground Water

43
EARTH RESOURCES AND REMOTE SENSING

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

20030037069 North Central Research Station, St. Paul, MN

Proceedings of the Second Missouri Ozark Forest Ecosystem Project Symposium: Post-Treatment Results of the Landscape Experiment

Shifley, S. R.; Kabrick, J. M.; Oct. 2002; 240 pp.; In English, October 17 - 18, 2000, St. Louis, Missouri

Report No.(s): PB2003-102176; FSGTR-NC-227; No Copyright; Avail: CASI; A11, Hardcopy

The Missouri Ozark Forest Ecosystem Project (MOFEP) is a centuries-long experiment to examine the impacts of alternative forest management practices on a wide array of ecosystem attributes. MOFEP includes an integrated program of research studies conducted by dozens of scientists and technicians. The studies are replicated on nine forest compartments that are the experiment sites. Between 1990 and 1996, all MOFEP sites were monitored to collect pre-treatment baseline data. This publication complements the first MOFEP Proceedings. This second proceedings reports findings two to three years after implementation of the even-aged, uneven-aged, and no-harvest management treatments. The introductory paper by Sheriff describes the experiment and sets the stage. The remaining papers describe the treatment effects for many different ecosystems attributes.

NTIS

Forest Management; Conferences; Forests

20030037131 Environmental Protection Agency, Washington, DC

National Recommended Water Quality Criteria: 2002. Human Health Criteria Calculation Matrix

Nov. 2002; 26 pp.

Report No.(s): PB2003-102694; EPA/822/R-02/012; No Copyright; Avail: CASI; A03, Hardcopy

This document contains information regarding the calculation of the human health criteria contained in the document entitled, National Recommended Water Quality Criteria: 2002. This document provides: cancer potency factors (q1*s); reference doses (RfDs); relative source contributions (RSCs); fish intake values; and equations used to derive the human health criteria in the aforementioned compilation. This document is not a regulation and cannot substitute for the Clean Water Act or Environmental Protection Agency (EPA) regulations. Thus, the criteria in the calculation matrix cannot impose legally binding requirements on EPA (Environmental Protection Agency), states, authorized tribes or the regulated community.

NTIS

Water Quality; Public Health

20030038902 Lawrence Berkeley National Lab., CA, Geological Survey, Menlo Park, CA

Mantle Helium and Carbon Isotopes in Separation Creek Geothermal Springs, Three Sisters Area, Central Oregon: Evidence for Renewed Volcanic Activity or a Long Term Steady State System

van Soest, M. C.; Kennedy, B. M.; Evans, W. C.; Mariner, R. H.; 2003; 12 pp.; In English

Report No.(s): DE2002-803778; No Copyright; Avail: Department of Energy Information Bridge

Cold bubbling springs in the Separation Creek area, the locus of current uplift at South Sister volcano show strong mantle signatures in helium and carbon isotopes and CO(sub 2)/(sup 3)He. This suggests the presence of fresh basaltic magma in the volcanic plumbing system. Currently there is no evidence to link this system directly to the uplift, which started in 1998. To the contrary, all geochemical evidence suggests that there is a long-lived geothermal system in the Separation Creek area, which has not significantly changed since the early 1990s. There was no archived helium and carbon data, so a definite conclusion regarding the strong mantle signature observed in these tracers cannot yet be drawn.

NTIS

Volcanoes; Geothermal Resources; Oregon; Tracers; Volcanology

20030038933 North Central Research Station, St. Paul, MN

Minnesota Forest Resources in 2000

Haugen, D. E.; Mielke, M. E.; 2002; 36 pp.; In English

Report No.(s): PB2003-102646; No Copyright; Avail: CASI; A03, Hardcopy

The North Central Research Station's Forest Inventory and Analysis Program began fieldwork for the sixth forest inventory of Minnesota's forest resources in 1999. This inventory initiated the new annual inventory system in which one-fifth of the field plots in the State are measured each year. A complete inventory consists of measuring and compiling the data for all plots. This sixth inventory of Minnesota's forest resources will be completed in 2004. However, because each year's sample is a systematic sample of the State's forest and because timely information is needed about Minnesota's forest resources, estimates have been prepared from data gathered during the first 2 years of the inventory. Because of the limited number of field plots measured, sampling errors are large at this point and data in this report should be used with caution. Future estimates that incorporate data in this report are subject to change when ensuing annual inventories are completed and data compiled. Results presented are estimates based on sampling techniques. As additional annual inventories are completed, the precision of the estimates will increase and additional data will be released. Reports of previous inventories of Minnesota are dated 1936, 1953, 1962, 1977, and 1990.

NTIS

Minnesota; Timber Identification; Timber Inventory

20030038955 Geological Survey, Anchorage, AK

Water Resources Data Alaska, Water Year 2001

Meyer, D. F.; Hess, D. L.; Schellekens, M. F.; Smith, C. W.; Snyder, E. F.; Oct. 2002; 482 pp.; In English

Report No.(s): PB2003-102244; USGS/WRD/AK-01-1; No Copyright; Avail: CASI; A21, Hardcopy

Water-resources data for the 2001 water year for Alaska consist of records of stage, discharge, and water quality of streams; stage of lakes; and water levels and water quality of ground-water wells. This volume contains records for water discharge at 112 gaging stations; stage or contents only at four gaging stations; water quality at 37 gaging stations; and water levels for 30 observation wells. Also included are data for 51 crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alaska.

NTIS

Alaska; Water Quality; Hydrology; Surface Water; Ground Water

20030045801 North Central Research Station, St. Paul, MN

North Dakota's Forest Resources in 2001

Haugen, D. E.; 2003; 12 pp.; In English

Report No.(s): PB2003-103619; FSRN-NC-387; No Copyright; Avail: CASI; A03, Hardcopy

The North Central Research Station's Forest Inventory and Analysis program began fieldwork for the fourth forest inventory of North Dakota in 2001. This initiates a new annual inventory system. This Research Note contains estimates of

North Dakota's forest resources derived from data gathered during the first year of the inventory.
NTIS
Forest Management; Timber Inventory

20030045803 North Central Research Station, St. Paul, MN
South Dakota's Forest Resources in 2001
Leatherberry, E. C.; Haugan, D.; 2003; 12 pp.
Report No.(s): PB2003-103618; FSRN-NC-383; No Copyright; Avail: CASI; A03, Hardcopy

The North Central Research Station's Forest Inventory and Analysis program began fieldwork for the fifth forest inventory of South Dakota in 2001. This initiates a new annual inventory system. This Research Note contains estimates of South Dakota's forest resources derived from data gathered during the first year of the inventory.
NTIS
Forest Management; Forests; Timber Inventory

20030051525 Helsinki Univ. of Technology, Espoo (Finland)
Design and Construction of Tree Scale Distributed Multipoint Measuring System of Par
Palva, L.; Markkanen, T.; Siivola, E.; Garam, E.; Linnavuo, M.; 2001; 32 pp.
Report No.(s): PB2003-101747; HUT-RR-B10; Copyright; Avail: National Technical Information Service (NTIS)

A tree scale distributed multipoint measuring system of photosynthetically active radiation (PAR) has been designed. The new system is divided into a central unit, a maximum number of 32 measuring units and 24 sensor-amplifier included in each of the measuring units. An industrial PC104-standard microcomputer functions as the central unit taking care of the system timing and data storage. The system is movable and capable of long term automatic data collection. The connection network enables the distribution of MUs into chains and star type arrangements with a maximum cable length of 100 m. The construction of the system is described in detail in this report.
NTIS
Design Analysis; Constrictions; Photosynthetically Active Radiation; Radiation Measuring Instruments

20030051531 Forest Service, Portland, OR
Analysis of the Timber Situation in the USA: 1952 to 2050
Haynes, R. W.; Feb. 2003; In English
Report No.(s): PB2003-103294; FSGTR-PNW-560; No Copyright; Avail: National Technical Information Service (NTIS)

For more than a century, national assessments of supply and demand trends for timber have helped shape perceptions of future commodity consumption and resource trends. These perceptions have guided forest policy. Since 1952, U.S. timber harvest has risen by nearly 67 percent, accompanied by growing timber inventories on both public and private lands, but there has been a decline in the critical private timberland base. The current assessment envisions forest products consumption rising 42 percent by 2050 and marked shifts in the extent and location of domestic and imported supplies. Prospective shifts include a temporary near-term decline in U.S. roundwood harvest and an increase in the share of consumption from imports. In the longer term, U.S. timber harvest expands by 24 percent. As a result of steady improvement in growth and productivity on U.S. forest lands, this increased harvest is accommodated by continued expansion in inventory despite decreasing area in the private timberland base.
NTIS
Forest Management; Timber Inventory; United States

20030051575 Agricultural Research Service, Tucson, AZ, Environmental Protection Agency, Las Vegas, NV
Quality Assurance and Quality Control in the Development and Application of the Automated Geospatial Watershed Assessment (AGWA) Tool
Hernandez, M.; Miller, S.; Semmens, D.; Goodrich, D. C.; Kepner, W. G.; Apr. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only. Prepared in cooperation with Environmental Protection Agency, Las Vegas, NV. National Exposure Research Lab
Report No.(s): PB2003-103047; ARS-137460; EPA/600/R-02/046; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to document the procedures followed to ensure that AGWA (Automated Geospatial Watershed Assessment) conforms to the design objectives and specifications, and that it correctly performs the incorporated

functions. These procedures include parameterization of the hydrologic models, the application of coding standards and practices for the development of the GIS (Geographical Information Systems)-based interface, testing of its functional design, and evaluation of its performance characteristics. AGWA is a graphical user interface for the KINEROS and SWAT models developed as an ArcView extension. The main purpose of the AGWA tools is to assist in the assessment of the effects of land cover effects of land cover change and land use on watershed response across multiple scales.
NTIS
Watersheds; Applications Programs (Computers); Quality Control; Hydrology

20030052127 National User Support Programme, Delft (Netherlands)
User Requirements Document for RADS/NEONET
Naeije, M. C.; Schrama, E. J. O.; Scharroo, R.; Apr. 2000; 42 pp.
Report No.(s): PB2003-102144; USP-2-00-06; No Copyright; Avail: CASI; A03, Hardcopy

This document describes a study that was conducted in the frame of the DEOS' Radar Altimeter Database System (RADS) project. RADS is a so-called application facility of the Dutch infrastructure for exploitation of remotely sensed data, NEONET, which is funded by the Dutch government (SRON/BCRS). This particular document deals with a description of the collection, summary, and evaluation of user requirements concerning the retrieval and use of satellite altimeter data in both research environments and operational environments.
NTIS
Remote Sensing; User Requirements

20030052179 Physics and Electronics Lab. TNO, The Hague, Netherlands
Extraction Algorithms for IMINT
Dekker, R. J.; vandenBroek, A. C.; Smith, A. J. E.; July 2002; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): B99/D/860; TNO Proj. 015.29490
Report No.(s): FEL-02-A052; TD01-0292; Copyright; Avail: Other Sources

The report describes work done in 2001 for the image intelligence part of the Program 'Inlichtingen' supported by the Royal Dutch Army. The work was focussed on two main topics: the accuracy of digital elevations models and automatic land use updating algorithms. For the first topic preliminary data from the Shuttle Topographical Mission (SRTM) was studied and compared with standard DTED level I data. For the second topic land use updating algorithms using multi-spectral image data (Landsat) in combination with map data level I was studied. Also the role of texture information for land use updating was taken into account. The report is an interim report and the work will be continued in 2002 with studying the extraction of line and Dint objects in images. Also in 2002 high accuracy SRTM data will be evaluated for a number of test sites.
Author
Algorithms; Image Processing; Land Use; Digital Elevation Models

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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*.

20030037064 General Atomics Co., San Diego, CA
Direct Energy Conversion Fission Reactor. Annual Report for the Period August 15, 2000 Through September 30, 2001
Brown, L. C.; Jan. 2002; In English
Report No.(s): DE2002-805252; No Copyright; Avail: National Technical Information Service (NTIS)

Sandia National Laboratories, Los Alamos National Laboratories, The University of Florida, Texas A&M University and General Atomics have undertaken a joint project to explore the possibilities of exploiting direct energy conversion to increase the efficiency of electricity production from fission nuclear reactors. This report describes only the work performed at General Atomics during Phase 2 of this three-year project. Sandia National Laboratories leads the overall project and provides overall project reporting.
NTIS
Energy Conversion; Fission

20030037164 National Renewable Energy Lab., Golden, CO

Criteria for the Design of GaInP/GaAs/Ge Triple-Junction Cells top Optimize Their Performance

McMahon, W. E.; Kurtz, S.; Emery, K.; Young, M. S.; May 2002; 12 pp.; In English

Report No.(s): DE2002-15000997; No Copyright; Avail: Department of Energy Information Bridge

This conference paper investigates which reference spectrum should be used to design GaInP/GaAs/Ge triple-junction cells (at 300 K) in order to optimize their performance outdoors (at elevated temperatures). The outdoor performance is simulated using direct spectra from the recently proposed Module Energy Rating Procedure. We find that triple-junction cells designed for AM1.5D, low-AOD and AM1.5G standard spectra at 300 K all work well for maximizing daily energy production at elevated temperatures. AM1.5G cells are the best choice for midday power production, whereas AM1.5D cells are the best choice for power production during the morning and evening. Performance of cells optimized for a newly proposed Low-AOD spectrum is intermediate between these two extremes.

NTIS

Concentrators; Solar Collectors; Design Analysis

20030037166 Lawrence Livermore National Lab., Livermore, CA

Separation of Climate Signals

Fodor, I. K.; Kamath, C.; Nov. 13, 2002; In English

Report No.(s): DE2002-15002083; UCRL-ID-150775; No Copyright; Avail: National Technical Information Service (NTIS)

Understanding changes in global climate is a challenging scientific problem. Simulated and observed data include signals from many sources, and untangling their respective effects is difficult. In order to make meaningful comparisons between different models, and to understand human effects on global climate, we need to isolate the effects of different sources. Recent eruptions of the El Chichon and Mt. Pinatubo volcanoes coincided with large El Nino and Southern Oscillation (ENSO) events, which complicates the separation of their contributions on global temperatures. Current approaches for separating volcano and ENSO signals in global mean data involve parametric models and iterative techniques. We investigate alternative methods based on principal component analysis (PCA) and independent component analysis (ICA). Our goal is to determine if such techniques can automatically identify the signals corresponding to the different sources, without relying on parametric models.

NTIS

Signals; Climate Change

20030038896 Virginia Polytechnic Inst. and State Univ., Blacksburg. Office of Sponsored Programs

24-Channel Geophone Array for Horizontal or Vertical Boreholes. July 2002

Westman, E. C.; Aug. 2002; 14 pp.; In English

Report No.(s): DE2002-802183; No Copyright; Avail: Department of Energy Information Bridge

This report describes the technical progress on a project to design and construct a multichannel geophone array that improves tomographic imaging capabilities in both surface and underground mines. Especially important in the design of the array is sensor placement. One issue related to sensor placement is addressed in this report: the method for clamping the sensor once it is emplaced in the borehole. If the sensors (geophones) are not adequately coupled to the surrounding rock mass, the resulting data will be of very poor quality. Improved imaging capabilities will produce energy, environmental, and economic benefits by increasing exploration accuracy and reducing operating costs.

NTIS

Boreholes; Imaging Techniques; Seismology; Arrays; Tomography

20030045725 Lawrence Livermore National Lab., Livermore, CA

Fracture Surface Area Effects on Fluid Extraction and the Electrical Resistivity of Geothermal Reservoir Rocks

Roberts, J. J.; Detwiler, R. L.; Ralph, W.; Bonner, B. P.; May 09, 2002; 16 pp.; In English

Report No.(s): DE2002-15002361; UCRL-JC-148240; No Copyright; Avail: Department of Energy Information Bridge

Laboratory measurements of the electrical resistivity of fractured analogue geothermal reservoir rocks were performed to investigate the resistivity contrast caused by active boiling and to determine the effects of variable fracture dimensions and surface area on water extraction. Experiments were performed at confining pressures up to 10 h4Pa (100 bars) and temperatures to 170DGC. Fractured samples show a larger resistivity change at the onset of boiling than intact samples. Monitoring the resistivity of fractured samples as they equilibrate to imposed pressure and temperature conditions provides an estimate of fluid migration into and out of the matrix. Measurements presented are an important step toward using field

electrical methods to quantitatively search for fractures, infer saturation, and track fluid migration in geothermal reservoirs. NTIS

Reservoirs; Electrical Resistivity; Rocks; Fractures (Materials)

20030051422 North Dakota Univ., Grand Forks. Energy and Environmental Research Center

Evaluation of SO(3) Emission Control by Flue Gas Humidification at the R. Paul Smith Station

Jun. 2002; In English

Report No.(s): DE2002-803198; 2002-EERC-06-04; No Copyright; Avail: National Technical Information Service (NTIS)

Depending on the size and type of boiler, the 1990 Clean Air Act Amendments required specific reductions in SO2 and NOx emissions from coal-fired electric utilities. To meet these requirements, SO2 reduction strategies have included installing scrubbing technology, switching to a more expensive low-sulfur coal, or purchasing SO2 allowances. It is expected that over the next 10 years there will be an increase in the price of low-sulfur coals, but that higher-sulfur coal costs will remain the same. Technologies must be strongly considered that allow the use of high sulfur fuels while at the same time meeting current and future SO2 emission limits. In addition, it is expected that many new selective catalytic reduction (SCR) systems will be installed to reduce NOx.

NTIS

Sulfur Dioxides; Flue Gases; Humidity; Pollution Control

20030051431 Lawrence Livermore National Lab., Livermore, CA

Status and Future Directions of the ENERGY STAR Program

Brown, R.; Webber, C.; Koomey, J.; 2000; 16 pp.; In English

Report No.(s): DE2002-806095; LBNL-45952; No Copyright; Avail: Department of Energy Information Bridge

In 1992 the U.S. Environmental Protection Agency (EPA) introduced ENERGY STAR, a voluntary labeling program designed to identify and promote energy-efficient products, in order to reduce carbon dioxide emissions. Since then EPA, now in partnership with the U.S. Department of Energy (DOE), has expanded the program to cover nearly the entire buildings sector, spanning new homes, commercial buildings, residential heating and cooling equipment, major appliances, office equipment, commercial and residential lighting, and home electronics. This paper provides a snapshot of the ENERGY STAR program in the year 2000, including a general overview of the program, its accomplishments, and the possibilities for future development. First, we describe the products that are currently eligible for the ENERGY STAR label and the program mechanisms that EPA and DOE are using to promote these products. Second, we illustrate selected milestones achieved in some markets, and ways that EPA and DOE are responding to challenges or changes in certain markets. Third, we discuss the evolving ENERGY STAR brand strategy. Next, we explore ways in which ENERGY STAR interacts with and enhances other policies, such as appliance standards and regional market transformation collaboratives.

NTIS

Carbon Dioxide; Space Cooling (Buildings); Space Heating (Buildings)

20030051433 Lawrence Livermore National Lab., Livermore, CA, Massachusetts Univ., Amherst

Solar Absorption in Thick and Multilayered Glazings

Powles, R.; Curcuija, D.; Koehler, C.; Feb. 2002; 14 pp.; In English

Report No.(s): DE2002-806104; LBNL-49555; No Copyright; Avail: Department of Energy Information Bridge

Thick and multilayered glazings generally have a nonuniform distribution of absorbed solar radiation which is not taken into account by current methods for calculating the center of glass solar gain and thermal performance of glazing systems. This paper presents a more accurate method for calculating the distribution of absorbed solar radiation inside thick and multilayered glazings and demonstrates that this can result in a small but significant difference in steady-state temperature profile and Solar Heat Gain Coefficient for some types of glazing systems when compared to the results of current methods. This indicates that a more detailed approach to calculating the distribution of absorbed solar radiation inside glazings and resulting thermal performance may be justified for certain applications.

NTIS

Solar Radiation; Thickness; Glazes; Absorption; Multilayer Insulation

20030051555 Office of Air Quality Planning and Standards, Research Triangle Park, NC

National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Engine Test Cells/Stands: Background Information for Final Standards. Summary of Public Comments and Responses

Feb. 2003; 58 pp.

Report No.(s): PB2003-103059; EPA/453/R-03/001; No Copyright; Avail: CASI; A04, Hardcopy

On May 14, 2002, the U.S. Environmental Protection Agency (EPA) proposed national emission standards for hazardous air pollutants (NESHAP) for engine test cells/stands (67 FR 34548) under authority of Section 112 of the Clean Air Act (Act). Public comments were received from 24 sources consisting mainly of automotive, truck, and diesel engine manufacturers; airlines; aircraft and marine engine manufacturers; various industry trade associations; and Government agencies. All of the comments that were submitted and the responses to these comments are summarized in this document. This summary is the basis for the revisions made to the standards between proposal and promulgation.
NTIS
Air Pollution; Exhaust Emission; Exhaust Gases; Engine Tests; Hazardous Materials; Environment Protection; Energy Technology

20030051591 Iowa State Univ. of Science and Technology, Ames, IA
Engineering a New Material for Hot Gas Cleanup
Wheelock, T. D.; Doraiswamy, L. K.; Constant, K.; Akiti, T. T.; Hasler, D. J. L.; Jun. 2001; 34 pp.; In English
Report No.(s): DE2002-803200; No Copyright; Avail: Department of Energy Information Bridge
The overall objective of this project is the engineering development of a reusable calcium based sorbent for desulfurizing hot coal gas. A two-step pelletization method has been employed to produce relatively strong, core-in-shell, spherical pellets. Each pellet consists of a highly reactive core surrounded by a strong, inert, porous shell. A suitable core is composed largely of CaO which reacts with H2S to form CaS. Pellet cores have been prepared by pelletizing either pulverized limestone or plaster of Paris, and shells have been made of various materials. The most suitable shell material has been formed from a mixture of alumina and limestone particles. The core-in-shell pellets require treatment at high temperature to convert the core material to CaO and to partially sinter the shell material. Pellet cores derived from plaster of Paris have proved superior to those derived from limestone because they react more rapidly with H2S and their reactivity does not seem to decline with repeated loading and regeneration. The rate of reaction of H2S with CaO derived from either material is directly proportional to H2S concentration. The rate of reaction does not appear to be affected significantly by temperature in the range of 1113 K (840 deg C) to 1193 K (920 deg C) but decreases markedly at 1233 K (960 deg C). The rate is not affected by shell thickness within the range tested, which also provides adequate compressive strength.
NTIS
High Temperature Gases; Cleaning; Pellets

20030052000 Environmental Protection Agency, Seattle, WA
Columbia River Basin Fish Contaminant Survey, 1996-1998 (on CD-ROM)
Jul. 2002; In English
Report No.(s): PB2003-500014; EPA/910/R-02/006-CD; No Copyright; Avail: National Technical Information Service (NTIS)
The survey provides data on those chemicals which are most likely to be accumulated in fish tissue and therefore pose the greatest risks to people. These are the chemicals for which regulatory strategies need to be defined to eliminate or reduce these chemicals in our environment. These results of this survey can be used to design future investigations of chemical sources and the effects of these chemicals on the fishery resources in the basin.
NTIS
Fisheries; Contaminants; Chemical Effects

20030052085 McDermott Technology, Inc., Alliance, OH, Northern Research and Engineering Corp., Cambridge, MA
Fuel Cell/Micro-Turbine Combined Cycle
Chaney, L. J.; Tharp, M. R.; Wolf, T. W.; Fuller, T. A.; Hartvigson, J. J.; Dec. 1999; In English
Report No.(s): DE2002-802823; No Copyright; Avail: National Technical Information Service (NTIS)
A wide variety of conceptual design studies have been conducted that describe ultra-high efficiency fossil power plant cycles. The most promising of these ultra-high efficiency cycles incorporate high temperature fuel cells with a gas turbine. Combining fuel cells with a gas turbine increases overall cycle efficiency while reducing per kilowatt emissions. This study has demonstrated that the unique approach taken to combining a fuel cell and gas turbine has both technical and economic merit. The approach used in this study eliminates most of the gas turbine integration problems associated with hybrid fuel cell turbine systems. By using a micro-turbine, and a non-pressurized fuel cell the total system size (kW) and complexity has been reduced substantially from those presented in other studies, while maintaining over 70\% efficiency. The reduced system size can be particularly attractive in the deregulated electrical generation/distribution environment where the market may not

demand multi-megawatt central stations systems. The small size also opens up the niche markets to this high efficiency, low emission electrical generation option.
NTIS
Cycles; Fuel Cells; Market Research; Fossils

20030052199 TNO Environment, Energy and Process Innovation, Apeldoom, Netherlands, Prins Maurits Lab. TNO, Rijswijk, Netherlands
Development of a Fuel Cell/Battery Power Pack on a 1 kW Scale
Raadschelders, J. W.; deMeij, J. A.; Dill, R. B.; December 2002; 116 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/KM/159; A00/KM/491; TNO Proj. 32462/014.12641
Report No.(s): R-2002/583; TD2002-0205; Copyright; Avail: Other Sources

In the future, fuel cells in combination with batteries will play an important role in the generation of electrical energy on board of ships, both surface ships (all electric ship) and submarines. In order to get experience with integration and combination of a fuel cell and a battery, a test set-up has been build and tested on a scale of about 1 kW. Special attention has been paid to the development and verification of various control strategies of such a system. This has been done for various power time profiles as they can be expected in a submarine and a diesel generator set. Furthermore, a model for the system has been made, based on experimental results. This makes it possible to investigate the influence of the various possible control strategies on e.g fuel consumption. In this way it could be a valuable tool for conceptual system designs. On the basis of the study a project proposal has been made, with the aim to develop a so called Power Pack demonstrator of the order of magnitude of about 100 kW, consisting of a fuel cell and a battery. From the project it was concluded that the response time of the system is more or less completely determined by the reformer (which was not tested). This response time has very much influence on the system design and dimensioning of the components. Therefore it is intended to pay more attention to this aspect by development of a dynamical model that can be used for design and dimensioning of systems with a diesel reformer. Author
Electric Batteries; Fuel Cells; Ships

20030052246 Iowa State Univ. of Science and Technology, Ames, IA
Development of Novel Electrode Materials for the Electrocatalysis of Oxygen-Transfer and Hydrogen-Transfer Reactions
Simpson, B. K.; 2002; 138 pp.; In English
Report No.(s): DE2003-804542; No Copyright; Avail: Department of Energy Information Bridge

The main focus of research in our group has been to increase our knowledge of the fundamental aspects of processes involved in the mechanisms for the electrocatalysis of oxygen-transfer (O-transfer) and hydrogen-transfer (H-transfer) reactions. Based upon the knowledge obtained, novel electrode materials have been developed with improved electrocatalytic properties for the transfer reactions. The novel electrode materials have practical applications in electrochemical detection, environmental remediation, and electrosynthesis.
NTIS
Electrocatalysts; Reaction Kinetics; Electrode Materials; Oxygen; Hydrogen

45
ENVIRONMENT POLLUTION

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

20030037095 Lawrence Livermore National Lab., Livermore, CA
Autonomous Pathogen Detection System FY 02 Annual Progress Report
Colston, B.; Brown, S.; Burris, K.; Elkin, C.; Hindson, B.; Nov. 11, 2002; 10 pp.
Report No.(s): DE2002-15002220; UCRL-ID-144275-02; No Copyright; Avail: Department of Energy Information Bridge

The objective of this project is to design, fabricate and field demonstrate a biological agent detection and identification capability, the Autonomous Pathogen Detector System (APDS). Integrating a flow cytometer and real-time polymerase chain reaction (PCR) detector with sample collection, sample preparation and fluidics will provide a compact, autonomously operating instrument capable of simultaneously detecting multiple pathogens and/or toxins. The APDS will operate in fixed locations, continuously monitoring air samples and automatically reporting the presence of specific biological agents. The APDS will utilize both multiplex immunoassays and nucleic acid assays to provide quasi-orthogonal multiple agent detection

approaches to minimize false positives and increase the reliability of identification. Technical advances across several fronts must occur, however, to realize the full extent of the APDS. The end goal of a commercially available system for civilian biological weapon defense will be accomplished through three progressive generations of APDS instruments. The APDS is targeted for civilian applications in which the public is at high risk of exposure to covert releases of bioagent, such as major subway systems and other transportation terminals, large office complexes and convention centers. APDS is also designed to be part of a monitoring network of sensors integrated with command and control systems for wide-area monitoring of urban areas and major public gatherings.
NTIS
Pathogens; Detection; Autonomy

20030037104 Department of Energy, Washington, DC
Radioactive Air Emissions Notice of Construction Application for the Waste Receiving and Processing Facility
Dec. 19, 2000; 74 pp.; In English
Report No.(s): DE2002-805620; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Construction; Waste Treatment; Facilities; Air Pollution; Emission

20030037111 Department of Energy, Richland, WA
Environmental Management Performance Report December 1999
2000; 154 pp.; In English
Report No.(s): DE2002-801306; OE/RL-99-83; No Copyright; Avail: Department of Energy Information Bridge
This is a report of the Project Hanford Management Contractor's (PHMC) Environmental Management (EM) performance by Fluor Hanford (FH) and its subcontractors. Provided are detailed performance data relative to each individual mission area (e.g., Waste Management, Spent Nuclear Fuels, etc,).
NTIS
Environment Management; Hazardous Wastes; Waste Management

20030037114 Environmental Protection Agency, Washington, DC
National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category. 40 CFR Part
Oct. 1997; 680 pp.; In English
Report No.(s): PB2003-101563; EPA-821-R-97-019; No Copyright; Avail: CASI; A99, Hardcopy
This action promulgates effluent limitations guidelines and standards under the Clean Water Act (CWA) for a portion of the pulp, paper, and paperboard industry, and national emission standards for hazardous air pollutants (NESHAP) under the Clean Air Act (CAA) as amended in 1990 for the pulp and paper production source category.
NTIS
Effluents; Pollution Control; Air Quality; Standards

20030037118 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering
Diesel Aerosol Sampling Methodology (CRC-E-43)
Kittelson, D.; Watts, W.; Johnson, J.; Aug. 19, 2002; In English
Report No.(s): PB2003-102419; No Copyright; Avail: National Technical Information Service (NTIS)
The University of Minnesota and research partners West Virginia University, Carnegie Mellon University, Tampere University, Paul Scherrer Institute, University of California at Riverside, Caterpillar, Inc., and Cummins, Inc. undertook the study titled Diesel Aerosol Sampling Methodology to sample, characterize and quantify particles in Diesel exhaust. The goal of this project (E-43) was to develop Diesel aerosol sampling methods for the laboratory that would produce particle size distributions similar to those obtained under real-world roadway conditions. The study was carried out at four locations with measurements on four test trucks powered by Caterpillar and Cummins engines and several engines installed on engine dynamometers. Standard certification (EPA) and market basket blends of California fuels (CA fuel) were used for all tests. A mobile laboratory was built and used to conduct onroad, chase studies, and a wind tunnel study was carried out at the Langley

Wind Tunnel in Langley, Virginia. Engine and chassis dynamometer laboratory studies were carried out at Caterpillar, Cummins, and at the University of Minnesota.
NTIS
Exhaust Emission; Diesel Engines; Air Sampling; Aerosols

20030037124 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering, Paul Scherrer Inst., Villigen (Switzerland), Tampere Univ. (Finland)
Diesel Aerosol Sampling Methodology (CRC-E-43) Caterpillar Data Report
Kittelson, D.; Watts, W.; Johnson, J.; Ristimaeki, J.; Drayton, M.; Oct. 14, 2002; In English
Report No.(s): PB2003-102420; No Copyright; Avail: National Technical Information Service (NTIS)

The University of Minnesota formed an international research team to conduct the CRC E-43 project Diesel Aerosol Sampling Methodology. The objectives of the E-43 project were: 1. Determine the actual particle size distribution and particle number concentration in the exhaust plume from heavy-duty diesel vehicles operated on the road. 2. Compare on-road aerosol data with data generated in emissions test facilities to determine if current emission test facility sampling and analysis methods are adequate for characterizing particle size observed on the road. 3. Examine particle transformations as the plume disperses downwind of the roadway in a typical urban situation. 4. Characterize the bulk diesel particulate matter chemical composition and to determine surface properties and composition. The goal of E-43 was to develop diesel aerosol sampling methods for the laboratory that would produce results similar to those obtained under real- world roadway conditions. As part of E-43, a field study was carried out using two test trucks powered by Caterpillar engines, a 3406C and a 3406E. A central goal of the E-43 project was to recommend methods and procedures that when used in the laboratory would improve the simulation of on-road exhaust aerosol sampling. Detailed recommendations are made in the E-43 Final Report along with a discussion of the theory behind nanoparticle formation and growth.
NTIS
Aerosols; Exhaust Gases; Nanoparticles; Air Pollution; Methodology; Air Sampling; Diesel Fuels

20030037141 Pacific Northwest National Lab., Richland, WA
Assessment of Unabated Facility Emission Potentials for Evaluating Airborne Radionuclide Monitoring Requirements at Pacific Northwest National Laboratory, 1999
Sep. 1999; 40 pp.; In English
Report No.(s): DE2002-15001488; No Copyright; Avail: Department of Energy Information Bridge

Assessments were performed to evaluate compliance with the airborne radionuclide emission monitoring requirements in the National Emission Standards for Hazardous Air Pollutants. In these assessments, potential unabated offsite doses were evaluated for emission locations at facilities owned by the U.S. Department of Energy and operated by Pacific Northwest National Laboratory (pacific Northwest) on the Hanford Site. Two of the facilities evaluated, 325 Building Radiochemical Processing Laboratory, and 331 Building Life Sciences Laboratory met state and federal criteria for continuous sampling of airborne radionuclide emissions. One other building, the 3720 Environmental Sciences Laboratory, was recognized as being in transition with the potential for meeting the continuous sampling criteria.
NTIS
Radioactive Contaminants; Aerosols; Air Pollution; Pollution Monitoring

20030037149 Environmental Protection Agency, Washington, DC
Indoor Air Quality Tools for Schools Program: Benefits of Improving Air Quality in the School Environment
2002; 22 pp.
Report No.(s): PB2003-102736; No Copyright; Avail: CASI; A03, Hardcopy

Indoor air quality (IAQ) is increasingly an important issue in our nation's schools. Approximately 20 percent of the U.S. population- nearly 55 million people-spend their days inside elementary and secondary schools. In 1999, indoor air quality (IAQ) was reported to be unsatisfactory in about one in five public schools in the USA, while ventilation was reported as unsatisfactory in about one-quarter of public schools, according to the National Center for Education Statistics of the Department of Education. The health of students and staff in these schools is a cause for great concern, particularly the negative effects of poor IAQ on asthma and other respiratory illnesses. The U.S. Environmental Protection Agency (EPA) developed the Indoor Air Quality Tools for Schools (IAQ TfS) Program to help schools prevent, identify, and resolve their IAQ problems. Through simple, low-cost measures, schools can: Reduce IAQ-related health risks and triggers for asthma; Identify

sources of mold; Improve comfort and performance levels; Avoid costly repairs; Avoid negative publicity and loss of parent and community trust; and Avoid liability problems.
NTIS
Air Quality; Schools; Indoor Air Pollution; Environmental Quality

20030037152 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering, Cummins Engine Co., Inc., Columbus, IN, California Univ., Davis
Diesel Aerosol Sampling Methodology (CRC-E-43) Cummins Final Report
Oct. 14, 2002; In English
Report No.(s): PB2003-102761; CRC-E-43-CUMMINS; No Copyright; Avail: National Technical Information Service (NTIS)

The University of Minnesota formed an international research team to conduct the CRC E-43 project, titled 'Diesel Aerosol Sampling Methodology'. The objectives of the E-43 project were: To determine the actual particle size distribution and particle number concentration in the exhaust plume from heavy-duty Diesel vehicles operated on the road; to compare on-road aerosol data with data generated in emissions test facilities to determine if current emission test facility sampling and analysis methods are adequate for characterizing particle size observed on the road; to examine particle transformations as the plume disperses downwind of the roadway in a typical urban situation; and to characterize the bulk Diesel particulate matter chemical composition and to determine surface properties and composition. The goal of the E-43 project was to develop laboratory methods to measure Diesel aerosol size that would mimic results obtained under real-world roadway conditions. To accomplish this goal, a fundamental understanding of aerosol formation, trans formation and measurement, and the physical processes that affect the size distribution, such as dilution, nucleation, condensation, adsorption and coagulation was required. The University of Minnesota formed a research team that measured and characterized Diesel aerosol on the roadway and in the laboratory to try and establish a link between aerosol size characteristics measured on the roadway under real- world conditions and those measured in the laboratory.
NTIS
Aerosols; Air Sampling; Exhaust Gases

20030037153 Carnegie-Mellon Univ., Pittsburgh, PA
Lifetimes of Ultrafine Diesel Aerosol
Capaldo, K.; Pandis, S.; Dec. 01, 2001; In English
Report No.(s): PB2003-102763; No Copyright; Avail: National Technical Information Service (NTIS)

The University of Minnesota (UMN) group measured the aerosol size distributions in the plume of diesel trucks under realistic on-road driving conditions. During a typical test, the UMN mobile lab followed a truck (e.g., truck 61) at a distance ranging from 15 to 60 m from the back of the cab or trailer depending upon the specific test condition. The sampling boom of the lab was kept in the truck plume and bag samples were collected for analysis by the Scanning Mobility Particle Spectrometer (SMPS). Tests were conducted at idle, 55-mph, 40-55 mph acceleration, and 55-45 mph deceleration. For the cruise, acceleration and deceleration the tests were conducted when the truck was configured with and without load. For all conditions two fuels were evaluated: a market basket blend California fuel and an EPA certification fuel.
NTIS
Aerosols; Fuels; Diesel Engines

20030037155 Environmental Protection Agency, Ann Arbor, MI, Minnesota Univ., Minneapolis. Particle Technology Lab
CRC E-43 Final QA Audit (Addendum to Final QA Report)
Cantrell, B.; Ayala, A.; Olson, B.; Oct. 2002; In English
Report No.(s): PB2003-102769; No Copyright; Avail: National Technical Information Service (NTIS)

During the final QA audit for Project E-43, the QA team conducted an in-depth survey of the project database. In addition to critiquing the QA protocols used for data acceptance, reduction, and incorporation into the database, an assessment of project results is also provided. The latter includes validation of results produced in this study and verification that these results are usable in meeting project objectives and goals. In the following audit report, deficiencies noted during the audit are flagged by enclosing them in a text box. The audit revealed that some of the aerosol number concentration and size distribution data accepted as valid for inclusion in the database, and the results of analysis of that data, as reported, should be considered as qualitatively valid.
NTIS
Quality Control; Aerosols

20030037156 Statewide Air Pollution Research Center, Riverside, CA

Chemical Analysis of Diesel Nanoparticles Using a Nano-DMA/Thermal Desorption Particle Beam Mass Spectrometer. Final Report for Phase 1

Zuenann, P. J.; Oct. 17, 2000; 44 pp.; In English

Report No.(s): PB2003-102766; No Copyright; Avail: CASI; A03, Hardcopy

The primary objective of Phase 1 was to evaluate the use the Nano-DMA/TDPBMS to obtain information on the chemical composition of diesel nanoparticles formed under various engine operating conditions. The studies were carried out at UMNCDR. The focus was on the chemistry of nucleationmode particles, but larger particles were also analyzed for comparison. The goal was to use the composition data in conjunction with measured particle physical properties (e.g., size, concentration, etc.) to develop an understanding of the chemical mechanisms by which nanoparticles are formed in diesel exhaust. Such knowledge could aid in determining modifications in engine design, operation, fuel, lubricating oil, or after-treatment that might be made in order to ameliorate the problem of nanoparticle formation.

NTIS

Chemical Analysis; Exhaust Emission; Mass Spectrometers; Engine Design; Exhaust Gases

20030037160 West Virginia Univ., Morgantown, Desert Research Inst., Reno, NV, Old Dominion Univ., Norfolk, VA

Diesel Particulate Sampling Methodology (Langley Wind Tunnel Research)

Clark, N. N.; Gautam, M.; Lyons, D. W.; Ayala, A.; 2002; In English

Report No.(s): PB2003-102765; CRC-E-43-WVU; No Copyright; Avail: National Technical Information Service (NTIS)

Concern over health effects associated with diesel exhaust and debate over the influence of high number counts of particles in diesel exhaust prompted a study (E-43) of methodology for diesel particulate matter (PM) characterization. As part of this program, a tractor truck with an electronically managed diesel engine was installed on a dynamometer in the Old Dominion University (ODU) Langley full-scale wind tunnel. This arrangement permitted repeat measurements of diesel exhaust under realistic and reproducible conditions and permitted examination of the steady exhaust plume at multiple points. Background particle size distribution was characterized using a Scanning Mobility Particle Sizer (SMPS). In addition, a remote sampling system consisting of a SMPS, PM filter arrangement, and carbon dioxide (CO2) analyzer was attached to a roving gantry that allowed for exhaust plume sampling in a three dimensional grid. Raw exhaust CO2 levels were also measured in the vehicles exhaust stack. The plume centerline was mapped and dilution ratios were determined and mapped.

NTIS

Particulates; Wind Tunnel Tests; Diesel Fuels; Exhaust Emission; Trucks; Air Pollution; Pollution Monitoring; Air Sampling

20030037162 Environmental Protection Agency, Research Triangle Park, NC

Control of Mercury Emissions from Coal-Fired Electric Utility Boilers: Interim Report including Errata dated 03-21-2002

Kilgroe, J. D.; Sedman, C. B.; Srivastava, R. K.; Ryan, J. V.; Lee, C. W.; Apr. 2002; 46 pp.; In English

Report No.(s): PB2003-102793; EPA/600/R-01/109; No Copyright; Avail: CASI; A03, Hardcopy

In December 2000, the U.S. Environmental Protection Agency (USEPA) announced its intent to regulate mercury emissions from coal-fired electric utility steam generating plants. This report, produced by EPA's Office of Research and Development (ORD), National Risk Management Research Laboratory (NRMRL), provides additional information on mercury emissions control, following the release of 'Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Plants - Final Report to Congress,' in February 1998. The first three chapters describe EPA's December 2000 decision to regulate mercury under the National Emission Standards for Hazardous Air Pollutants (NESHAP) provisions of the Clean Air Act, coal use in electric power generation, and mercury behavior in coal combustion. Chapters 4-9 report: new information on current electric utility fuels, boilers, and emission control technologies; mercury emissions associated with these diverse technology combinations; results and implications of tests to evaluate the performance of mercury control technologies and strategies; retrofit control cost modeling; and mercury behavior in solid residues from coal combustion. The final chapter summarizes current research and identifies future efforts needed to ensure cost-effective control of mercury emissions. References are provided at the conclusion of each chapter.

NTIS

Research And Development; Boilers; Exhaust Emission

20030037448 Environmental Protection Agency, Cincinnati, OH

Selected Office of Water Methods and Guidance, Version 2, and Guidance for the Analysis of Water (on CD-ROM with search & retrieval software)

Jun. 2002; In English

Report No.(s): PB2002-500075; No Copyright; Avail: National Technical Information Service (NTIS)

The Selected Office of Water Methods and Guidance CD-ROM includes recently developed and frequently requested analytical methods and related guidance, including methods for the detection of trace metals, microbiological contaminants, and organics in wastewater and drinking water, chemical and biological methods for biosolids, guidance documents on Office of Water's (OW) revised approach to method approval, whole affluent toxicity testing, and oil and grease analysis. Version 2.0 of this popular CD-ROM lets you search, print and display the full text of more than 500 EPA wastewater and drinking water methods and guidance documents. Additionally, the CD-ROM contains the full text of all EPA methods approved for compliance monitoring at 40 Code of Federal Regulations (CFR) part 136 and 141 including the 500-, 600- and 1600-series methods and a complete version of the March 1983 revision of Methods for Chemical Analysis of Water and Waste (MCAWW). For the first time, the Office of Water CD-ROM identifies which methods are approved at 40 CFR parts 136 and 141 for wastewater and drinking water compliance monitoring. The EPA Methods and Guidance for the Analysis of Water CD-Rom, version 2.0, includes the full text of newly developed EPA wastewater and drinking water methods and guidance documents. Additionally, the CD contains tables detailing what methods are approved at 40 CFR part 136 and 141. For the first time, the Office of Water CD includes links tables based on those in the Code of Federal Regulations (CFR) listing which methods are approved for wastewater and drinking water compliance monitoring. Accessing approved EPA water test methods has never been easier. To find which methods are approved an an analyte of interest, simply click on the tables of approved methods button and search by analyte. Then click on the EPA method number listed for that analyte to instantly access the full text of approved methods listed at 40 CFR parts 136 and 141. Software includes a powerful text search engine to allow searches by method number, analyte name, and key words. All methods, guidance documents, and graphics have been converted to Adobe Acrobat8 Portable Document Format (PDF) to ensure efficient text searches.

NTIS

Procedures; Methodology; Water Pollution; Water Sampling; Pollution Monitoring; Chemical Analysis

20030038936 Environmental Protection Agency, Research Triangle Park, NC

Response of Surface Water Chemistry to the Clean Air Act Amendments of 1990

Jan. 2003; In English

Report No.(s): PB2003-102732; EPA/620/R-03/001; No Copyright; Avail: National Technical Information Service (NTIS)

Title IV of the 1990 Clean Air Act Amendments (CAAA) set target reductions for sulfur and nitrogen emissions from industrial sources as a means of reducing the acidity in deposition. One of the intended effects of the reductions was to decrease the acidity of low alkalinity waters and thereby improve their biological condition. The purpose of this report is to assess recent changes in surface water chemistry in the northern and eastern U.S., in response to changes in deposition. The regions covered in this report are New England (sites in Maine, New Hampshire, Vermont and Massachusetts), the Adirondack Mountains of New York, the Northern Appalachian Plateau (New York, Pennsylvania and West Virginia), the Ridge and Blue Ridge provinces of Virginia, and the Upper Midwest (Wisconsin and Michigan). The data covered in this report are from 1990 through 2000, the period since the last major science review by the National Acidic Precipitation Assessment Program (NAPAP).

NTIS

Air Quality; Surface Water; Environment Pollution; Water Quality; Precipitation (Meteorology)

20030038937 Environmental Protection Agency, Research Triangle Park, NC

Toxicological Effects of Fine Particulate Matter Derived from the Destruction of the World Trade Center

Dec. 2002; 64 pp.

Report No.(s): PB2003-102737; EPA/600/R-02/028; No Copyright; Avail: CASI; A04, Hardcopy

The goal of the experiments described in this report was to evaluate the toxicity of fine particulate matter (PM) derived from the destruction of the World Trade Center (WTC) on the respiratory tract of mice, and thereby contribute to the short-term health risk assessment of WTC PM being conducted by the Environmental Protection Agency. The adopted approach allowed a comparison of the intrinsic acute toxicity of fine WTC PM in the respiratory tract to well-studied PM reference samples that range in toxicity from essentially inert to quite toxic. The fundamental question was whether fine WTC PM was uniquely highly toxic. This toxicological research complements efforts by EPA and other organizations to assess the extent and level of worker and public exposures to PM derived from the WTC disaster and recovery efforts. This research is informative, but

it is of limited scope, with a focus on the toxicological effects of the fine fraction of WTC dust from a single exposure.
NTIS
Toxicity; Particulates; New York; Health; Risk; Dust

20030038941 Environmental Protection Agency, Washington, DC, Department of Health and Human Services, Washington, DC, Public Health Service, Rockville, MD
Citizen's Guide to Radon (Fourth Edition). The Guide to Protecting Yourself and Your Family from Radon (Revised)
May 2002; In English
Report No.(s): PB2003-102751; EPA/402/K-02/006; No Copyright; Avail: National Technical Information Service (NTIS)

Radon is a radioactive gas. It comes from the natural decay of uranium that is found in nearly all soils. It typically moves up through the ground to the air above and into your home through cracks and other holes in the foundation. Your home traps radon inside, where it can build up. Any home may have a radon problem. This means new and old homes, well-sealed and drafty homes, and homes with or without basements. Radon from soil gas is the main cause of radon problems. Sometimes radon enters the home through well water. In a small number of homes, the building materials can give off radon, too. However, building materials rarely cause radon problems by themselves.
NTIS
Radon; Radioactivity; Air Pollution

20030038942 General Accounting Office, Washington, DC
Water Quality: Improved EPA Guidance and Support Can Help States Develop Standards That Better Target Cleanup Efforts
Jan. 2003; 86 pp.
Report No.(s): PB2003-102743; GAO-03-308; No Copyright; Avail: CASI; A05, Hardcopy

This report discusses the extent to which states are refining designated uses when necessary and the Environmental Protection Agency (EPA) is assisting states toward that end and EPA is updating its criteria documents and assisting states in establishing criteria that can be compared with reasonably obtainable monitoring data. Included are recommendations to the Administrator of EPA to provide additional guidance regarding designated use changes to the states and regional offices that clarifies when a change is appropriate, what data are needed to justify the change, and how to establish subcategories of uses; follow through on the agency's plans to assess the feasibility of establishing a clearinghouse of approved designated use changes by 2004; set a time frame for developing and publishing nationally recommended sedimentation criteria; develop alternative, scientifically defensible monitoring strategies that states can use to determine if water bodies are meeting the criteria; and develop guidance and a training strategy that will help EPA regional staff determine the scientific defensibility of proposed criteria modifications.
NTIS
Environment Protection; Water Quality; Environmental Cleanup

20030038948 Minnesota Univ., Minneapolis. Particle Technology Lab, Environmental Protection Agency, Ann Arbor, MI
Working Quality Assurance Project Plan for Diesel Aerosol Sampling Methodology (CRC Project E-43)
Ayala, A.; Olson, B.; Cantrell, B.; Apr. 2002; In English
Report No.(s): PB2003-102768; No Copyright; Avail: National Technical Information Service (NTIS)

To ensure quality processes and products for the research entitled 'Diesel Aerosol Sampling Methodology' conducted by the University of Minnesota (UMN) and performed under the Coordinating Research Council (CRC) contract E-43, a 'quality assurance (QA) team' was formed consisting of Dr. Alberto Ayala, a Private Consultant, and Dr. Bernard Olson, Research Associate in UMN's Particle Technology Laboratory (PTL). The primary goal of the QA team was to provide independent opinions and guidance for the UMN research team in the development of QA protocols for the research and final evaluation of project data quality. This activity is described in this quality assurance project plan (QAPP), which is patterned after one of the U.S. Environmental Protection Agency (EPA) Quality System Series requirements and guidance documents.
NTIS
Air Sampling; Quality Control; Aerosols; Environment Protection

20030038950 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering, West Virginia Univ., Morgantown, Paul Scherrer Inst., Villigen (Switzerland)
Diesel Aerosol Sampling Methodology (CRC-E-43) Wind Tunnel Report
Kittelson, D. B.; Watts, W.; Johnson, J.; Drayton, M.; Paulsen, D.; 2002; In English
Report No.(s): PB2003-102762; No Copyright; Avail: National Technical Information Service (NTIS)

The University of Minnesota formed an international research team to conduct the CRC E-43 project Diesel Aerosol Sampling Methodology. The objectives of the E-43 project are: To determine the actual particle size distribution and particle number concentration in the exhaust plume from heavy-duty diesel vehicles operated on the road; To compare that information with data generated in emission test facilities to determine if current sampling and analysis methods are adequate for characterizing particle size; To examine particle transformations as the plume disperses downwind of the roadway in a typical urban situation; To characterize the bulk diesel particulate matter chemical composition and to determine surface properties and composition. The goal of E-43 is to develop laboratory methods to measure diesel aerosol size that mimic results obtained under real-world roadway conditions. This entails a fundamental understanding of aerosol formation, transformation and measurement, and the physical processes that affect the size distribution such as dilution, nucleation, condensation, adsorption and coagulation. The result of this research will establish a link between aerosol size characteristics measured under real-world conditions to those measured in the laboratory.
NTIS
Aerosols; Wind Tunnel Tests; Air Pollution; Wind (Meteorology); Environment Pollution; Methodology

20030038959 ENVIRON International Corp., Novato, CA, Sonoma Technology, Inc., Petaluma, CA
Development of an Advanced Photochemical Model for Particulate Matter: PMCAMx
Morris, R.; Jan. 2003; In English
Report No.(s): PB2003-102775; No Copyright; Avail: National Technical Information Service (NTIS)
The report describes the development and testing of PMCAMx conducted under CRC sponsorship in project A-30. The report is organized as follows: Section 2 provides a background on the science and modeling approaches for PM as a basis for the following sections; Section 3 describes the PM modeling algorithms used in PMCAMx; Section 4 discusses the implementation of the PM modules in the PMCAMx code; Section 5 describes how PMCAMx was tested for a Los Angeles PM episode including the model performance evaluation, diagnostic and sensitivity testing. The study conclusions and recommendations for further work are presented in the Executive Summary to the report.
NTIS
Particulates; Air Quality; Mathematical Models; Photochemical Reactions; Air Pollution; Environmental Monitoring

20030038971 Savannah River Site, Aiken, SC
Cone Permeameter (TRADE MARK) Innovative Subsurface Characterization and Monitoring Technology. Characterization, Monitoring, and Sensor technology Crosscutting Program and Subsurface Contaminants Focus Area
Sep. 2000; In English
Report No.(s): DE2002-803413; DOE/EM-0632; No Copyright; Avail: National Technical Information Service (NTIS)
Cleanup of hazardous waste left after 50 years of U.S. production of nuclear weapons is the largest environmental management problem in the world. The DOE (Department of Energy) currently has 353 projects at 53 cleanup sites; the program is responsible for characterization and cleanup of approximately 9,000 release sites at these 53 sites. The cleanup of release sites involves the remediation of soil surface water and/or groundwater. In most cases where the contamination has moved into the subsurface, remedial treatment requires removal of groundwater for surface treatment, circulation of groundwater through a treatment cell, or circulation of treatment fluids or gases. In all cases, a detailed knowledge of the permeability distribution in the subsurface is needed to support groundwater modeling efforts and will lead to more efficient design of remedial systems. How It Works: The Cone Permeameter (Trademark) a sensor designed to be deployed using a cone penetrometer. The sensor measures air permeability and saturated hydraulic conductivity of soils at discrete intervals in the subsurface. These measurements allow one to predict how groundwater and air will move through the subsurface. Determining the permeability of sediments is essential for predicting the migration paths of contaminants and for designing optimal remediation strategies.
NTIS
Hazardous Materials; Radioactive Wastes; Waste Disposal; Environmental Cleanup; Soil Pollution; Soil Sampling

20030038984 National Inst. for Occupational Safety and Health, Cincinnati, OH
Health Hazard Evaluation Report: HETA 99-0266-2850, Costa Mesa Fire Department, Costa Mesa, California
Roegner, K. C.; Sieber, W. K.; Echt, A.; May 2001; 42 pp.
Report No.(s): PB2003-103028; HETA-99-0266-2850; No Copyright; Avail: CASI; A03, Hardcopy
On August 4, 1999, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Costa Mesa Fire Department (CMFD), located in Costa Mesa, California, to conduct a health hazard evaluation (HHE). The CMFD

was planning to install diesel exhaust filtration systems on some of their apparatus and wanted NIOSH to evaluate the effectiveness of the controls. In response to the request, NIOSH conducted pre- and post-control evaluations of diesel exhaust in two fire stations. The pre-control evaluations were conducted on November 8-11, 1999. Samples were collected to characterize contaminant concentrations at the fire stations, and to provide base line data for determining the effectiveness of the ceramic exhaust filters at controlling these contaminants. Airborne concentrations of elemental carbon, sulfur dioxide, nitric oxide, nitrogen dioxide, and volatile organic compounds were measured. After the ceramic filters were installed on the engines, a follow-up evaluation was conducted on March 14-17, 2000, to determine the controls effectiveness in reducing diesel soot in the fire stations.

NTIS

Fires; Hazards; California; Environment Pollution; Public Health

20030038994 Alaska Dept. of Fish and Game, Anchorage

EXXON VALDEZ Oil Spill State/Federal Natural Resources Damage Assessment Final Report. Effects of Hydrocarbons on Bivalves Following the EXXON VALDEZ Oil Spill. Fish/Shellfish Study 13

Trowbridge, C.; Baker, T. T.; Johnson, J. D.; Jan. 2002; 157 pp.

Report No.(s): PB2003-102851; No Copyright; Avail: CASI; A08, Hardcopy

The authors examined the effects of hydrocarbons on bivalve populations in Prince William Sound, Kenai Peninsula, Kodiak Island, and the Alaska Peninsula following the Exxon Valdez oil spill. The majority of sampling sites were exposed to low levels of aromatic hydrocarbons. One designated control site (Simpson Bay) was also partially contaminated by refined petroleum hydrocarbons. Bivalve tissues at oiled sites were found to have high levels of aromatic hydrocarbons. However, clam tissues were not severely affected histopathologically either in 1989 or 1990. The authors were unable to determine mortality rates of bivalves during this study. Growth rates of littleneck clams decreased as the levels of aromatic hydrocarbons increased. Growth rates of littleneck clams decreased as tide level increased. There were no significant differences in recruitment of young-of-the-year (YOY) littleneck clams between control and oiled sites in Prince William Sound. The initiation of future studies is recommended to study bivalve populations throughout Prince William Sound, Cook Inlet, Kodiak Island, and the Alaska Peninsula to provide baseline information in the event of another oil spill.

NTIS

Prince William Sound (Ak); Alaska; Hydrocarbons; Oil Slicks; Environment Pollution; Water Pollution; Valves; Fishes; Shellfish

20030038998 Lockheed Martin Hanford Corp., Richland, WA

Notice of Construction for Tank Waste Remediation System Vadose Zone Characterization

2002; 138 pp.; In English

Report No.(s): DE2002-802969; DOE/ORP-2000-05-REV-1; No Copyright; Avail: Department of Energy Information Bridge

The following description and any attachments and references are provided to the Washington State Department of Health (WDOH), Division of Radiation Protection, Air Emissions & Defense Waste Section as a notice of construction (NOC) in accordance with Washington Administrative Code (WAC) 246-247, Radiation Protection - Air Emissions. The WAC 246-247-060, 'Applications, registration, and licensing', states 'This section describes the information requirements for approval to construct, modify, and operate an emission unit. Any NOC requires the submittal of information listed in Appendix A.' Appendix A (WAC 246-247-1 10) lists the requirements that must be addressed. The original NOC was submitted in May of 1999 as DOE-99-34. Additionally, the following description, attachments and references are provided to the U.S. Environmental Protection Agency (EPA) as an NOC, in accordance with Title 40 Code of Federal Regulations (CFR), Part 61, 'National Emission Standards for Hazardous Air Pollutants.' This NOC covers the activities associated with vadose zone characterization within the Single-Shell Tank Farms located in the 200-East and 200-West Areas of the Hanford Site. Vadose zone characterization activities include the drilling and sampling of soil from the surface to the depth of groundwater. Boreholes that are drilled to groundwater will be extended into the aquifer a sufficient distance to enable a groundwater sample to be collected. Under extenuating circumstances it may be prudent to complete these characterization boreholes as groundwater monitoring wells.

NTIS

Vadose Water; Soils; Environment Protection; Environmental Monitoring; Water Pollution; Soil Pollution

20030045782 Lawrence Livermore National Lab., Livermore, CA

Comparative Environmental Performance of Two Diesel-Fuel Oxygenates: Dibutyl Maleate (DBM) and Triproplyene Glycol Monomethyl Ether (TGME)

Layton, D. W.; Marchetti, A. A.; Oct. 01, 2001; 16 pp.; In English

Report No.(s): DE2002-803163; UCRL-JC-145656; No Copyright; Avail: Department of Energy Information Bridge

Many studies have shown that the addition of oxygen bearing compounds to diesel fuel can significantly reduce particulate emissions. To assist in the evaluation of the environmental performance of diesel-fuel oxygenates, we have implemented a suite of diagnostic models for simulating the transport of compounds released to air, water, and soils/groundwater as well as regional landscapes. As a means of studying the comparative performance of DBM and TGME, we conducted a series of simulations for selected environmental media. Benzene and methyl tertiary butyl ether (MTBE) were also addressed because they represent benchmark fuel-related compounds that have been the subject of extensive environmental measurements and modeling. The simulations showed that DBM and TGME are less mobile in soil because of reduced vapor-phase transport and increased retention on soil particles. The key distinction between these two oxygenates is that DBM is predicted to have a greater potential than TGME for aerobic biodegradation, based on chemical structure. NTIS

Diesel Fuels; Dibutyl Compounds; Methyl Compounds; Glycols

20030045811 Iowa Univ., Iowa City, Iowa Dept. of Natural Resources, Des Moines

Greenhouse Gases Phase 3 - Carbon Storage Quantification and Methodology Demonstration. Final Report

Ney, R. A.; Schnoor, J. L.; Mancuso, M. A.; Espina, A.; Budhathoki, O.; Jun. 30, 2001; In English

Report No.(s): PB2003-102690; No Copyright; Avail: National Technical Information Service (NTIS)

In December, 1996, the Center for Global and Regional Environmental Research (CGRER) at the University of Iowa published the Iowa Greenhouse Gas Action Plan, a report prepared in cooperation with the Iowa Department of Natural Resources. The report included 16 recommendations for priority reductions in greenhouse gas emissions to prevent global warming and to improve the economy of the State. Recommendations included: energy efficiency, wind power development, reduction in fertilizer applications, capturing of methane at large hog lots, production of energy crops (switchgrass and poplars), market incentives, and carbon sequestration in forests, buffer strips, and prairies. Progress has been made on wind power development, switchgrass production, and some of the energy efficiency recommendations since 1996. However, the State has continued to use more energy and to emit more greenhouse gases each year. We are currently emitting about 100 million tons of carbon dioxide equivalents each year (100 million short tons CO2-eq/yr). That is an average of 35 tons of carbon dioxide into the atmosphere per year from each Iowa citizen, considering all our activities (industrial, commercial, residential, and transportation). It is the purpose of this report to provide quantification and demonstration of agricultural recommendations in the Iowa Greenhouse Gas Action Plan, i.e., carbon storage in forests (aboveground sequestration) and soils (below-ground sequestration), and energy crop utilization. These actions remain some of the most cost-effective means to reduce greenhouse gas emissions in the State of Iowa, together with energy efficiency. NTIS

Methodology; Iowa; Greenhouse Effect; Carbon

20030045816 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering, Paul Scherrer Inst., Villigen (Switzerland)

Suitability of Epiphaniometer Measurements for On-Road Experiments and Intercomparison with the Diffusion Charging Sensor

Bukowiecki, N.; Gysel, M.; Weingartner, E.; Baltensperger, U.; Johnson, J.; 2002; 26 pp.; In English

Report No.(s): PB2003-102764; No Copyright; Avail: CASI; A03, Hardcopy

During the Coordinating Research Council (CRC) E-43 project 'Diesel Aerosol Sampling Methodology' an epiphaniometer (EPI) was one of two instruments in use to measure surface properties of the sampled aerosol. This report describes the general instrument handling and the subsequent data analysis procedure, followed by the discussion of selected EPI data collected during the project. Data intercomparison is shown for EPI and diffusion charging sensor (DC) results. Further details on the surface area measurements during the E-43 project, also involving scanning mobility particle sizer (SMPS) measurements, are discussed. The selected examples (EPI measurements during an October 1999 truck chase experiment, during the wind tunnel study at Langley, VA in 1999 and during chassis dynamometer experiments in Spring 2000) will illustrate the possibilities and limits of the EPI for the respective experimental conditions. Results show that the epiphaniometer (EPI) provided reliable particle surface area concentrations with a minimal time resolution of 15 minutes and that the correlation to the DC was generally better for on-road truck chase experiments than for the other steady state

experiments, despite the high (but short) peak concentrations during the first experiment type.
NTIS
Aerosols; Air Quality; Air Pollution

20030045820 Energy Information Administration, Washington, DC
Voluntary Reporting of Greenhouse Gases, 2001
Feb. 2003; In English
Report No.(s): PB2003-102982; DOE/EIA-0608/2001; No Copyright; Avail: National Technical Information Service (NTIS)
The Voluntary Reporting of Greenhouse Gases Program, required by Section 1605(b) of the Energy Policy Act of 1992, records the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions. A total of 228 U.S. companies and other organizations reported to the Energy Information Administration (EIA) that, during 2001, they had undertaken 1,705 projects to reduce or sequester greenhouse gases. The reported greenhouse gas emission reductions for the projects reported included 222 million metric tons carbon dioxide equivalent of direct reductions, 71 million metric tons of indirect reductions, 8 million metric tons of reductions from carbon sequestration, and 15 million metric tons of unspecified reductions.
NTIS
Greenhouse Effect; Air Pollution; Pollution Monitoring

20030045826 National Inst. for Occupational Safety and Health, Cincinnati, OH
Health Hazard Evaluation Report: HETA 2000-0332-2827, NIOSH Exposure Assessment of Cellulose Insulation Applicators
McCleery, R. E.; McCullough, J.; Hall, R. M.; Fernback, J. E.; Mar. 2001; 114 pp.
Report No.(s): PB2003-103029; HETA-2000-0332-2827; No Copyright; Avail: CASI; A06, Hardcopy
In July 1994, cellulose insulation (CI) was nominated to the National Toxicology Program (NTP) for a comprehensive toxicological evaluation. The evaluation consisted of two components: (1) a bulk analytical characterization of CI and (2) an exposure assessment of U.S. contractors applying the CI in residential and commercial buildings. The National Institute for Occupational Safety and Health (NIOSH) was presented with an opportunity to assist in the evaluation of CI by conducting the exposure assessment through an interagency agreement with the National Institute of Environmental Health Sciences/NTP.
NTIS
Hazards; Health; Toxicology; Utilization; Air Sampling

20030051403 Pacific Northwest National Lab., Richland, WA
Investigations of Paleoclimate Variations Using Accelerator Mass Spectrometry
Southon, J. R.; Kashgarian, M.; Brown, T. A.; Aug. 24, 2000; 24 pp.; In English
Report No.(s): DE2002-15001984; No Copyright; Avail: Department of Energy Information Bridge
This project has used Accelerator Mass Spectrometry (AMS) (14)C measurements to study climate and carbon cycle variations on time scales from decades to millennia over the past 30,000 years, primarily in the western US and the North Pacific. (14)C dates provide a temporal framework for records of climate change, and natural radiocarbon acts as a carbon cycle tracer in independently dated records. The overall basis for the study is the observation that attempts to model future climate and carbon cycle changes cannot be taken seriously if the models have not been adequately tested. Paleoclimate studies are unique because they provide realistic test data under climate conditions significantly different from those of the present, whereas instrumental results can only sample the system as it is today. The aim of this project has been to better establish the extent, timing, and causes of past climate perturbations, and the carbon cycle changes with which they are linked.
NTIS
Mass Spectroscopy; Accelerators; Paleoclimatology; Carbon Cycle

20030051513 Transportation Research Board, Washington, DC
Quantifying Air Quality and Other Benefits and Costs of Transportation Control Measures
2001; In English
Report No.(s): PB2003-500024; TRB-NCHRP-462-CD; Copyright; Avail: National Technical Information Service (NTIS)
This report presents potential improvements to the analytical framework for assessing the air quality and other benefits and costs of transportation air quality control strategies. Short and long range improvements are included that will enhance the metropolitan planning models being used and considered in major metropolitan areas. The report also discusses how a

monitoring program can augment quantitative analysis to provide a more full understanding of the air quality impacts of transportation control measures. The CD-ROM contains more detailed research results. Air quality specialists will find the report helpful, particularly when considering improvements to their analysis systems.
NTIS
Air Quality; Transportation; Quantitative Analysis; Quality Control

20030051526 Alaska Dept. of Fish and Game, Cordova
EXXON VALDEZ Oil Spill Restoration Project 99188 Final Report: Otolith Marking of Pink Salmon in Prince William Sound Salmon Hatcheries
Joyce, T. L.; Evans, D. G.; Sep. 2002; 84 pp.
Report No.(s): PB2003-102847; No Copyright; Avail: CASI; A05, Hardcopy

In the fall of 1995, 1996, and 1997, thermal marks were applied to otoliths of all hatchery pink salmon in Prince William Sound (PWS). The marks were highly visible on voucher samples taken from hatchery fry in the spring of 1996, 1997 and 1998. For brood year 1996 and 1997 pink salmon, accessory thermal marks, applied after the fry hatched, allowed identification of within-hatchery treatment groups. Double-blind tests were conducted to assess the ability of laboratory personnel to correctly identify hatchery otolith marks laid down in brood years 1995-1997 salmon. The tests indicated that the probability of a successful identification between hatchery and wild pink salmon was 99.6\%, 99.7\% and 99.3\% for brood years 1995-1997, respectively. Catch-sampling and estimation protocols were used to estimate the contribution of hatchery fish to PWS 1997 and 1998 pink salmon commercial fisheries. Preliminary estimates of the stock composition of an area-time specific catch were available within 24 hours after fishery closures.
NTIS
Otolith Organs; Fishes; Prince William Sound (Ak); Oil Slicks; Fisheries

20030051540 Environmental Quality Management, Inc., Cincinnati, OH, Camp, Dresser and McKee, Inc., Cincinnati, OH
Exfiltration in Sewer Systems
Amick, R. S.; Burgess, E. H.; Dec. 2000; 44 pp.; In English
Report No.(s): PB2003-103053; No Copyright; Avail: CASI; A03, Hardcopy

The study focused on the quantification of leakage of sanitary and industrial sewage from sanitary sewer pipes on a national basis. The method for estimating exfiltration amounts utilized groundwater table information to identify areas of the country where the hydraulic gradients of the sewage are typically positive, i.e., the sewage flow surface (within pipelines) is above the groundwater table. An examination of groundwater table elevations on a national basis reveals that the contiguous USA is comprised of groundwater regions (established by the U.S. Geological Survey) which are markedly different. Much of the northeastern, southeastern, and midwestern USA has relatively high groundwater tables that are higher than the sewage flow surface, resulting in inflow or infiltration. Conversely, a combination of relatively low groundwater tables and shallow sewers creates the potential for widespread exfiltration in communities located in the western USA. This report presents information on typical sewer systems, identifies and assesses the factors that cause or probably cause exfiltration, presents commonly used and advanced corrective measures and their costs for dealing with exfiltration, identifies technology gaps, and recommends associated research needs and priorities. This report also examines urban exfiltration, including a case study of Albuquerque, New Mexico.
NTIS
Filtration; Sewers; Leakage; Water Tables; Ground Water

20030051545 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Municipal Solid Waste Landfills: Background Information Document for National Emission Standards for Hazardous Air Pollutants (NESHAP). Public Comments and Responses
Nov. 2002; 72 pp.; In English
Report No.(s): PB2003-103057; EPA/453/R-02/014; No Copyright; Avail: CASI; A04, Hardcopy

On November 7, 2000, the U.S. Environmental Protection Agency (EPA) proposed national emission standards for hazardous air pollutants (NESHAP) for municipal solid waste (MSW) landfills. The proposed rule fulfills the requirements of the Clean Air Act (CAA), which requires EPA to regulate emissions of hazardous air pollutants (HAP) listed in section 112(b) of the CAA. In addition, the proposed rule would help implement the Urban Air Toxics Strategy developed under section 112(k) of the CAA. This document contains summaries of the public comments that EPA received on the November 7, 2000 proposal and the May 23, 2002 supplemental proposal to establish NESHAP for MSW landfills. In this document, EPA

responds to the public comments. This summary of public comments and EPA responses serves as the basis for revisions made to the landfills NESHAP between proposal and promulgation.
NTIS
Air Pollution; Environment Protection; Standards; Solid Wastes; Landfills; Exhaust Emission

20030051551 Eastern Research Group, Inc., Morrisville, NC
Nonmethane Organic Compounds (NMOC) and Speciated Nonmethane Organic Compounds (SNMOC) Monitoring Program, 2001
May 2002; 118 pp.; In English
Report No.(s): PB2003-103056; No Copyright; Avail: CASI; A06, Hardcopy

This report summarizes and interprets ambient air monitoring data collected during the summer of 2001 as part of the National Nonmethane Organic Compound and Speciated Nonmethane Organic Compound Monitoring Program, which is also called the NMOC/SNMOC Monitoring Program. Designed to characterize levels of air pollution in regions with ground-level ozone problems, the NMOC/SNMOC Monitoring Program measures air concentrations of several groups of pollutants that contribute to the photochemical reactions that form smog. The 2001 NMOC/SNMOC Monitoring Program spanned four months (June to September), during which ambient air samples were collected daily between 6:00 a.m. and 9:00 a.m., local time, at two monitoring locations. These samples were analyzed for NMOC and SNMOC. Overall, over 8,600 ambient air concentrations were measured during the 2001 program.
NTIS
Environmental Monitoring; Organic Compounds; Air Pollution; Air Quality; Ecology

20030051590 Brookhaven National Lab., Upton, NY
Ozone Production in the Phoenix Urban Plume
Kleinman, L. I.; Daum, P. H.; Klotz, P.; Lee, Y. N.; Nunnermacker, L. J.; Sep. 1999; 10 pp.; In English
Report No.(s): DE2002-750766; BNL-66852; No Copyright; Avail: Department of Energy Information Bridge

In May and June of 1998, the Department of Energy's Atmospheric Chemistry Program conducted an aircraft and surface based field campaign in Phoenix, Arizona, with the overall goal of obtaining a mechanistic understanding of O3 formation in the metropolitan area. Participants in the study included scientists from the Arizona Department of Environmental Quality, Argonne National Laboratory, Brookhaven National Laboratory, and Pacific Northwest National Laboratory.
NTIS
Air Pollution; Ozone; Plumes

20030051602 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Economic Impact Analysis for the Supplemental to the Municipal Solid Waste (MSW) NESHAP
Dec. 2002; 28 pp.
Report No.(s): PB2003-102261; EPA/452/R-03/001; No Copyright; Avail: CASI; A03, Hardcopy

This economic impact analysis is in support of a regulatory action in a supplemental to the national emission standards for hazardous air pollutants (NESHAP) for municipal solid waste (MSW) landfills. On November 7, 2002, EPA proposed NESHAP for MSW landfills and requested comments on bioreactors. Based on comments to the proposed rule and additional information and analyses, EPA is adding a definition of bioreactors to the rule and is issuing timely control for bioreactors located at MSW landfills with a design capacity greater than or equal to 2.5 million Mg and 2. 5 million m(cu) meters. This analysis is intended to provide information on the impacts of this supplemental on directly affected entities, as well as some information on the impacts on indirectly affected entities such as governments and communities. Included also is a profile of landfills and the use of bioreactors at landfills.
NTIS
Air Pollution; Bioreactors; Landfills; Solid Wastes

20030052015 Office of Air Quality Planning and Standards, Research Triangle Park, NC, Battelle Memorial Inst., Arlington, VA
Data Quality and Objectives (DQOs)for Relating Federal Reference Method (FRM) and Continuous PM(sub 2.5) Measurements to Report an Air Quality Index (AQI)
Eberly, S.; Hanley, T.; Weinstock, L.; Fitz-Simons, T.; Tamanini, T.; Nov. 2002; 108 pp.; In English
Report No.(s): PB2003-103058; EPA/454/B-02/002; No Copyright; Avail: CASI; A06, Hardcopy

According to Part 58.50 of 40 CFR, all Metropolitan Statistical Areas (MSAs) with a population of 350,000 or greater are required to report daily air quality using the Air Quality Index (AQI) to the general public. AQI is calculated from concentrations of five criteria pollutants: ozone (O3), particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO2), and nitrogen dioxide (NO2). According to Part 58 of 40 CFR, Appendix G, particulate matter measurements from non-Federal Reference Method (FRM) monitors may be used for the purpose of reporting the AQI if a linear relationship between these measurements and reference or equivalent method measurements can be established by statistical linear regression. This report provides guidance to MSA's for establishing a relationship between FRM and continuous PM2.5 measurements.
NTIS
Air Quality; Carbon Monoxide; Monitors; Ozone; Chemical Analysis; Air Pollution; Pollution Monitoring

20030052050 Bureau of Mines, Washington, DC
Hybrid Fiber-Optic Electrochemical Carbon Monoxide Monitor
Chilton, J. E.; Carpenter, C. R.; 1992; 24 pp.
Report No.(s): PB2003-103264; BUMINES-RI-9423; No Copyright; Avail: CASI; A03, Hardcopy
The U.S. Bureau of Mines has developed an intrinsically safe carbon monoxide (CO) monitoring system for mines by coupling a fiber-optic data telemetry (FODT) system with a prototype electrochemical CO monitor. This report discusses the performance of the FODT system and characteristics of the CO monitor such as response times, linearity, and temperature and pressure effects.
NTIS
Monitors; Fiber Optics; Electrochemistry; Carbon Monoxide; Air Pollution

20030052099 Fluor Hanford, Richland, WA
236-Z/291-Z Vacuum Pump System Flow Determination
2002; 14 pp.; In English
Report No.(s): DE2002-803648; HNF-6327; No Copyright; Avail: Department of Energy Information Bridge
There are two sample vacuum pump systems at the Plutonium Finishing Plant facility for obtaining record samples and air monitoring. One pump is located in 236-Z and provides services to only that building, the second pump system is located in 291-Z and provides services to 291-Z, 232-Z, 2736-Z and 234-5Z. Both systems operate at 17 inHg vacuum.
NTIS
Vacuum Pumps; Exhaust Systems

20030052164 Lawrence Livermore National Lab., Livermore, CA
LES and RANS Model Evaluations of Flow Around a Complex Building
Calhoun, R.; Chan, S.; Lee, R.; Leone, J.; Shinn, J.; Jun. 02, 2000; 8 pp.; In English
Report No.(s): DE2002-793949; UCRL-JC-139185; No Copyright; Avail: Department of Energy Information Bridge
We compare the results of computer simulated flow fields around a complex building (B170) at Lawrence Livermore National Laboratory (LLNL) with field measurements. This is the first stage of a larger effort to assess the ability of computational fluid dynamics (CFD) models to predict atmospheric dispersion scenarios around building complexes. At this stage, the focus is on accurate simulation of the velocity field. Two types of simulations were performed: predictive and post-experiment. The purpose of the predictive runs was primarily to provide initial guidance for the planning of the experiment. By developing an approximate understanding of the major features of the flow field, we were able to more effectively deploy the sensors.
NTIS
Computational Fluid Dynamics; Computerized Simulation; Flow Distribution; Buildings

20030052192 Lawrence Livermore National Lab., Livermore, CA
Evaluation of Two Advanced Turbulence Models for Simulating the Flow and Dispersion Around Buildings
Chan, S. T.; Stevens, D. E.; Mar. 14, 2000; In English
Report No.(s): DE2002-791454; UCRL-JC-135557; No Copyright; Avail: National Technical Information Service (NTIS)
Numerical modeling of airflow and pollutant dispersion around buildings is a challenging task due to the geometrical variations of buildings and the extremely complex flow created by such surface-mounted obstacles. The airflow around buildings inevitably involves impingement and separation regions, building wakes with multiple vortices, and jetting effects in street canyons. The interference from adjacent buildings further complicates the flow and dispersion patterns. Thus accurate

simulations of building-scale transport phenomena requires not only appropriate physics submodels but also significant computing resources. We have developed an efficient, high resolution CFD model for simulating chemical and biological releases around buildings. Our primary goal is to support incident response and preparedness in emergency response planning and vulnerability analysis.
NTIS
Air Flow; Buildings; Turbulence Models

20030052198 Brookhaven National Lab., Upton, NY
Trace Gas Measurements in Phoenix, Arizona (1998)
Nunnermacker, L. J.; Weinstein-Lloyd, J.; Daum, P. H.; Kleinman, L. I.; Lee, Y. N.; Oct. 1999; 10 pp.; In English
Report No.(s): DE2002-750768; BNL-66838; No Copyright; Avail: Department of Energy Information Bridge
The DOE Atmospheric Chemistry Program, and the Arizona Department of Environmental Quality (DEQ) conducted a field program in the Phoenix Metropolitan area in the late spring of 1998. The experiment was composed of a linked set of aircraft and surface measurements designed to characterize the chemical and meteorological processes leading to ozone episodes. The existing network of Arizona DEQ sites in Phoenix was utilized to document ground level concentrations of ozone and its precursors. West of the downtown area, a site (Usery Pass) was set up for the detailed characterization of the mature Phoenix urban plume. Detailed measurements in the source region were made at several sites in downtown Phoenix. are in the Eastern US. The latter includes significant differences in atmospheric humidity, solar intensity, and boundary layer heights. The objective of this paper is to describe general features of the chemical and meteorological data collected during the program and to present results from an aircraft case study when O3 concentrations were among the highest measured during the entire study.
NTIS
Trace Elements; Ozone; Gas Analysis

20030052241 Research Triangle Inst., Research Triangle Park, NC, Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering
Carbon Dioxide Capture from Flue Gas using Dry Regenerable Sorbents
Green, D. A.; Turk, B. S.; Portzer, J. W.; Gupta, R. P.; McMichael, W. J.; Jul. 2002; In English
Report No.(s): DE2003-803845; No Copyright; Avail: National Technical Information Service (NTIS)
The objective of this project is to develop a simple, inexpensive process to separate CO2 as an essentially pure stream from a fossil fuel combustion system using a regenerable sorbent. The sorbents being investigated in this project are primarily alkali carbonates, and particularly sodium carbonate and potassium carbonate, which are converted to bicarbonates through reaction with carbon dioxide and water vapor. Bicarbonates are regenerated to carbonates when heated, producing a nearly pure CO2 stream after condensation of water vapor. This quarter, electrobalance tests conducted at LSU suggested that the severity of calcinations conditions had a noticeable effect on the carbonation activity of trona during subsequent cycles, while the effect of calcination severity on sodium bicarbonate was much less significant.
NTIS
Carbon Dioxide; Flue Gases; Sorbents; Phase Separation (Materials)

20030052284 Office of Air Quality Planning and Standards, Research Triangle Park, NC
National Emission Standards for Hazardous Air Pollutants (NESHAP) for Taconite Iron Ore Processing Plants. Background Information for Proposed Standards
Sarsony, C.; Chin, C. K.; Dec. 2002; 242 pp.
Report No.(s): PB2003-102260; EPA/453/R-02/015; No Copyright; Avail: CASI; A11, Hardcopy
This background information document (BID) provides information relevant to the proposal of national emission standards for hazardous air pollutants (NESHAP) for limiting hazardous air pollutants (HAP) emissions from taconite iron ore processing plants. The standards are being developed according to section 112(d) of Title III of the Clean Air Act (CAA) as amended in 1990.
NTIS
Air Pollution; Pollution Control; Iron Ores; Exhaust Emission

20030052294 Purdue Univ., West Lafayette, IN

Effects of Varying the Tire Cap Ply, Sidewall Filler Height and Pavement Surface Texture on Tire/Pavement Noise Generation

Bernhard, R. J.; Thornton, W. D.; Baumann, J.; Feb. 2003; In English

Report No.(s): PB2003-103286; No Copyright; Avail: National Technical Information Service (NTIS)

In order to better understand the effect of tire carcass construction and pavement texture on tire/pavement noise generation, a measurement program was conducted on a group of four automobile tires on three pavement textures. The tires included all combinations of cap ply, no cap ply, sidewall filler height of 1.75 inches and sidewall filler height of 0. 35 inches. The tires, General AmeriG4S, P205/65R15, were nominally identical in all other respects including tread pattern and rubber compound properties. During this investigation, other tire design variables such as tire pressure and rim size were held constant. The pavement samples were made of rigid Portland Cement Concrete (PCC) pavement sections with smooth, textured and porous surface textures. Tests were conducted at speeds of 10, 20 and 30 mph. The Tire/Pavement Test Apparatus (TPTA) at the Ray W. Herrick Laboratories at Purdue University was used for the tests. Five microphones were used to measure the sound generated by the tire/pavement interaction.

NTIS

Tires; Noise Generators; Pavements

20030052302 National Risk Management Research Lab., Cincinnati, OH

Planning and Implementing a Real-Time Air Pollution Monitoring and Outreach Program for Your Community. The AirBeat Project of Roxbury, Massachusetts

Nov. 2002; In English

Report No.(s): PB2003-103650; EPA/625/R-02/012; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction (About the EMPACT Program, About the AirBeat Project, About This Handbook, For More Information); How to use this handbook; About ground-level ozone and fine particulate matter (About Ozone, About Fine Particulate Matter, About Black Carbon, National Ambient Air Quality Standards for Ozone and Particulate Matter, Existing Monitoring Programs for Ozone and Particulate Matter, The Air Quality Index-A Tool for Reporting Air Quality Information, For More Information); Beginning the program (Program Structure: Overview of a Community-Based Air Pollution Monitoring and Outreach Program, Selecting Program Partners, Identifying Potentially Impacted Communities, Getting To Know the Community, Estimating Program Costs); Monitoring (Overview of AirBeat's Monitoring Efforts, Key Steps in Designing and Implementing a Monitoring System, For More Information); Data management (Introduction to Data Management, Overview of AirBeat's Data Management Efforts, Hardware Components Used to Operate the Data Management Center, Software Components Used to Operate the Data Management Center, Creating the AirBeat Web Site, Creating the Telephone Hotline); Education and Outreach (Developing an Outreach Plan, Education and Outreach Tools, Evaluating the Effectiveness of Outreach Efforts); Appendices.

NTIS

Air Pollution; Pollution Monitoring

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*.

20030037139 Wisconsin Univ.-Madison. Space Science and Engineering Center

History of the University of Wisconsin Atmospheric Emitted Radiance Interferometer (AERI) Prototype During the Period April 1994 Through July 1995

Knuteson, R.; Whitney, B.; Revercomb, H.; Best, F.; Jun. 1999; 52 pp.; In English

Report No.(s): PB2003-102719; ARM-TR-001-1; No Copyright; Avail: CASI; A04, Hardcopy

This document describes reprocessing of data collected with the University of Wisconsin (UW) Atmospheric Emitted Radiance Interferometer (AERI) prototype at the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Programs Southern Great Plains (SGP) Cloud And Radiation Testbed Central Facility (CART CF) during the period April 1994 through July 1995. Two corrections have been applied to the downwelling atmospheric radiance observed by the AERI prototype during the period April 11, 1994, through April 28, 1995. The first is a small calibration refinement that accounts for an improved characterization of the AERI prototype blackbodies based upon thermal modeling and cavity paint spectral

measurements. The second correction was required to remove the effect of an obstruction that was found in the AERI prototype sky field of view. The obstruction caused an error of several percent of ambient radiance, substantially exceeding the AERI calibration uncertainty of less than about 1\%. The basis for the sky field of view obstruction correction came from coincident downwelling radiance data of the AERI facility instrument (AERI-01), which was first deployed to the SGP CART CF in April 1995. The obstruction in the AERI prototype was removed on April 28, 1995. The reprocessing of data from the period April 29, 1995, through May 31, 1995, required only the smaller hot blackbody correction. The real-time processing software was modified at that time such that no correction was required for the AERI prototype data beginning June 1, 1995, through the last full day of operation, July 25, 1995. The data corrections described in this document bring the corrected AERI prototype (AERI-00) data in the period April 1994 through July 1995 up to a level of quality comparable to the AERI-01 facility instrument, though with somewhat greater absolute uncertainties.
NTIS
Radiance; Interferometers; Airglow

20030038879 Virginia Polytechnic Inst. and State Univ., Blacksburg. Office of Sponsored Programs
24-Channel Geophone Array for Horizontal or Vertical Boreholes. August 2002
Westman, E. C.; Jul. 2002; 12 pp.; In English
Report No.(s): DE2002-802179; No Copyright; Avail: Department of Energy Information Bridge

This report describes the technical progress on a project to design and construct a multichannel geophone array that improves tomographic imaging capabilities in both surface and underground mines. Especially important in the design of the array is sensor placement. One issue related to sensor placement is addressed in this report: the method for orienting the sensor once it is emplaced in the borehole. If the sensors (geophones) do not have the same orientation, the data will be essentially worthless. Improved imaging capabilities will produce energy, environmental, and economic benefits by increasing exploration accuracy and reducing operating costs.
NTIS
Arrays; Boreholes; Seismographs

20030051589 Lawrence Livermore National Lab., Livermore, CA
2-D and 3-D Elastic Modeling with Shared Seismic Models
House, L.; Marfurt, K. J.; Shawn, S.; Martin, G. S.; Apr. 30, 2002; 10 pp.; In English
Report No.(s): DE2002-803189; UCRL-JC-148350; No Copyright; Avail: Department of Energy Information Bridge

Several elastic models, both 2-D and 3-D. are being built for use in calculating synthetic elastic seismic data. The models will be made available to the research community, along with the synthetic data that are being calculated from them. These shared models have been proposed or contributed by participants in a collaborative industry, national laboratory. and university research project. The purpose of the modeling is to provide synthetic data to better understand elastic wave propagation and the effects of structural and stratigraphic complexities. The 2-D models are easier to design and change and synthetic calculations can be run relatively quickly in them. It will be possible to alter their layer properties and calculate time-lapse data sets from them. Field data will be available to accompany many of the 2-D models. 3-D models are more realistic, but more difficult to design and change. They also require considerably more computing resources to calculate synthetic data from them. A new 3-D model is being designed, and will be used for computing synthetic elastic data.
NTIS
Three Dimensional Models; Two Dimensional Models; Elastic Waves; Seismic Waves; Geophysics; Exploration

20030052022 Hawaii Univ., Honolulu, HI, USA
Finding the Onset of Convection in Main Sequence Stars
Simon, Theodore; [2003]; 12 pp.; In English
Contract(s)/Grant(s): NAG5-8979; No Copyright; Avail: CASI; A03, Hardcopy

The primary goal of the work performed under this grant was to locate, if possible, the onset of subphotospheric convection zones in normal main sequence stars by using the presence of emission in high temperature lines in far ultraviolet spectra from the FUSE spacecraft as a proxy for convection. The change in stellar structure represented by this boundary between radiative and convective stars has always been difficult to find by other empirical means. A search was conducted through observations of a sample of A-type stars, which were somewhat hotter and more massive than the Sun, and which were

carefully chosen to bridge the theoretically expected radiative/convective boundary line along the main sequence.
Author
Convection; Main Sequence Stars; Stellar Structure; Emission Spectra

20030052732 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A New Fitting Procedure for the Blended He I 1083 nm Multiplet
Jones, H. P.; Malanushenko, O. V.; [2003]; 1 pp.; In English; SHINE 2003 Workshop, 6-11 Jul. 2003, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

The He I 1083 nm multiplet is a powerful tool for observing the outer solar atmosphere but is difficult to analyze because the lines are weak, highly variable, and spectrally blended, both internally and with other neighboring solar and telluric lines. After separation from nearby spectral features, two components of the He I multiplet are resolved. Fitting these lines with two unconstrained Gaussian profiles always gives a ratio of major to minor component of less than half the value which would be expected for optically thin lines. One possibility for explaining the discrepancy between the weakness of the lines and the ratio of the spectral components is to assume that the line formation regions are concentrated in laterally unresolved, optically thick structures with small filling factor. However, we present here a least-squares fitting technique using cubic splines with fixed breakpoints with the constraint that the blend is the sum of three identically shaped profiles shifted in wavelength according to the atomic structure of the blend and weighted by the corresponding statistics weights, in agreement with optically thin line formation. The basis functions for the fitting procedure have no built-in spectral symmetry or shape. The resulting underlying profiles tend to be asymmetric with excess absorption to the blue, consistent with formation by 'hot' and 'cool' spatial elements within the observed volume, with the hotter regions having differential motion toward the observer. The results agree well with NASA/XSO Spectromagnetograph observations in quiet sun and coronal holes. Partial funding of this research was provided through the NASA Sun-Earth Connection SR&T program.
Author
Helium Isotopes; Solar Spectra; Solar Terrestrial Interactions; Coronal Holes

20030052734 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Single Station System and Method of Locating Lightning Strikes
Medelius, Pedro J., Inventor; Starr, Stanley O., Inventor; April 22, 2003; 18 pp.; In English
Patent Info.: Filed: 10 Jul. 2001; No Copyright; Avail: CASI; A03, Hardcopy

An embodiment of the present invention uses a single detection system to approximate a location of lightning strikes. This system is triggered by a broadband RF detector and measures a time until the arrival of a leading edge of the thunder acoustic pulse. This time difference is used to determine a slant range R from the detector to the closest approach of the lightning. The azimuth and elevation are determined by an array of acoustic sensors. The leading edge of the thunder waveform is cross-correlated between the various acoustic sensors in the array to determine the difference in time of arrival, AT. A set of AT S is used to determine the direction of arrival, AZ and EL. The three estimated variables (R, AZ, EL) are used to locate a probable point of the lightning strike.
Author
Detection; Elevation; Lightning; Position (Location); Signal Detectors; Sound Waves

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20030037179 Lawrence Livermore National Lab., Livermore, CA
Intercomparison of Climate Data Sets as a Measure of Observational Uncertainty
Feb. 22, 2002; In English
Report No.(s): DE2002-15002142; UCRL-ID-147371; No Copyright; Avail: National Technical Information Service (NTIS)

Uncertainties in climate observations are revealed when alternate observationally based data sets are compared. General circulation model-based 'reanalyses' of meteorological observations will yield different results from different models, even if identical sets of raw unanalyzed data form their starting points. We have examined 25 longitude-latitude fields (including selected levels for three-dimensional quantities) encompassing atmospheric climate variables for which the PCMDI observational data base contains two or more high-quality sources. For the most part we compare ECMWF with NCEP reanalysis. In some cases, we compare in situ and/or satellite-derived data with reanalysis. To obtain an overview of the

differences for all 25 fields, we use a graphical technique developed for climate model diagnosis: a 'portrait diagram' displaying root-mean-square differences between the alternate data sources. With a few exceptions (arising from the requirement that RMS differences be normalized to accommodate different units of variables) the portrait diagrams indicate areas of agreement and disagreement that can be confirmed by examining traditional graphics such as zonal mean plots. In accord with conventional wisdom, the greatest agreement between alternate data sets - hence the smallest implied observational uncertainty - occurs for upper tropospheric zonal wind. We also find fairly good agreement between reanalysis and more direct measures of precipitation, suggesting that modern observational systems are resolving some longstanding problems with its measurement.
NTIS
Climate Models; Data Processing

20030038970 National Center for Atmospheric Research, Boulder, CO, California Univ., Los Angeles. Dept. of Atmospheric Sciences
Modeling Global Oceanic Inter-Annual Variability (1958-1997): Simulation Design and Model-Data Evaluation
Doney, S. C.; Yeager, S.; Danabasoglu, G.; Large, W. G.; McWilliams, J. C.; Jan. 2003; In English
Report No.(s): PB2003-102292; NCAR/TN-452-STR; No Copyright; Avail: National Technical Information Service (NTIS)
The ocean exhibits significant low frequency variability across a range of spatial scales from regional to global, with much of the signal associated with atmosphere-ocean climate modes. Here the authors explore and evaluate the simulated inter-annual variability from the oceanic component of the global NCAR Community Climate System Model (CCSM) forced with historical (1958-1997) surface atmospheric reanalysis estimates and assorted satellite data products. The simulations are conducted in a fully prognostic mode, reserving the oceanic observational data sets as independent measures of model skill. A new anisotropic, horizontal viscosity scheme is introduced that, atypical for coarse resolution models, results in the separation of the Gulf Stream off Cape Hatteras and the southward penetration of the sub-polar gyre along the east coast of North America. The framework for the forced historical simulations is discussed, and the model long-term subsurface drift and initial condition sensitivity are characterized. Overall, the model shows considerable skill in replicating observed inter-annual variability.
NTIS
Annual Variations; Climate Models; Air Water Interactions; Ocean Models

20030038982 Lawrence Livermore National Lab., Livermore, CA
Comparison of Aerosol Properties Within and Above the ABL at the ARM Program's SGP Site
Monache, L. D.; May 01, 2002; In English
Report No.(s): DE2002-15001986; UCRL-LR-146711; No Copyright; Avail: National Technical Information Service (NTIS)
The goal of this thesis is to determine under what conditions, if any, measurements of aerosol properties made at the Earths surface are representative of aerosol properties within the column of air above the surface. This thesis will use data from the Atmospheric Radiation Measurement (ARM) site at the Southern Great Plains (SGP) which is the only location in the world where ground-based and in situ airborne measurements are made on a routine basis. All flight legs in the one year period from March 2000 to March 2001 were categorized as either within or above the atmospheric boundary layer using an objective mixing height determination technique. The correlations between the aerosol properties measured at the surface and the measured within and above the ABL were then computed. The conclusion of this comparison is that the aerosol extensive and intensive properties measured at the surface are representative of values within the ABL, but not within the free atmosphere.
NTIS
Aerosols; Dust; Great Plains Corridor (North America)

20030038990 Lawrence Livermore National Lab., Livermore, CA
Uncertainty in Dispersion Forecasting using Meteorological Ensembles
Leach, M. J.; Chin, H. -N.; Mar. 23, 2000; 14 pp.; In English
Report No.(s): DE2002-15002080; UCRL-JC-134884-REV-1; No Copyright; Avail: Department of Energy Information Bridge
A approach for quantifying meteorological uncertainty is via development of an ensemble of forecasts from slightly perturbed initial conditions (Sivillo et al., 1997) to predict the time evolution of the probability density function of atmospheric variables (Mullen and Baurnhefner, 1994). We create an ensemble of forecasts by varying the initial (and boundary) conditions for the COAMPS meteorological model. The variations in the initial conditions must be consistent with analysis error.

Optimally, the range of initial conditions would encompass the true atmospheric state, but which is never actually known. Our method for creating varying initial conditions is to use different global data sets to derive the necessary data. We use two models from the National Weather Service (the AVN and ETA models) and one from the Navy (the NOGAPS model). In addition to those data sets we perturb the data from those models, using a normally distributed random number at each grid point in the COAMPS model. We perturb the (u, v) wind components, the temperature and the moisture. The size of the perturbation is determined by the variability within that variable field. The forecasts are run for 48 hours. We then use the output from the COAMPS model to drive a Lagrangian dispersion model (LODI) for simulated releases. The results from a simulated release from hour 33 are shown in Figure 1. The center of the domain is Oakland airport and the basic on-shore wind is from the southwest. In three of the simulations, the plume goes over the top of the hills to the northeast, and in the other three the plume hugs the coastline and goes around those hills The two solutions reflect a dependence on the Froude number, a ratio of the Kinetic energy to Potential energy. Higher Kinetic energy flow (Higher Froude number) flow goes over the top of the mountain, while lower Kinetic energy flow goes around the hills.
NTIS
Weather Forecasting; Air Pollution; Wind (Meteorology); Mathematical Models; Climatology; Atmospheric Models

20030045728 Lawrence Livermore National Lab., Livermore, CA
Long Range Weather Prediction III: Miniaturized Distributed Sensors for Global Atmospheric Measurements
Teller, E.; Leith, C.; Canavan, G.; Wood, L.; Nov. 13, 2001; In English
Report No.(s): DE2002-15002367; UCRL-JC-146204-PT-3; No Copyright; Avail: National Technical Information Service (NTIS)

We continue consideration of ways-and-means for creating, in an evolutionary, ever-more-powerful manner, a continually-updated data-base of salient atmospheric properties sufficient for finite differenced integration-based, high-fidelity weather prediction over intervals of 2-3 weeks, leveraging the lo to the 14th power FLOPS digital computing systems now coming into existence. A constellation comprised of 10 to the 6th power - 10 to the 9th power small atmospheric sampling systems - high-tech superpressure balloons carrying early 21st century semiconductor devices, drifting with the local winds over the meteorological spectrum of pressure-altitudes - that assays all portions of the troposphere and lower stratosphere remains the central feature of the proposed system. We suggest that these devices should be active-signaling, rather than passive-transponding, as we had previously proposed only for the ground- and aquatic-situated sensors of this system.
NTIS
Weather Forecasting; Meteorological Parameters; Atmospheric Chemistry; Air Sampling

20030045812 Iowa Univ., Iowa City
Carbon Storage and Change in Iowa Forest Ecosystem
Jan. 2000; In English
Report No.(s): PB2003-102692; No Copyright; Avail: National Technical Information Service (NTIS)

Increases of atmospheric greenhouse gases and the potential consequences of future climate change have generated interest in understanding and quantifying the role of terrestrial ecosystems in the carbon cycle. Forest ecosystems are capable of storing large quantities of carbon in trunks, limbs, roots, and soil, providing an important terrestrial 'sink' for carbon dioxide (PCC/UNEP/OECD/IEA, 1997). Conversion of forests to other land uses can result in net emissions of CO2, while forest regeneration will, over time, result in uptake. The purpose of this study was to complete a GIS presentation of annual carbon storage increments resulting from forest management and land use changes in Iowa and to establish a baseline inventory of above and below ground carbon storage for the year 1990.
NTIS
Ecosystems; Iowa; Carbon; Climate Change

20030051410 Lawrence Livermore National Lab., Livermore, CA
Meteorological Monitoring on Bikini Atoll: System Description Data Summary (May 2000-April 2001)
Gouveia, F.; Bradsher, R.; Brunk, J.; Robinson, W.; Hamilton, T.; Jan. 01, 2002; In English
Report No.(s): DE2002-15002223; UCRL-ID-147523; No Copyright; Avail: National Technical Information Service (NTIS)

This document provides an operational description and status report on the three new meteorological monitoring systems on Bikini Atoll as well as an computational summary of previously recorded data. Included are overviews of procedures for sensor exchange, data recovery and reduction, and specific information about the different sensors. We also provide a

description of systems maintenance and trouble shooting activities. This report will be updated on an annual basis.
NTIS
Meteorological Instruments; Meteorology

20030051614 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Radar Reflectivity Simulated by a 2-D Spectra Bin Model: Sensitivity of Cloud-aerosol Interaction
Li, Kiaowen; Tao, Wei-Kuo; Khain, Alexander; Simpson, Joanne; Johnson, Daniel; [2003]; 1 pp.; In English; 31st International Conference on Radar Meteorology, 6-12 Aug. 2003, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Goddard Cumulus Ensemble (GCE) model with bin spectra microphysics is used to simulate mesoscale convective systems.The model uses explicit bins to represent size spectra of cloud nuclei, water drops, ice crystals, snow and graupel. Each hydrometeorite category is described by 33 mass bins. The simulations provide a unique data set of simulated raindrop size distribution in a realistic dynamic frame. Calculations of radar parameters using simulated drop size distribution serve as an evaluation of numerical model performance. In addition, the GCE bin spectra modes is a very useful tool to study uncertainties related to radar observations; all the environmental parameters are precisely known. In this presentation, we concentrate on the discussion of Z-R (ZDR-R) relation in the simulated systems. Due to computational limitations, the spectra bin model has been run in two dimensions with 31 stretched vertical layers and 1026 horizontal grid points (1 km resolution). Two different cases, one in midlatitude continent, the other in tropical ocean, have been simulated. The continental case is a strong convection which lasted for two hours. The oceanic case is a persistent system with more than 10 hours' life span. It is shown that the simulated Z-R (ZDR-R) relations generally agree with observations using radar and rain gauge data. The spatial and temporal variations of Z-R relation in different locations are also analyzed. Impact of aerosols on cloud formation and raindrop size distribution was studied. Both clean (low CCN) and dirty (high CCN) cases are simulated. The Z-R relation is shown to vary considerable in the initial CCN concentrations.
Author (revised)
Aerosols; Atmospheric Models; Meteorological Radar; Cumulus Clouds; Spectral Reflectance; Radar Signatures; Drop Size; Raindrops

20030052065 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simulated KWAJEX Convective Systems Using a 2D and 3D Cloud Resolving Model and Their Comparisons with Radar Observations
Shie, Chung-Lin; Tao, Wei-Kuo; Simpson, Joanne; [2003]; 1 pp.; In English; 31st International Conference on Radar Meteorology, 6-12 Aug. 2003, Seattle, WA, USA; No Copyright; Avail: Other Sources; Abstract Only

The 1999 Kwajalein Atoll field experiment (KWAJEX), one of several major TRMM (Tropical Rainfall Measuring Mission) field experiments, has successfully obtained a wealth of information and observation data on tropical convective systems over the western Central Pacific region. In this paper, clouds and convective systems that developed during three active periods (Aug 7-12, Aug 17-21, and Aug 29-Sep 13) around Kwajalein Atoll site are simulated using both 2D and 3D Goddard Cumulus Ensemble (GCE) models. Based on numerical results, the clouds and cloud systems are generally unorganized and short lived. These features are validated by radar observations that support the model results. Both the 2D and 3D simulated rainfall amounts and their stratiform contribution as well as the heat, water vapor, and moist static energy budgets are examined for the three convective episodes. Rainfall amounts are quantitatively similar between the two simulations, but the stratiform contribution is considerably larger in the 2D simulation. Regardless of dimension, fo all three cases, the large-scale forcing and net condensation are the two major physical processes that account for the evolution of the budgets with surface latent heat flux and net radiation solar and long-wave radiation)being secondary processes. Quantitative budget differences between 2D and 3D as well as between various episodes will be detailed.Morover, simulated radar signatures and Q1/Q2 fields from the three simulations are compared to each other and with radar and sounding observations.
Author
Atmospheric Models; Cumulus Clouds; Atolls; Radar Tracking; Meteorological Radar; Convection

20030052066 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity of Precipitation Processes to Microphysics and Resolution in a Cloud Resolving Model
Tao, Wei-Kuo; [2003]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

The Goddard Cumulus Ensemble (GCE) model examines the impact of various microphysical schemes, and vertical and horizontal resolution in the development, intensity and rainfall associated with mesoscale convective systems, idealized

hurricanes and an ensemble of clouds. The model variables include horizontal and vertical velocities, potential temperature, perturbation pressure, turbulent kinetic energy, and mixing rations of all water phases (vapor, liquid and ice). The major characteristics of the GCE model are the explicit representation of warm rain and ice microphysical processes, and their complex interactions with solar and infrared radiative transfer processes and with surface processes. For idealized hurricanes, an axisymmetric version of the GCE model was developed and used to simulate the tropical cyclogenesis process using both a Rankin vortex and saturated air within a specified radius as initial conditions. For mesoscale convective systems, the 3-D version of the GCE model was use to simulate squall lines that developed in the western Pacific, South China Sea, eastern Atlantic, South America and central U.S. FOr the cloud ensemble, the GCE model was integrated for several days in order to have a good sampling of cloud statistics. In this paper, the sensitivities of hurricane intensity to various microphysical processes and model grid resolutio will be examined. This will be mainly achieved by performing sensitivity tests using various horizontal (from 1-to 5-km) and vertical resolutions (from 20- to 200-m in the lower troposphere to 200- to 500m in the middle and upper troposphere). Sensitivity test using various microphysical schemes (warm rain only, and three ice with either graupel or hail) will also be performed. The thermodynamic and water budget associated with various types of precipitation systems will also be evaluated. The budgets will be calculated for different regions (i.e., convective and stratiform regions).
Author
Atmospheric Models; Cumulus Clouds; Mesoscale Phenomena; Hurricanes; Cyclogenesis

20030052200 National Aeronautics and Space Administration, Langley Station, VA, Pacific Northwest National Lab., Richland, WA, Wisconsin Univ., Madison, Sandia National Labs., Albuquerque, NM
Raman Lidar Profiling of Water Vapor and Aerosols Over the Arm SGP Site
Ferrare, R. A.; Turner, D. D.; Heilman, L. A.; Feltz, W. F.; Peppler, R. A.; Nov. 1999; 10 pp.; In English
Report No.(s): DE2002-750772; BNL-66954; No Copyright; Avail: Department of Energy Information Bridge

We have developed and implemented automated algorithms to retrieve profiles of water vapor mixing ratio, aerosol backscattering, and aerosol extinction from Southern Great Plains (SGP) Cloud and Radiation Testbed (CART) Raman Lidar data acquired during both daytime and nighttime operations. This Raman lidar system is unique in that it is turnkey, automated system designed for unattended, around-the-clock profiling of water vapor and aerosols. These Raman lidar profiles are important for determining the clear-sky radiative flux, as well as for validating the retrieval algorithms associated with satellite sensors. Accurate, high spatial and temporal resolution profiles of water vapor are also required for assimilation into mesoscale models to improve weather forecasts. We have also developed and implemented routines to simultaneously retrieve profiles of relative humidity. These routines utilize the water vapor mixing ratio profiles derived from the Raman lidar measurements together with temperature profiles derived from a physical retrieval algorithm that uses data from a collocated Atmospheric Emitted Radiance Interferometer (AERI) and the Geostationary Operational Environmental Satellite (GOES). These aerosol and water vapor profiles (Raman lidar) and temperature profiles (AERI+GOES) have been combined into a single product that takes advantage of both active and passive remote sensors to characterize the clear sky atmospheric state above the CART site.
NTIS
Water Vapor; Optical Radar; Aerosols

20030052208 Lawrence Livermore National Lab., Livermore, CA
Reduced Grid Methods for a Parallel Global Ocean General Circulation Model
Wickett, M. E.; Dec. 01, 1999; In English
Report No.(s): DE2002-791655; UCRL-LR-136903; No Copyright; Avail: National Technical Information Service (NTIS)

A limitation of many explicit finite-difference global climate models is the timestep restriction caused by the decrease in cell size associated with the convergence of meridians near the poles. A computational grid in which the number of cells in the longitudinal direction is reduced toward high-latitudes, keeping the longitudinal width of the resulting cells as uniform as possible and increasing the allowable timestep, is applied to a three-dimensional primitive equation ocean-climate model. This 'reduced' grid consists of subgrids which interact at interfaces along their northern and southern boundaries, where the resolution changes by a factor of three. Algorithms are developed to extend the finite difference techniques to this interface, focusing on the conservation required to perform long time integrations, while preserving the staggered spatial arrangement of variables and the numerics used on subgrids.
NTIS
Mathematical Models; Computational Grids; Finite Difference Theory; Climate Models

20030052220 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Vertically Lagrangian Finite-Volume Dynamical Core for Global Models

Lin, Shian-Jiann; [2003]; 42 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

A finite-volume dynamical core with a terrain-following Lagrangian control-volume discretization is described. The vertically Lagrangian discretization reduces the dimensionality of the physical problem from three to two with the resulting dynamical system closely resembling that of the shallow water dynamical system. The 2D horizontal-to-Lagrangian-surface transport and dynamical processes are then discretized using the genuinely conservative flux-form semi-Lagrangian algorithm. Time marching is split- explicit, with large-time-step for scalar transport, and small fractional time step for the Lagrangian dynamics, which permits the accurate propagation of fast waves. A mass, momentum, and total energy conserving algorithm is developed for mapping the state variables periodically from the floating Lagrangian control-volume to an Eulerian terrain-following coordinate for dealing with physical parameterizations and to prevent severe distortion of the Lagrangian surfaces. Deterministic baroclinic wave growth tests and long-term integrations using the Held-Suarez forcing are presented. Impact of the monotonicity constraint is discussed.

Author

Lagrangian Function; Finite Volume Method; Terrain Following; Baroclinic Waves; Shallow Water

20030052229 Lawrence Livermore National Lab., Livermore, CA

AERI/GOES Retrievals versus Radiosondes for Driving SCMs

Xie, S. C.; Cederwall, R. T.; Yio, J. J.; Feltz, W. F.; Turner, D. D.; Jul. 13, 2000; In English

Report No.(s): DE2002-792824; UCRL-JC-139675; No Copyright; Avail: National Technical Information Service (NTIS)

Single-Column Models (SCMs) require observations to provide suitable initial and boundary conditions. To meet this need, the Atmospheric Radiation Measurement (ARM) program conducts Intensive Observing Periods (IOPs) to provide 3-hourly radiosondes and other observations. However, such high-frequency sonde launches can be expensive. Therefore, the ARM program can only support a couple IOPs each year with each one lasting 2 - 4 weeks. In order to reduce the need for high-frequency sonde launches and to potentially expand the periods available for SCM simulations, we have conducted a study using the Atmospheric Emitted Radiance Interferometer (AERI) and Geostationary Operational Environmental Satellite (GOES) temperature and moisture retrievals, instead of radiosondes, in the ARM variational analysis system to derive the large-scale forcing terms for driving SCMs during the March 1999 IOP. We have compared the large-scale forcing and associated SCM simulations for various combinations of data sources used in the variational analysis.

NTIS

Boundary Conditions; Goes Satellites; Interferometers

20030052254 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Investigation of Overlap Correction Techniques for the Micro-Pulse Lidar NETwork (MPLNET)

Berkoff, T. A.; Welton, E. J.; Campbell, J. R.; Scott, V. S.; Spinhirne, J. D.; [2003]; 3 pp.; In English; IGARSS Conference 2003, 21-25 Jul. 2003, Toulouse, France; No Copyright; Avail: CASI; A01, Hardcopy

The Micro-Pulse Lidar NETwork (MPLNET) uses elastic-scattering lidars stationed at sites around the globe to produce aerosol and cloud vertical profiles on a continuous year-round basis. Processing of MPLNET data requires a correction for the lidar overlap function in the 0-6 km range, to take into account the loss in near-field receiver efficiency. This correction is normally determined from recording horizontal profiles that require a approximately 10 km clear line-of-sight and homogenous atmospheric conditions, limiting the practicality in which successful corrections can be obtained. An alternative overlap correction method using a secondary receiver is considered that eliminates the need for horizontal measurements. A review of both methods is presented, including a discussion of signal uncertainties.

Author

Elastic Scattering; Optical Radar; Meteorology; Geomagnetic Micropulsations; Radar Measurement

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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*.

20030037042 Lawrence Livermore National Lab., Livermore, CA

References to Studies of (137)Cs, (90)Sr and (239+240)Pu In The Pacific Ocean A Bibliography

Noshkin, V. E.; Feb. 01, 2001; 44 pp.

Report No.(s): DE2002-802595; No Copyright; Avail: Department of Energy Information Bridge

This report contains a listing of publications known to this author on reported concentrations, reviews and discussions of (sup 137)Cs,(sup 90)Sr and(sup 239+240)Pu in seawater, sediment and the biota from parts of the North and South Pacific Ocean. Each reference has been assigned an accession number consisting of the first three letters of the first author's last name followed by the first letter of the first name, the year of the publication and an assigned number. Studies in both the coastal areas and the open ocean are included as well as those providing data within lagoons of coral atolls. Some references to the radionuclides in the Indian Ocean are also provided.
NTIS
Pacific Ocean; Radioactive Isotopes; Cesium 137; Plutonium 239; Plutonium 240; Strontium 90; Bibliographies

20030037122 National Marine Fisheries Service, Miami, FL
Analysis of Sea Turtle Bycatch in the Commercial Shrimp Fisheries of Southeast U.S. Waters and the Gulf of Mexico
Epperly, S.; Avens, L.; Garrison, L.; Henwood, T.; Hoggard, W.; Nov. 2002; 96 pp.
Report No.(s): PB2003-102659; NOAA/TM/NMFS/SEFSC-490; No Copyright; Avail: CASI; A05, Hardcopy

This report is organized by sections. We first provide estimates of fishing effort by shrimp trawls. Next we provide estimates of sea turtle CPUE in shrimp trawls and adjust those estimates with aerial survey data. Following those sections, we provide the results: estimates of the number of interactions, the number of interactions resulting in mortalities under current regulations, and the number of interactions which we expect will result in interactions once new TED regulations are enacted. We then discuss the potential for interactions in other gears and in the bait shrimp fisheries. Lastly, we provide the reader a summary discussion and make research recommendations.
NTIS
Fishing; Statistics; Turtles

20030037137 Geological Survey, Menlo Park, CA, California State Dept. of Water Resources, Sacramento
Measurements of Salinity, Temperature, and Tides in South San Francisco Bay, California, at Dumbarton Bridge: 1990-93 Water Years
Schemel, L. E.; 1995; 68 pp.; In English
Report No.(s): PB2003-102705; USGS-OFR-95-326; No Copyright; Avail: CASI; A04, Hardcopy

The U.S. Geological Survey measures salinity, temperature, and water levels (tides) in southern San Francisco Bay at Dumbarton Bridge as part of a cooperative program with the California State Department of Water Resources. During water years 1990-93, measurements were made at 15-minute intervals with electronic sensors located approximately one meter above the substrate in approximately six meters of water (at mean water level). During March and April of 1991 and 1992, salinity and temperature also were measured with a self-contained system floating one meter below the surface of the water. Sections of the data set were selected to illustrate influences of tidal currents, weather events, and seasonal and interannual variations in climate on salinity, temperature, and water levels at this location. The edited data are provided on high-density disks in comma-delimited, ASCII text files.
NTIS
Salinity; Geological Surveys; Surface Water; Oceanography; Tides; Water Temperature

20030037154 Texas A&M Univ., College Station, TX, Minerals Management Service, New Orleans, LA
Deepwater Program: Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology. Interim Report - Year 2
Rowe, G. T.; Kennicutt, M. C.; Dec. 2002; 166 pp.; In English
Report No.(s): PB2003-102983; No Copyright; Avail: CASI; A08, Hardcopy

This report provides a summary of the progress to date at the end of the second year of the program. At this stage of the program, sample analyses are in progress with only partial data sets finalized. The program is on schedule and planning is in progress for the final years field program which includes a major extension of the sampling and analysis efforts into the deepest regions of the southern Gulf of Mexico. Increasing exploration and exploitation of fossil hydrocarbon resources in the deep-sea prompted the Minerals Management Service of the U.S. Department of the Interior to support an investigation of the structure and function of the assemblages of organisms that live in association with the sea floor in the deep-sea. The program, Deep Gulf of Mexico Benthos or DGoMB, is studying the northern Gulf of Mexico (GOM) continental slope from water depths of 300 meters on the upper continental slope out to greater than 3,000 meters water depth seaward of the base of the Sigsbee and Florida Escarpments. The study is focused on areas that are the most likely targets of future resource exploration and exploitation. However, to develop a Gulfwide perspective of deep-sea communities, sampling in areas beyond those

thought to be potential areas for exploration has been included in the study design.
NTIS
Continental Shelves; Ecology; Marine Biology; Ocean Bottom; Gulf Of Mexico; Deep Water

20030037181 Lawrence Livermore National Lab., Livermore, CA
Speciation and Fate of Trace Metals in Estuarine Sediments Under Reduced and Oxidized Conditions, Seaplane Lagoon, Alameda Naval Air Station
Carroll, S.; O'Day, P. A.; Esser, B.; Randall, S.; Oct. 18, 2002; 46 pp.
Report No.(s): DE2002-15002130; UCRL-JC-150548; No Copyright; Avail: Department of Energy Information Bridge

We have identified important chemical reactions that control the fate of metalcontaminated estuarine sediments if they are left undisturbed (in situ) or if they are dredged. We combined information on the molecular bonding of metals in solids from X-ray absorption spectroscopy (XAS) with thermodynamic and kinetic driving forces obtained from dissolved metal concentrations to deduce the dominant reactions under reduced and oxidized conditions. We evaluated the in situ geochemistry of metals (cadmium, chromium, iron, lead, manganese and zinc) as a function of sediment depth (to 100 cm) from a 60-year record of contamination at the Alameda Naval Air Station, California.
NTIS
Chemical Reactions; Sediments; Trace Elements; Metals

20030038957 National Oceanic and Atmospheric Administration, Seattle, WA, Joint Inst. for the Study of the Atmosphere and Ocean, Seattle, WA
Tidal Datum Distributions in Puget Sound, Washington, Based on a Tidal Model
Mofjeld, H. O.; Venturato, A. J.; Tutiv, V. V.; Gonzalez, F. I.; Newman, J. C.; Dec. 2002; In English
Report No.(s): PB2003-102259; NOAA/TM/OAR/PMEL-122; No Copyright; Avail: National Technical Information Service (NTIS)

To improve the spatial estimates of tidal datums in Puget Sound, Washington, the harmonic constant datum method has been applied to the harmonic constants from a channel tide model of the Sound. This was done using the FORM180 Version 1.8 program. The model datums, harmonic constants, and associated geospatial information are available on the website www.pmel.noaa.gov/tsunami/TIME/. Focusing on mean high water (MHW) relative to mean lower low water, it increases in height from 2.16 m at Port Townsend to 4.10 m at Olympia and 4.17 m at the head of Oakland Bay. Larger increases per km occur in Admiralty Inlet (1.66 cm/km) and the Tacoma Narrows (2.92 c/km); smaller gradients occur in the Main Basin (0.44 cm/km) and South Sound (0. 70 cm/km). The model MHW in Hood Canal closely follows MHW along the main axis with distance away from the main entrance to the Sound, to a maximum of 3.23 m at the head of Lynch Cove. This is also true for MHW in Whidbey Basin, except for a maximum of 3.17 m in southern Skagit Bay before decreasing northward toward Deception Pass.
NTIS
Sounds (Topographic Features); Channels; Models; Tides

20030038993 Lawrence Livermore National Lab., Livermore, CA
Calibration of Hydrophone Stations: Lessons Learned from the Ascension Island Experiment
Harben, P. E.; Rodgers, A. J.; Jul. 11, 2000; 16 pp.; In English
Report No.(s): DE2002-15002082; UCRL-JC-138987; No Copyright; Avail: Department of Energy Information Bridge

Calibration of hydroacoustic stations for nuclear explosion monitoring is important for increasing monitoring capability and confidence from newly installed stations and from existing stations. Calibration of hydroacoustic stations is herein defined as the near-field precision location of the hydrophones and determination of the amplitude response; and the regional-scale calibration of acoustic traveltimes, bathymetric shadowing, diffraction, and reflection as recorded at a particular station. An important type of calibration not considered here is ocean-basin-scale calibration of a hydroacoustic monitoring system. To understand how to best conduct hydroacoustic station calibrations, an experiment was conducted in May 1999 at Ascension Island in the South Atlantic Ocean. The experiment made use of a British oceanographic research vessel towing an airgun array and collected data over three MILS hydrophones that were in use by the National Data Center and the International Data Center. From the towed airgun data we were able to determine the location for each of the three hydrophones to accuracy better than 100 meters in latitude, longitude, and depth. The agreement with the nominal locations was excellent in depth and to within 1 km in latitude and longitude. The depths determined for the hydrophones and the ocean bottom depths determined

from the ships sonar system force the conclusion that all three hydrophones are located at or near the ocean bottom.
NTIS
Calibrating; Hydrophones; Oceanography; Underwater Acoustics

20030051443 National Oceanic and Atmospheric Administration, Boulder, CO
U.S. East Coast Multibeam Bathymetric Data
1999; In English
Report No.(s): PB2002-500102; No Copyright; Avail: National Technical Information Service (NTIS)
This CD-ROM contains National Geophysical Data Center (NGDC) multibeam bathymetric data for the U.S. East Coast and software to visualize the tracklines of the data. This CD-ROM was created with relaxed ISO-9660 rules on the file names because some of the original file names did not follow the ISO-9660 8.3 file name rule. It should however be noted that all the data files on this CD-ROM contain Intel low byte order data and will need bytes-swapped for hi byte order platforms. The actual data files with their original names (i.e) the names of the data files as NGDC received them can be found in the dat/NGDC(no.) directory (each NGDC(no.) represents a survey/area of data). Each survey/area has a readme.txt file that contains a self description and the data file format along with other metadata about the survey.
NTIS
Bathymeters; Geophysics; Multibeam Antennas; Data Processing; Oceanography

20030051584 Lawrence Livermore National Lab., Livermore, CA
Simulating Ocean Fertilization: Effectiveness and Unintended Consequences
Calderia, K.; Nov. 03, 2002; 10 pp.
Report No.(s): DE2002-15001998; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Ocean Models; Carbon Dioxide; Computerized Simulation; Effectiveness

20030051604 National Oceanic and Atmospheric Administration, Rockville, MD
National Coral Reef Action Strategy. Report to Congress
Jun. 2002; 160 pp.
Report No.(s): PB2003-103652; No Copyright; Avail: CASI; A08, Hardcopy
Coral reefs are some of the most biologically rich and economically valuable ecosystems on Earth. They are also in serious jeopardy, threatened by an increasing array of impacts from overexploitation, pollution, habitat loss, invasive species, diseases, and climate change. The rapid decline and loss of these valuable marine ecosystems has significant social, economic, and environmental consequences in the U.S. and around the world. Action is needed on a wide variety of fronts to address the coral reef crisis, especially on issues of global proportions such as the impacts of climate change, increasing coastal development and persistent over- fishing of reef systems. This document, A National Coral Reef Action Strategy, was produced by the National Oceanic and Atmospheric Administration (NOAA), in cooperation with the U.S. Coral Reef Task Force (Task Force), to fulfill the requirements of the Coral Reef Conservation Act of 2000 (CRCA) (P.L. 106-562; 16 U.S.C. 6401 et seq.) and help track implementation of The National Action Plan to Conserve Coral Reefs (U.S. Coral Reef Task Force 2000). The Task Force National Action Plan was the first national blueprint for U.S. action to address the loss and degradation of U.S. and international coral reef ecosystems. Based on extensive input from government and non-government organizations, scientists, resource managers, stakeholders and the public, the Nationa l Action Plan: (1) identified key threats and issues driving the loss and degradation of coral reefs, (2) established thirteen major goals to address these threats, and (3) outlined objectives and priority actions needed to achieve each goal.
NTIS
Coral Reefs; Environment Protection; Marine Environments

20030052083 Massachusetts Inst. of Tech., Cambridge. Energy Lab
International Collaboration on CO(2) Sequestration
Herzog, H. J.; Adams, E. E.; Sep. 2002; 28 pp.; In English
Report No.(s): DE2002-802585; No Copyright; Avail: Department of Energy Information Bridge
The primary focus of this reporting period was to prepare for conducting the ocean carbon sequestration field experiment during the summer of 2002. We discuss four key aspects of this preparation: design criteria for a CO2 flow system mounted

on a ship; inter-model comparison of plume models; application of a double plume model to compute near field mixing, and evaluation of tracers.
NTIS
Carbon Dioxide; Oceans

20030052197 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft, Netherlands
Comparison of Theoretical Noise Criteria and Behavioural Observations of 2 Odontocete Species
Verboom, W. C.; Kastelein, R. A.; January 10, 2003; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A02/KM/113; TNO Proj. 008.03463/01.01
Report No.(s): DGT-RPT-020035; TD-0237; Copyright; Avail: Other Sources

World wide a concern is emerging about the influence of high-power, (low-frequency) sonar equipment on marine life in the sea. Knowledge on the effects of intense sound levels on marine mammals is scarce, as well as detailed information on marine mammal hearing systems. Mitigation of man-made noise at short notice may be necessary to protect marine life. Based upon a practical approach, TNO TPD has proposed dose/response criteria for marine mammals. This report compares the severe discomfort criterion for harbour porpoises to the results of experiments carried out with porpoises. It can be concluded that the criterion level, as proposed by TNO TPD, is not a pessimistic one. Even lower sound levels clearly deter harbour porpoises. Also an experiment on a striped dolphin is discussed.
Author
Sonar; Low Frequencies; Porpoises; Hearing; Physiological Effects; Dolphins

20030052277 Alaska Univ. Museum, Fairbanks
Alaska Frozen Tissue Collection: A Resource for Marine Biotechnology, Phase II
Cook, J. A.; Jarrell, G. H.; Nov. 2002; 42 pp.; In English
Report No.(s): PB2003-102242; No Copyright; Avail: CASI; A03, Hardcopy

The 23-page report describes the Alaska Frozen Tissue Collection (AFTC), highlighting marine mammal tissues collected, listing independent analyses of AFTC tissues, and describing their mammal and AFTC interactive database summary now accessible on the Worldwide Web (www.uaf.edu/museum/mammal/dbf).
NTIS
Biotechnology; Marine Mammals; Alaska; Tissues (Biology); Biochemistry

20030052287 National Ocean Service, Rockville, MD
Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands (Draft)
Mar. 2003; In English
Report No.(s): PB2003-102992; No Copyright; Avail: National Technical Information Service (NTIS)

This draft Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands (NWHI) has been developed to support research, management, and conservation of critical resources found in the region. In this Atlas, shallow-water refers to water generally less than 30 m deep. Other efforts and technologies will be used to characterize the deeper waters (generally greater than 30 m) of the NWHI. This Atlas also supports the U.S. Coral Reef Task Force's mandate to develop shallow-water coral reef ecosystem maps for all U.S. waters by 2009. The diverse, expansive and pristine shallow-water coral reef ecosystems of the NWHI are unmatched anywhere else on Earth.
NTIS
Ecosystems; Habitats; Shallow Water; Resources Management

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*.

20030037108 Swedish Defence Research Agency, Stockholm
Mental Stress Related to Peacekeeping Missions. A Survey of the Problem Area
Oedlund, A.; Feb. 2001; 32 pp.; In Swedish
Report No.(s): PB2003-101260; FOI-R-0044-SE; No Copyright; Avail: CASI; A03, Hardcopy

Soldiers and other groups of personnel in peacekeeping missions are at risk of getting mentally injured during their service abroad. Conditions including threats against one's own, or the groups, life or security, the suffering of other people and boredom in combination with state of alert create an environment that demand planning and readiness. Carefully prepared countermeasures help the personnel to cope with different kinds of situations without getting mental damages. In that Sweden is prepared to contribute with personnel in conflicts abroad, is there a demand for knowledge and resources in order to cope with this field. The Swedish Armed Forces, National Police Board and National Rescue Services Board have liability due to their personnel during international service. This report presents a survey of the authorities program (2000) for handling mental stress during international missions. The surveys, grouped into before, during and after a mission show great similarities. Differences between the complete programs and how they function in practice have however not been studied. NTIS

Stress (Psychology); Military Operations; Armed Forces (Foreign)

20030039173 Southern California Evidence-Based Practice Center/RAND, Santa Monica

Ephedra and Ephedrine for Weight Loss and Athletic Performance Enhancement: Clinical Efficacy and Side Effects. Volume 1. Evidence Report and Evidence Tables. Evidence Report/Technology Assessment Number 78

Shekelle, P.; Morton, S.; Maglione, M.; Mar. 2003; 252 pp.; In English

Report No.(s): PB2003-103315; No Copyright; Avail: CASI; A12, Hardcopy

In the direction of the funding agencies (National Institutes of Health Office of Dietary Supplements (ODS), the National Center for Complementary and Alternative Medicine (NCCAM), and the Agency for Healthcare Research and Quality (AHRQ)), and in consultation with their Technical Expert Panel, investigators at the Southern California-RAND Evidence-based Practice Center addressed research questions regarding the efficacy of herbal ephedra and ephedrine for weight loss and athletic performance through a comprehensive literature review and synthesis of evidence. They assessed the safety of these products through review of clinical trials. Meta-analysis was performed where appropriate. In addition, investigators reviewed herbal ephedra- and ephedrine-related adverse events reports on file with the U.S. Food and Drug Administration (FDA), published case reports, and reports to a manufacturer of ephedra-containing products. In addition to answering these 15 questions about ephedra-containing dietary supplement products, investigators also synthesized the available information on the same questions for the purified alkaloid, ephedrine. The full Evidence Report consists of two volumes: Volume 1, which contains the Evidence Report and the corresponding Evidence Tables, and Volume 2, which contains the Appendixes. It is expected that the results of this review will be used to direct further research. NTIS

Diets; Drugs; Performance; Safety; Physical Fitness

20030045819 Civil Aerospace Medical Inst., Oklahoma City

Laboratory Comparison of Clockwise and Counter-Clockwise Rapidly Rotating Shift Schedules, Part III: Effects on Core Body Temperature and Neuroendocrine Measures

Boquet, A.; Cruz, C. E.; Nesthus, T. E.; Detwiler, C. A.; Knecht, W. R.; Nov. 2002; 28 pp.; In English

Report No.(s): PB2003-102976; No Copyright; Avail: CASI; A03, Hardcopy

Most researchers suggest that shift rotation in a forward or clockwise direction produces less disruption of circadian rhythms than those that rotate in a backward or counter-clockwise direction. This is based upon extrapolation from quasi-experimental studies of shift-workers and research on the effects of jet lag, which indicate that westward travel results in less disruption of circadian rhythms. The effect of direction of rotation on cortisol, melatonin, and core body temperature was examined in participants randomly assigned to either a clockwise or counter-clockwise shift rotation. Twenty-eight participants worked a day shift (0800-1600) for one week followed by either a clockwise (n=14) or counter-clockwise (n=14) shift rotation for two weeks. Participants wore a flexible rectal temperature sensor for the three weeks of the study and were allowed to remove the sensor for 90 minutes each day. Saliva samples were collected at the end of the baseline week for later assay for melatonin and cortisol, and were time-locked to collection times during the two 'shiftwork' weeks. No group differences were found for cortisol for either of the workweeks. The clockwise group, however, had a significantly greater increase in melatonin during the early morning shift, compared with the counter-clockwise group. Finally, the analyses of core body temperature revealed a significantly lower amplitude and a delay of the acrophase for the counter-clockwise group during both weeks of testing. While cortisol levels did not appear to differ based on direction of shift rotation, there were inherent differences with melatonin secretion and core body temperature. Precisely why such differences exist remains unclear but may be similar to that seen with circadian resynchronization during westward travel. Furthermore, it is not clear if these differences would persist in individuals exposed to longer periods of shift rotations. NTIS

Schedules; Endocrine Systems; Air Traffic Controllers (Personnel); Sleep; Body Temperature

20030046826 Institute for Prevention and Health TNO, Leiden, Netherlands
Passive Immunization with Antibody Fragments
vanDalen, P. J.; August 30, 2002; 85 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A96/M/107; A99/M/108; TNO Proj. 011.20051; TNO Proj. 3626086
Report No.(s): PG/I&I/2003-010; Copyright; Avail: Other Sources

Passive immunization is the injection of protective antibodies without making use of the body's own immune system. The injected antibodies usually are derived from immunized persons or animals. However it is not possible yet to immunize people against all infectious diseases. And antibodies from animals may show serious side effects and induce antibody responses against the given antibodies since these are recognized as strange. For these reasons recombinant passive vaccines consisting of antibody fragments are most welcome. We wanted to show the concept of producing antibody fragments at the location of infection, in this case the gut, by Lactobacilli bacteria which are normal commensals of the gut. The gene fragments coding for antibody fragments were taken by molecular biological techniques from a hybridoma cell line producing monoclonal antibodies against shigatoxin, a bacterial toxsin causing serious diarrhea. The gene fragments were expressed in E. coli as a shuttle organism. We showed that the expressed fragments could bind shigatoxin. Neutralization could not be determined, probably due to the low level of expression. Subsequently the fragments were expressed in Lactobacillus, but toxin binding could not be detected. The experiments are a first step in the development of a versatile platform technology.
Author
Antibodies; Immunology; Infectious Diseases; Vaccines; Bacteria; Immunity

20030051521 California Univ., Berkeley. Agricultural Ergonomics Research Center
California Agricultural Ergonomics Program Trail: Intervention Studies in Agricultural Safety and Health
Jun. 2002; 144 pp.; In English
Report No.(s): PB2003-102818; No Copyright; Avail: CASI; A07, Hardcopy

This is a report on the goals, methods, implementation and results of the California Agricultural Ergonomics Program Trial of the University of California as proposed to and funded by the National Institute for Occupational Safety and Health in Continuing Agreement PHS-ROI OH14508. This project terminated in November 2001 however a 3-month extension was awarded to enable assessment of data from the 2001 tomato harvest.
NTIS
Safety; Health; Agriculture; Human Factors Engineering; Personnel

20030052135 Southern California Evidence-Based Practice Center/RAND, Santa Monica
Ephedra and Ephedrine for Weight Loss and Athletic Performance Enhancement: Clinical Efficacy and Side Effects. Volume 2. Appendixes. Evidence Report/Technology Assessment 76
Shekelle, P.; Morton, S.; Maglione, M.; Mar. 2003; 240 pp.; In English
Report No.(s): PB2003-103316; No Copyright; Avail: CASI; A11, Hardcopy

In the direction of the funding agencies (National Institutes of Health Office of Dietary Supplements (ODS), the National Center for Complementary and Alternative Medicine (NCCAM), and the Agency for Healthcare Research and Quality (AHRQ)), and in consultation with their Technical Expert Panel, investigators at the Southern California-RAND Evidence-based Practice Center addressed research questions regarding the efficacy of herbal ephedra and ephedrine for weight loss and athletic performance through a comprehensive literature review and synthesis of evidence. They assessed the safety of these products through review of clinical trials. Meta-analysis was performed where appropriate. In addition, investigators reviewed herbal ephedra- and ephedrine-related adverse events reports on file with the U.S. Food and Drug Administration (FDA), published case reports, and reports to a manufacturer of ephedra-containing products. In addition to answering these 15 questions about ephedra-containing dietary supplement products, investigators also synthesized the available information on the same questions for the purified alkaloid, ephedrine. The full Evidence Report consists of two volumes: Volume 1, which contains the Evidence Report and the corresponding Evidence Tables, and Volume 2, which contains the Appendixes. It is expected that the results of this review will be used to direct further research.
NTIS
Diets; Drugs

20030052154 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Zeist, Netherlands
Renovation of Military Rations, Part 3, Rations Hot Climate
vanBoxtel, L. B. J.; December 2003; 56 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A00/KL/103; TNO Proj. 010.50800
Report No.(s): TNO-Voeding-V4982; TD-2002-0233; Copyright; Avail: Other Sources

Concepts for individual combat rations to be used in hot climate operations were compiled. The compositions for the rations were based to fulfil the expected nutritional requirements and energy expenditure during activity and/or action in hot weather climates. The expected logistic operations of the rations (central stocking, transport, local stocking et cetera) and the temperature load during lifetime of the rations have consequences for the items suited for incorporation in these rations. For a peanut based snack food item - part of the new ration concept - a long-term stability test using high barrier packaging material and strict control of residual oxygen (O2- scavenger) were run. Expelling oxygen and using a high quality starting material a shelf-life of more than 8 month at elevated temperature could be reached (test is still going on and will finally cover up to two years).
Author
Rations; Hot Weather; Storage Stability

20030052266 Swedish Defence Research Agency, Linkoeping. Man-System-Interaction
Motion Illness Decreases the Capacity to Tolerate Gravitational Forces in Humans
Eiken, O.; Tipton, M. J.; Kolegard, R.; Lindborg, B.; Mekjavic, I. B.; Dec. 2001; 18 pp.
Report No.(s): PB2003-102113; FOI-R-0341-SE; No Copyright; Avail: CASI; A03, Hardcopy

Motion illness (MI) is a common aeromedical problem that may occur in pilots exposed to increased gravitational (G) forces in the head-to-foot direction (+Gz). Since MI may affect automatic nervous functions including cardiovascular control the authors hypothesized that it might interfere with cardiovascular responses to high G-forces, thereby decreasing G-tolerance. G-tolerance and cardiovascular responses to increased Gz-load were studied in 9 subjects in a centrifuge in two conditions. In the MI condition the subject was exposed to a Motion Illness Provocative Simulation (MIPS) comprising repeated rapid changes in G-load in combination with a regimen of head movements. In the Control condition (C) the subject was exposed to the same cumulative G-stress, but without the MIPS. Mean Arterial Pressure (MAP) was measured. An index of peripheral vascular resistance was achieved by measuring the difference in skin temperature between the forearm and fingertip. MIPS decrease ($P < 0.01$) Gradual-Onset Rate (GOR) G-tolerance from 5.1 + 1.0 G (mean + or - SD) to 4.6 + 0.9 G. There was no change in GOR-tolerance in the C condition. Also, Rapid-Onset-Rate G tolerance was lower ($P < 0.001$) in the MI (2.9 + or - 0.5 G) than in the C (3.4 + or - 0.3 G) condition. MIPS reduced MAP by 10 - 12 mmHg and forearm-fingertip by -4.2 + 4.1 degrees C ($P < 0.05$). In the C condition MAP and fore-fingertip were unaffected. Thus, motion illness may reduce the tone of peripheral resistance vessels to the extent that it results in a drop in arterial pressure large enough to significantly diminish the capacity of an individual to withstand increased +Gz-forces. This may have implications for pilots flying high-performance aircraft.
NTIS
Gravitational Fields; Motion Simulation; Cardiovascular System; Physiological Responses

20030052739 NASA Ames Research Center, Moffett Field, CA, USA
Recovery After Prolonged Bed-Rest Deconditioning
Greenleaf, John E.; Quach, David T.; January 2003; 85 pp.; In English
Contract(s)/Grant(s): UPN 111-10-20
Report No.(s): NASA/TM-2002-211860; NAS 1.15:211860; A-0207736; No Copyright; Avail: CASI; A05, Hardcopy

Recovery data were analyzed from normal healthy test subjects maintained in the horizontal or head-down body position in well-controlled bed rest (BR) studies in which adherence to the well-designed protocol was monitored. Because recovery data were almost always of secondary importance to the data collected during the BR period, there was little consistency in the recovery experimental designs regarding control factors (e.g., diet or exercise), duration, or timing of data collection. Thus, only about half of the BR studies that provided appropriate data were analyzed here. These recovery data were sorted into two groups: those from BR protocols of less than 37 days, and those from protocols greater than 36 days. There was great disparity in the unchanged responses at the end of BR in these two groups. Likewise with the variables that required more than 40 days for recovery; for example, some immune variables required more than 180 days. Knowledge of the recovery process after BR in healthy people should assist rehabilitation workers in differentiating 'healthy' BR recovery responses from those of the infirmity of sick or injured patients; this should result in more appropriate and efficient health care.
Author
Bed Rest; Human Factors Engineering; Deconditioning; Physiological Responses; Human Beings

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 Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20030039191 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Background Information on Vitamins for Pilots of the Royal Airforce
Jansen-vanderVliet, M.; November 2002; 21 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A00/D/105; TNO Proj. 22051/01.01
Report No.(s): V4808; TD-2002-0202; Copyright; Avail: Other Sources

Pilots of the Royal Airforce have a need for more easily available and accessible information on nutrition. This report provides information on vitamins. There are 13 vitamins, lipid-soluble: vitamin A, D, E and K and water-soluble: vitamin C and vitamin B. The report goes into different aspects of vitamins, like functions, sources, recommended intake and average intake in the Netherlands. The average vitamin supply for adults in the Netherlands is adequate (except for pregnant women). This does not mean that everybody always eats wisely and varied. Sometimes more vitamins are needed, like during topclass sport, at which time vitamin supplements or enriched foods can be a solution.
Author
Nutrition; Vitamins; Aircraft Pilots; Defense Program

20030052095 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Cost-Effectiveness Analyses of Interventions; Development of Methodology
vandeVijver, L. P. I.; January 2003; 62 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A02/KL/116; TNO Proj. 22054
Report No.(s): TNO-V4934; TD-2003-0162; Copyright; Avail: Other Sources

For the Dutch Ministry of Defence a start was made in developing a method for cost-result analyses, with respect to nutrition and occupational health interventions for the Dutch Royal army. Cost-result analyses can give insight in the potential results of an intervention, before the intervention actually started. In this way it can play a role in the decision making process, whether or not to start an intervention and it may point out specific target groups in which an intervention will be the most effective. During the first year of this long-term project, an inventory of available methods was made. Two methods are described, a cost-benefit analysis and a cost-effectiveness analysis. For the methods the variables to consider, the successive phases of the process to come to the analysis and different calculation methods are mapped. In a pilot study a cost-effectiveness study on the case Weightco@ch was performed. From this pilot it is concluded that with the available input data and the used calculation method, a global estimate of the results can be reached. However, the results thus far are inaccurate. In this document the results for 2002 are reported and further steps to improve the methodology are discussed.
Author
Cost Analysis; Cost Effectiveness; Nutrition; Health; Occupational Diseases

20030052103 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Biodosimetry of Radiation Exposed Individuals at 3 to 24 h After Exposure; Improvement and Validation of the Assay
vanderSchans, G. P.; Timmerman, A. J.; April 2003; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A98/M/543; TNO Proj. 014.12843
Report No.(s): PML-2002-A95; TD-2002-0169; Copyright; Avail: Other Sources

In this report the results are described of the development and validation of an immunochemical assay for the detection of persistent base damage induced by ionizing radiation. It appeared that radiation-induced base damage can be detected in human blood lymphocytes in a dose range of 0.3 - 20 Gy. In the period between 1 and 4 h no significant repair was observed with Micrococcus luteus extract. In conclusion, this makes base damage detection a very promising biological indicator for radiation injury at periods between 1 h and longer (at least 4 h) after exposure. A Standard Operating Procedure has been drafted for application by a trained technician in a simply utilized field hospital laboratory. In the period up to 4 h after exposure, measurement of radiation-induced persistent single-strand breaks in human blood granulocytes may be an alternative for the base damage detection in lymphocytes. Explorative studies with irradiated skin revealed that also in skin radiation damage can be detected down to a dose of 0.3 Gy. This opens the way also to determine skin dose to assess its contribution to the effective dose and to predict the expected skin injury which helps to establish the relevant medical

countermeasures. This is, to our knowledge, the first time that radiation damage can be detected after doses below the annual dose limit for skin of radiological workers in The Netherlands.
Author
Radiation Dosage; Bioassay; Ionizing Radiation; Nucleotides; Dosimeters

20030052167 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Operational Toxicology: Towards a Strategy for Health Surveillance of Military Personnel During Operations
Mol, M. A. E.; March 2003; 20 pp.; In Dutch
Contract(s)/Grant(s): A01/D/517; TNO Proj. 014.13598/12881
Report No.(s): PML- 2002-A92; TD2002-0166; Copyright; Avail: Other Sources

Increased Dutch participation in UN and NATO missions enhances the chance of health impairment of military personnel while staying in areas with unknown toxicological risks. In order to cope with this pace, the Dutch Ministry of Defence has initiated specialized research programs. TNO Prins Maurits Laboratory (TNO-PML), one of the participants in research, is presenting some guidelines towards a strategy for health surveillance of military personnel during operations. On mission, determination of the toxicological status of the environment has high priority. Existing methods of analytical chemical detection of toxicants should be complemented with biological early warning systems, that give straight information about the toxicological impact of the present (mixture of)toxicant(s) on biological systems. To this aim, TNO-PML will evaluate current biomonitoring tests for use on military missions and, if necessary, improve them by implementing new molecular biological knowledge on toxicological stress responses generated by 'functional genomics' research. A long term aim of research will be the application of increasing knowledge of toxic responses at the molecular level for the development of biomarker profiles for use in biomonitoring tests of military personnel before, during and after a mission. With the proposed approach TNO-PML joins with large research programs running at several military laboratories in the U.S.A.
Author
Personnel; Health Physics; Military Operations; Toxicology; Biomarkers; Bioinstrumentation; Surveillance

53
BEHAVIORAL SCIENCES

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

20030038979 Institute for Human Factors TNO, Soesterberg, Netherlands
Psychological Operations for the Netherlands Armed Forces: A Contribution to the Development of a Policy
Janessen, H. J. W.; October 16, 2002; 42 pp.; In English
Contract(s)/Grant(s): TNO-013.40340; TNO Proj. 791.2
Report No.(s): TNO-TM-02-A048; TD-2002-0122; Copyright; Avail: Other Sources

Within the Defence Program 'Assessing the utility of NLW for the Netherlands armed forces', TNO Human Factors is conducting research on the development and the effectiveness of methods to be used in PsyOps. The main goal of the present study is to explore the issues that need to be considered in order to develop a general PsyOps policy for the Netherlands Armed Forces. We related fundamental knowledge of attitudes, behaviour, social influence and PsyOps with NATO Doctrine (AJP 3.7), which covers PsyOps policy and doctrine, as well as techniques, tactics and procedures. We reviewed this document from a psychological point of view and looked for unclear issues and bottlenecks. This resulted in suggestions that contribute to the development of a general PsyOps policy for the Netherlands Armed Forces. Several concepts are not well defined, which can lead to misunderstandings and ambiguity when they are translated to a practical level. Furthermore, it does not become clear that PsyOps is a form of persuasive communication and its effectiveness is always a result of the interaction between characteristics of the source, message, medium and receiver. Lastly, the translation of fundamental knowledge of psychology to practical application is insufficient. This study results into three general suggestions. First, in order to avoid misunderstandings, it is useful to give clear definitions. Second, theoretical should be translated to a practical level and should be related to actual PsyOps activities. Third, examples should be used to explain the content of certain sections, definitions and concepts in AJP 3.7.
Author (revised)
Armed Forces; Military Psychology; Human Performance; Human Behavior; Policies

20030045709 Institute for Human Factors TNO, Soesterberg, Netherlands
The Effect of Mixed-Gender Teams on Performance and Satisfaction
vanAmelsfoort, D. J. C.; Fennis, M.; October 17, 2002; 42 pp.; In Dutch
Contract(s)/Grant(s): TNO-013.12305; TNO Proj. 791.2
Report No.(s): TNO-TM-02-AO49; TD-2002-0123; Copyright; Avail: Other Sources

In co-operation with the division Behavioural Sciences of the Royal Dutch Army we tried to answer the question in what way the influence of women on performance and satisfaction of mixed-gender teams can be measured. First, we reviewed the literature for the research done on the influence of women on the performance and satisfaction of (military) teams. This review is somewhat restrained, because of the limited available (military) literature and the limited amount of research on this subject. Second, after the review of literature, we developed a research design and a questionnaire. Literature shows that performance and satisfaction are independent variables, both influenced by team composition. The performance and satisfaction of teams are especially dependent on the type of task that has to be performed. Heterogeneity can lead to conflicts and negatively influence group moral, but it also contributes to creativity and flexibility of the team. The literature found, makes us conclude that there is no straightforward answer to the question what the effect is of women on performance and satisfaction of (military) teams. Therefore we suggest that more research is needed. The developed research design and questionnaire can be used for research purposes.
Author
Human Performance; Human Factors Engineering; Military Technology; Teams; Human Behavior

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20030037112 Michigan Univ., Ann Arbor, MI
Reaction Time to Clear-Lens Turn Signals Under Sun-Loaded Conditions
Sullivan, J. M.; Flannagan, M. J.; Sep. 2001; 22 pp.; In English
Report No.(s): PB2003-101390; UMTRI-2001-30; No Copyright; Avail: CASI; A03, Hardcopy

The use of clear-lens signal lamps on automobiles, motivated largely by styling considerations, has prompted interest in whether there are any safety consequences associated with these lamps. In a previous report (UMTRI-98-2), it was found that under bright, sunny conditions, luminance contrast between the off and on states of clear-lens turn signal lamps is smaller than for lamps using amber lenses. On the other hand, color contrast between the off and on states is greater with clear-lens turn signals. An experiment was conducted to compare the reaction time of drivers to signal lamps using clear and amber lenses. The results indicate that luminance contrast is the primary characteristic influencing driver performance and that no compensatory advantage appears to be obtained with increases in color contrast. This result is also consistent with evidence from basic research on visual search.
NTIS
Sunlight; Reaction Time; Visual Signals

20030045711 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Evaluation of the Actual State of Respirators (Valves, Face Piece and Noose Cap)
Havinga, J. S.; February 13, 2003; 23 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A02/KL/191; TNO Proj. 007.63069.01.01
Report No.(s): Rept-42/03.006289/sec; TD2003-0164; Copyright; Avail: Other Sources

The actual state of used Avon FM12 respirators has been investigated. More specific the valves, in- and outlet, the face piece and the nose cap were involved. Reason for this investigation were the results of an investigation carried out before the ordering of the masks showing that the valves should have a lifetime expectation of about 7 years. Such a period is almost passed by now (the first respirators were delivered in 1996). Because the face piece and the noose cap are important components it has been decided to investigate them as well. The results of the present investigation indicate that the valves, inlet and outlet, show ageing, but the amount of ageing is such that the valves, at similar use, can still function well for at least 5 more years. For the face pieces and the noose caps it follows that there is hardly any ageing. These components can, with

the same conditions during use, most certainly function for at least another 10 years.
Author
Respirators; Face (Anatomy); Aging (Materials); Control Valves; Nose Cones

20030051585 Michigan Univ., Ann Arbor, MI
High-Beam Headlamp Usage on Unlighted Rural Roadways
Sullivan, J. M.; Adachi, G.; Mefford, M. L.; Flannagan, M. J.; Feb. 2003; 21 pp.; In English
Report No.(s): PB2003-102315; UMTRI-2003-2; No Copyright; Avail: CASI; A03, Hardcopy

In a survey conducted over 34 years ago, Hare and Hemion (1968) found that USA drivers underuse their high beams in circumstances in which their use is recommended. High-beam use was also found to be inversely related to traffic density. Since that time, changes in beam pattern design, dimming controls, and perhaps driver awareness of the hazards of limited visibility may have sufficiently altered the situation to warrant a follow-up investigation. A survey of high-beam headlamp use was conducted on three unit local roadways in the Ann Arbor area. Observers judged whether vehicles that were clear of both oncoming and preceding traffic had their high or low beams turned on. Illuminance measures at approximate beam pattern locations were also recorded to support beam judgements. In addition, traffic density was estimated over 15-minute intervals so that the relationship between beam use and traffic density could be examined. The results suggest that the pattern of high-beam underuse is similar to that observed in the late 1960s.
NTIS
Light Beams; Visibility; Illuminance; Luminaires

59
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*.

20030038799 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Membranes and Matrix Models
Hoppe, J.; Jun. 2002; 40 pp.
Report No.(s): PB2003-102080; IHES/P/02/47; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available
NTIS
Membranes; Matrices

20030038841 Lawrence Livermore National Lab., Livermore, CA
Generalizing Lifted Tensor-Product Wavelets to Irregular Polygonal Domains
Bertram, M.; Duchaineau, M. A.; Hamann, B.; Joy, K. I.; May 11, 2002; 18 pp.
Report No.(s): DE2002-802820; UCRL-JC-147950; No Copyright; Avail: Department of Energy Information Bridge

We present a new construction approach for symmetric lifted B-spline wavelets on irregular polygonal control meshes defining two-manifold topologies. Polygonal control meshes are recursively refined by stationary subdivision rules and converge to piecewise polynomial limit surfaces. At every subdivision level, our wavelet transforms provide an efficient way to add geometric details that are expanded from wavelet coefficients. Both wavelet decomposition and reconstruction operations are based on local lifting steps and have linear-time complexity.
NTIS
Splines; Tensors; Topology; Wavelet Analysis; Polygons; Domains

20030038854 Technische Univ. Delft (Netherlands)
Contour Integration and Inverse Laplace Transforms for Application in Moving Load Dynamics
Wolfert, A. R. M.; 1997; 56 pp.
Report No.(s): PB2003-102143; No Copyright; Avail: CASI; A04, Hardcopy

A lot of inverse Laplace transforms can be found in books as for example Tables of integrals, series and products by Gradshteyn I.S. and Ryzhik I.M. or Tables of integral transforms by Erdelyi A., et al. However in behalf of investigations on transient solutions for moving load problems there is a need of inverse Laplace transforms of functions which are not available in these books. So then one is forced to perform them oneself. The goal of this report is to present a table containing the final

results for these 'new' inverse Laplace transforms and to show the method of deriving such a transforms with the help of contour integration. For this last purpose first some basic properties and theorems of complex analysis, contour integration and the Laplace transform are treated. Then on the hand of the result of a well known inverse Laplace transform the procedure including branch points as well as the uniqueness of the transformation are elucidated. Finally four examples showing the inverse procedure applied for elaborating the inverse Laplace transforms are presented. At the end of this report the final results of these transformations are collected in tables.
NTIS
Laplace Transformation; Loads (Forces)

20030038882 Sandia National Labs., Albuquerque, NM
Large Scale Non-Linear Programming for PDE Constrained Optimization
van Bloemen, B.; Bartleet, R.; Long, K.; Boggs, P.; Salinger, A.; Oct. 2002; In English
Report No.(s): DE2002-805833; No Copyright; Avail: National Technical Information Service (NTIS)

Three years of large-scale PDE-constrained optimization research and development are summarized in this report. We have developed an optimization framework for 3 levels of SAND optimization and developed a powerful PDE prototyping tool. The optimization algorithms have been interfaced and tested on CVD problems using a chemically reacting fluid flow simulator resulting in an order of magnitude reduction in compute time over a black box method. Sandia's simulation environment is reviewed by characterizing each discipline and identifying a possible target level of optimization. Because SAND algorithms are difficult to test on actual production codes, a symbolic simulator (Sundance) was developed and interfaced with a reduced-space sequential quadratic programming framework (rSQP++) to provide a PDE prototyping environment. The power of Sundance/rSQP++ is demonstrated by applying optimization to a series of different PDE-based problems.
NTIS
Partial Differential Equations; Constraints; Programming Languages; Optimization

20030038909 Technische Univ., Eindhoven
Product Form Solutions to Production Systems with Simultaneous Resource Possession
Visschers, J.; Adan, I.; Wessels, J.; Sep. 1999; 26 pp.
Report No.(s): PB2003-101948; MEMO-COSOR-99-15; No Copyright; Avail: CASI; A03, Hardcopy

Queuing models with simultaneous resource possession can be used to model production systems, in which several resources are needed simultaneously to process a job. With these models, performance characteristics of the production systems can be calculated. This is done by recognizing the relevant Markov chain and calculating the equilibrium probabilities. However these Markov chains become high-dimensional and allow very large jumps, which make it extremely hard to find the exact solution to the equilibrium equations. In this paper the authors study three relatively simple models with simultaneous resource possession in order to gain insight into the solution of these models in general. The authors analyze the equilibrium equations of the relevant Markov chains and examine whether they allow a product form solution. The authors show that for these three models the behavior on the horizontal boundary of the corresponding random walk is crucial for the existence of a product form solution. Two of the three models have such a solution. For the third one the authors construct a product form approximation, based on the solution found for the other two models.
NTIS
Mathematical Models; Production Engineering; Production Planning

20030038912 Technische Univ., Eindhoven
Waiting-Time Asymptotics for the M/G/2 Queue with Heterogeneous Servers
Boxma, O.J.; Deng, Q.; Zwart, A. P.; Nov. 1999; 30 pp.
Report No.(s): PB2003-101950; MEMO-COSOR-99-20; No Copyright; Avail: CASI; A03, Hardcopy

This paper considers a heterogeneous M/G/2 queue. The service times at server 1 are exponentially distributed, and at server 2 they have a general distribution B(dot). The authors present an exact analysis of the queue length and waiting time distribution in case B(dot) has a rational Laplace-Stieltjes transform. When B(dot) is regularly varying at infinity of index-v, the authors determine the tail behavior of the waiting time distribution. This tail is shown to be semi-exponential if the arrival rate is lower than the service rate of the exponential server, and regularly varying at infinity of index 1-v if the arrival rate is higher than that service rate.
NTIS
Queueing Theory; Length

20030038940 Technische Univ. Twente, Enschede (Netherlands)
Word Graphs: The Third Set
Hoede, C.; Zhang, L.; May 2000; 32 pp.
Report No.(s): PB2003-102229; No Copyright; Avail: CASI; A03, Hardcopy

This is the third paper in a series of natural language processing in terms of knowledge graphs. A word is a basic unit in natural language processing. This is why we study word graphs. Word graphs were already built for prepositions and adwords (including adjectives, adverbs and Chinese quantity words) in two other papers. In this paper, the authors propose the concept of the logic word and classify logic words into groups in terms of semantics and the way they are used in describing reasoning processes. A start is made with the building of the lexicon of logic words in terms of knowledge graphs.
NTIS
Logic; Words (Language); Graphs (Charts)

20030038953 Helsinki Univ. of Technology, Espoo (Finland), Patras Univ. (Greece)
Helmholtz Theorem for Multiform Fields
Lindell, I. V.; Dassios, G.; Aug. 2002; 20 pp.; In English
Report No.(s): PB2003-102029; REPT-397; Copyright; Avail: National Technical Information Service (NTIS)

The classical Helmholtz theorem which decomposes a given vector field in three dimensions to its curl-free and divergence-free components in terms of a scalar and a vector potential is generalized in differential-form formalism to multiform fields in an n-dimensional space. Decomposition of a p-form field follows in a straightforward way from certain operator identities corresponding to the curi-curi formula of the Gibbsian vector analysis in three dimensions. For p > or = 1, the representation of a given p-form field is given in terms of a (p - 1)-form potential field whose respective generalized curl and divergence operations vanish.
NTIS
Helmholtz Equations; Electromagnetism

20030045780 Lawrence Livermore National Lab., Livermore, CA
Case Study: The 'Office of Real Soon Now' for Visualization
Uselton, S. P.; Mar. 27, 2002; 12 pp.
Report No.(s): DE2002-802920; No Copyright; Avail: Department of Energy Information Bridge

At UNC, the Office of Real Soon Now installations use only a small number of relatively inexpensive projectors, generally two or three, that limit resolution and features. These projectors are connected to Microsoft Windows PCs or Apple computers that are used for daily activities, such as reading email, writing papers, and debugging programs. Even though the UNC faculty involved are predominantly computer graphics researchers, these display systems are used mainly for text-oriented applications (5). Designing, developing, and deploying an office-based system at LLNL would provide opportunities to adapt the system to our specific uses and to evaluate such systems for a range of tasks beyond those typically found at UNC. The goals of the LLNL display system are to exceed previous UNC versions in resolution, to run Unix-based applications, and to support interactive visualization of simulation data better than can be done via current workstations and monitors.
NTIS
Computer Graphics; Scientific Visualization; Display Devices; Personal Computers

20030051448 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Question of Analyticity of Data for Semiclassical NLS
Kamvissis, S.; Dec. 2001; 12 pp.
Report No.(s): PB2003-102074; IHES/M/01/57; No Copyright; Avail: CASI; A03, Hardcopy

In a recent paper, Kamvissis, K. McLaughlin, and P. Miller analyze the semi-classical behavior of solutions to the focusing, completely integrable nonlinear Schrodinger equation, under the assumption of real analytic initial data. In this letter, the authors show that the constraint of analyticity is unnecessary.
NTIS
Nonlinear Equations; Schroedinger Equation

20030051449 Technische Univ. Delft (Netherlands)
Generalized WDVV Equations for F4 Pure N = 2 Super-Yang-Mills Theory
Hoevenaars, L. K.; Kersten, P. H. M.; Martini, R.; Dec. 2000; 24 pp.
Report No.(s): PB2003-102237; MEMO-1560; No Copyright; Avail: CASI; A03, Hardcopy

An associative algebra of holomorphic differential forms is constructed associated with pure N=2 Super-Yang-Mills theory for the Lie algebra F(sub 4). Existence and associativity of this algebra, combined with the general arguments in the work of Marshakov, Mironov and Mirozov, proves that the prepotential of this theory satisfies the generalized WDVV system.
NTIS
Algebra; Yang-Mills Theory; Supersymmetry; Cauchy Problem

20030051453 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Functional Labels and Syntactic Entropy on DNA Strings and Proteins
Carbone, A.; Gromov, M.; Dec. 2001; 30 pp.
Report No.(s): PB2003-102075; IHES/M/01/54; No Copyright; Avail: CASI; A03, Hardcopy

The DNA of a cell is an object which admits a simple mathematical description and a convenient representation in a computer (it is given by an easily manipulatable list, a finite sequence in four letters typically of length between one million and 10 billions). In contrast to this there is no simple way of describing the cell neither statically and even less temporally (dynamically). The authors shall indicate there a possible formalism of combinatorial and numerical (entropic) structures on spaces of sequences which reflect, up to some degree, the organization and functions of DNA and proteins.
NTIS
Deoxyribonucleic Acid; Combinatorial Analysis

20030051466 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Uniqueness of Equilibrium Measures for Countable Markov Shifts and Multi-Dimensional Piecewise Expanding Maps
Buzzi, J.; Sarig, O.; Dec. 2001; 24 pp.
Report No.(s): PB2003-102076; IHES/M/01/55; No Copyright; Avail: CASI; A03, Hardcopy

The authors prove that potentials with sumable variations on topologically transitive countable Markov shifts have at most one equilibrium measure. The authors apply this to multi-dimensional piecewise expanding maps using their Markov diagrams.
NTIS
Uniqueness; Markov Processes; Equilibrium Methods

20030051470 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, Pennsylvania State Univ., University Park. Biomechanics Lab, Hebrew Univ., Jerusalem, Israel
Universality of Critical Circle Covers
Levin, G.; Swiatek, G.; Nov. 2001; 40 pp.; In English
Report No.(s): PB2003-102096; IHES/M/01/50; No Copyright; Avail: CASI; A03, Hardcopy

For a class of critical circle covers we show that properly re-scaled first return maps to a neighborhood of the critical point converge to universal limits. For that to occur, the critical point has to be sufficiently flat.
NTIS
Circles (Geometry); Critical Point

20030051478 Technische Univ. Twente, Enschede (Netherlands)
Knowledge Graph Analysis of Some Particular Problems in the Semantics of Chinese
Hoede, C.; Li, X.; Liu, X.; Zhang, L.; Feb. 2000; 26 pp.
Report No.(s): PB2003-102230; MEMO-1516; No Copyright; Avail: CASI; A03, Hardcopy

Knowledge graph theory aims at giving an analysis of language in general. The theory is tested on some particular problems in the semantics of Chinese. These problems concern word formation and the use of verbs. It is attempted to understand how words are formed and how the verb is used in Chinese sentences.
NTIS
China; Graph Theory; Semantics; Verbal Communication

20030051491 Technische Univ. Twente, Enschede (Netherlands)
Optimal Maintenance Strategies for Systems with Partial Repair Options and without Assuming Bounded Costs
Bruns, P. B.; Feb. 2000; 26 pp.
Report No.(s): PB2003-102233; MEMO-1515; No Copyright; Avail: CASI; A03, Hardcopy

The authors study a repairable system with Markovian deterioration and partial repair options, carried out at fixed times

n=1,2,and look for optimal strategies under certain conditions. Two optimality criteria are considered: expected discounted cost and long-run average cost. Douer and Yechiali found conditions under which a policy in the class of generalized control limit policies is optimal. In this paper conditions are found under which an optimal policy is a control-limit policy. The authors explicitly explain how to derive this optimal policy; numerical examples are given, too. As in the book of Hernandez and Lerma, the authors are interested in the case of possibly unbounded costs.
NTIS
Maintenance; Reliability

20030051518 Technische Univ., Eindhoven
Class of Markov Processes on a Semi-Infinite Strip
Adan, I. J. B. F.; Resing, J. A. C.; Feb. 1999; 26 pp.
Report No.(s): PB2003-101980; MEMO-COSOR-99-03; No Copyright; Avail: CASI; A03, Hardcopy

In this paper the authors determine the equilibrium distribution for a general class of Markov processes on a semi-infinite strip. The authors expose a method to express the equilibrium probabilities of the Markov process as a finite sum of terms, which are geometric in the unbounded variable. The geometric factors are the roots inside the unit circle of a determinantal equation. By using a generating-function technique the authors are able to determine these roots very efficiently. Because of this, the expression for the equilibrium probabilities becomes numerically very attractive.
NTIS
Markov Processes; Probability Theory; Equilibrium Methods

20030051552 General Accounting Office, Washington, DC
Critical Infrastructure Protection: Challenges for Selected Agencies and Industry Sectors
Feb. 2003; 76 pp.
Report No.(s): PB2003-103671; GAO-03-233; No Copyright; Avail: CASI; A05, Hardcopy

The explosive growth of computer interconnectivity is transforming the workings of our nation, its government, and its critical infrastructures. But with the enormous benefits of this interconnectivity comes a threat: both physical and cyber assets are potentially vulnerable to computer based attack. In response, Presidential Decision Directive 63 (PDD 63, May 1998) called for a range of actions to improve the nation's ability to detect and respond to serious infrastructure attacks. For specific agencies under the Committee on Energy and Commerce's jurisdiction and for private-sector organizations for which these agencies have responsibilities, GAO was asked, among other things, to assess their progress and challenges in undertaking critical infrastructure protection (CIP) activities.
NTIS
Organizations; Presidential Reports; Protection; Security

20030051567 Technische Univ., Eindhoven
Fluid Queues and Mountain Processes
Boxma, O. J.; Perry, D.; van der Duyn Schouten, F. A.; Nov. 1998; 36 pp.
Report No.(s): PB2003-101976; MEMO-COSOR-98-28; No Copyright; Avail: CASI; A03, Hardcopy

This paper is devoted to the analysis of a fluid queue with a buffer content that varies linearly during periods that are governed by a three-state semi-Markov process. Two cases are being distinguished: (1) two upward slopes and one downward slope, and (2) one upward slope and two downward slopes. In both cases, at least one of the period distributions is allowed to be completely general. The authors obtain exact results for the buffer content distribution, the busy period distribution and the distribution of the maximal buffer content during a busy period. The results are obtained by establishing relations between the fluid queues and ordinary queues with instantaneous input, and by using level crossing theory.
NTIS
Fluid Dynamics; Buffer Storage; Linearity

20030052034 Lawrence Livermore National Lab., Livermore, CA
Model-Based Nonrigid Motion Analysis Using Natural Feature Adaptive Mesh
Zhang, Y.; Goldgof, D. B.; Sarkar, S.; Tsap, L. V.; Apr. 25, 2000; 12 pp.; In English
Report No.(s): DE2002-791520; UCRL-JC-138649; No Copyright; Avail: Department of Energy Information Bridge

The success of nonrigid motion analysis using physical finite element model is dependent on the mesh that characterizes the object's geometric structure. We suggest a deformable mesh adapted to the natural features of images. The adaptive mesh

requires much fewer number of nodes than the fixed mesh which was used in our previous work. We demonstrate the higher efficiency of the adaptive mesh in the context of estimating burn scar elasticity relative to normal skin elasticity using the observed 2D image sequence. Our results show that the scar assessment method based on the physical model using natural feature adaptive mesh can be applied to images which do not have artificial markers.
NTIS
Computational Grids; Finite Element Method; Mathematical Models; Deformation

20030052038 Lawrence Livermore National Lab., Livermore, CA
Multiscale Combination of Physically-Based Registration and Deformation Modeling
Tsap, L. V.; Goldgof, D. B.; Sarkar, S.; Nov. 08, 1999; 14 pp.; In English
Report No.(s): DE2002-791524; UCRL-JC-136349; No Copyright; Avail: Department of Energy Information Bridge
In this paper the authors present a novel multiscale approach to recovery of nonrigid motion from sequences of registered intensity and range images. The main idea of the approach is that a finite element (FEM) model can naturally handle both registration and deformation modeling using a single model-driving strategy. The method includes a multiscale iterative algorithm based on analysis of the undirected Hausdorff distance to recover correspondences. The method is evaluated with respect to speed, accuracy, and noise sensitivity. Advantages of the proposed approach are demonstrated using man-made elastic materials and human skin motion. Experiments with regular grid features are used for performance comparison with a conventional approach (separate snakes and FEM models). It is shown that the new method does not require a grid and can adapt the model to available object features.
NTIS
Deformation; Mathematical Models

20030052058 Lawrence Livermore National Lab., Livermore, CA
Distributed System Intruder Tools Trinoo and Tribe Flood Network
Criscuolo, P. J.; Rathbun, T.; Dec. 21, 1999; 14 pp.; In English
Report No.(s): DE2002-792254; UCRL-ID-136939; No Copyright; Avail: Department of Energy Information Bridge
Trinoo and Tribe Flood Network (TFN) are new forms of Denial of Service (DoS) attacks. DoS attacks are designed to bring down a computer or network by overloading it with a large amount of network traffic using TCP, UDP, or ICMP. In the past, these attacks came from a single location and were easy to detect. Trinoo and TFN are distributed system intruder tools. These tools launch DoS attacks from multiple computer systems at a target system simultaneously. This makes the assault hard to detect and almost impossible to track to the original attacker. Because these attacks can be launched from hundreds of computers under the command of a single attacker, they are far more dangerous than any DoS attack launched from a single location.
NTIS
Computer Security; Computer Networks

20030052064 Lawrence Livermore National Lab., Livermore, CA
Numerical Errors in DNS: Total Run-Time Error
Jameson, L. M.; Jun. 06, 2000; 20 pp.; In English
Report No.(s): DE2002-793863; UCRL-ID-139138; No Copyright; Avail: Department of Energy Information Bridge
In this manuscript we will explore truncation error of commonly occurring finite differences schemes and Runge-Kutta time advancement operators.
NTIS
Truncation Errors; Error Analysis; Mathematical Models

20030052078 Lawrence Livermore National Lab., Livermore, CA
Elliptic Solvers with Adaptive Mesh Refinement on Complex Geometries
Philip, B.; Jul. 24, 2000; 18 pp.; In English
Report No.(s): DE2002-793986; UCRL-JC-137372; No Copyright; Avail: Department of Energy Information Bridge
Adaptive Mesh Refinement (AMR) is a numerical technique for locally tailoring the resolution computational grids. Multilevel algorithms for solving elliptic problems on adaptive grids include the Fast Adaptive Composite grid method (FAC) and its parallel variants (AFAC and AFACx). Theory that confirms the independence of the convergence rates of FAC and AFAC on the number of refinement levels exists under certain ellipticity and approximation property conditions. Similar

theory needs to be developed for AFACx. The effectiveness of multigrid-based elliptic solvers such as FAC, AFAC, and AFACx on adaptively refined overlapping grids is not clearly understood. Finally, a non-trivial eye model problem will be solved by combining the power of using overlapping grids for complex moving geometries, AMR, and multilevel elliptic solvers.
NTIS
Algorithms; Computational Grids; Ellipticity; Grid Generation (Mathematics)

20030052100 Brookhaven National Lab., Upton, NY
Algebra of Taylor Series and the Roots of a General Polynomial
Herrera, J.; Oct. 11, 2002; 16 pp.; In English
Report No.(s): DE2003-804616; BNL-69414; No Copyright; Avail: Department of Energy Information Bridge
We develop the basic elements of the algebra of Taylor series. This knowledge allows us to derive a series expression for an exact root of a general polynomial of arbitrary degree.
NTIS
Algebra; Polynomials; Taylor Series

20030052111 Lawrence Livermore National Lab., Livermore, CA
Test Design Calculations II
Gerassimenko, M.; Jun. 01, 2000; In English
Report No.(s): DE2002-793924; UCRL-ID-140082; No Copyright; Avail: National Technical Information Service (NTIS)
In an earlier report, we presented results of modeling calculations for one simple geometry that represents an experiment potentially to be performed at Sandia National Laboratory, which is examining equation of state issues of interest to the National Missile Defense Program. In the earlier report, we showed snapshots of calculations with two different initial zone dimensions for Gruneisen EOS and LEOS. We also showed pressure profiles at various locations in a witness plate out of the way of direct projectile impact, but hit by shrapnel generated during impact. It was found that the pressure profiles exhibit strong dependence on location, zone size, and equation of state. In this report we examine the overall momentum impacted to the witness plate. This momentum shows negligible dependence on the equation of state and some dependence on zone size.
NTIS
Equations Of State; Position (Location); Pressure Distribution

20030052125 Technische Univ., Eindhoven
Does Increasing the Sample Size Always Increase the Accuracy of a Consistent Estimator
van der Laan, P.; van Eeden, C.; Feb. 1999; 14 pp.
Report No.(s): PB2003-101972; MEMO-COSOR-99-05; No Copyright; Avail: CASI; A03, Hardcopy
Birnbaum (1948) introduced the notion of peakedness about theta of a random variable T, defined by P((straight line)T-theta(straight line) < epsilon), epsilon > 0. What seems to be not well-known is that, for a consistent estimator T(sub n) of theta, its peakedness does not necessarily converge to 1 monotonically in n. In this article some known results on how the peakedness of the sample mean behaves as a function of n are recalled. Also, new results concerning the peakedness of the median and the interquartile range are presented.
NTIS
Random Variables; Extremum Values; Quartiles

20030052128 Technische Univ. Delft (Netherlands)
Branch Switch Procedures for Soil Based on Eigenvector Perturbations
van der Veen, H.; Vuik, K.; de Borst, R.; Nov. 1997; 58 pp.
Report No.(s): PB2003-102146; No Copyright; Avail: CASI; A04, Hardcopy
The authors study the plastic deformation of soil structures around a bifurcation point. Instead of changing the parameters of one of the elements of a finite element mesh to trigger localization, the authors perturb the incremental displacement vector with an eigenvector associated to a negative eigenvalue found just after the bifurcation point. The negative eigenvalue is a signal of instability, and stability is re-established by either deflating the system matrix, or by searching for a new displacement vector orthogonal to the old one. Considering non-associated plasticity, the system matrix is nonsymmetric, and moreover, the

number of eigenvalues that becomes negative is usually larger than one. The eigenvalues and eigenvectors used in the perturbation are computed with the two-sided Lanczos method.
NTIS
Eigenvectors; Soils; Plastic Deformation

20030052129 Technische Univ. Delft (Netherlands)
Solving Satisfiability Problems Using Elliptic Approximations-A Note on Volumes and Weights
van Maaren, H.; Warners, J. P.; 1998; 16 pp.
Report No.(s): PB2003-102152; REPT-98-32; Copyright; Avail: National Technical Information Service (NTIS)

In this note the authors propose to use the volume of elliptic approximations of satisfiability problems as a measure for computing weighting coefficients of clauses of different lengths. It is confirmed experimentally that, when applied in a DPLL algorithm with branching strategy based on the ellipsoids, the weight the authors deduce yields better results than the weights that are used in previous studies.
NTIS
Approximation; Weighting Functions; Coefficients; Ellipticity

20030052130 Helsinki Univ. of Technology, Espoo (Finland)
Adaptive Methods for Score Function Modeling in Blind Source Separation
Karvanen, J.; 2002; 74 pp.
Report No.(s): PB2003-103139; REPT-35; No Copyright; Avail: CASI; A04, Hardcopy

In Blind Source Separation (BSS) the goal is to recover the source signals from the observed mixed signals (mixtures). Blindness means that neither the sources nor the mixing system is known. Separation can be based on the theoretically limiting but practically feasible assumption that the sources are statistically independent. The assumption connects BSS and Independent component Analysis (ICA). The usage of mutual information as a measure of independence leads to iterative estimation of the score functions of the mixtures. The purpose of this thesis is to develop BSS methods that can adapt to different source distributions.
NTIS
Signal Processing; Measurement; Multichannel Communication

20030052186 Lawrence Livermore National Lab., Livermore, CA
Bicubic Subdivision: Surface Wavelets for Large-Scale Isosurface Representation and Visualization
Bertram, M.; Duchaineau, M. A.; Hamann, B.; Joy, K. I.; Jan. 05, 2000; In English
Report No.(s): DE2002-790918; UCRL-JC-136993; No Copyright; Avail: National Technical Information Service (NTIS)

We introduce a new subdivision-surface wavelet transform for arbitrary two-manifolds with boundary that is the first to use simple lifting-style filtering operations with bicubic precision. We also describe a conversion process for re-mapping large-scale isosurfaces to have subdivision connectivity and fair parameterizations so that the new wavelet transform can be used for compression and visualization.
NTIS
Wavelet Analysis; Algorithms

20030052257 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Secant Varieties and Successive Minima. Appendix: On Linear Subspaces Contained in the Secant Varieties of a Projective Curve
Soule, C.; Voisin, C.; Oct. 2001; 32 pp.
Report No.(s): PB2003-102087; IHES/P/01/49; No Copyright; Avail: CASI; A03, Hardcopy

The paper is organized as follows. In Section 1 the authors compute the degree of the secant varieties and they give Voisin's result on secant varieties of curves (Th. 1). The authors deduce from it a geometric result on extension classes in Theorem 2. In Section 2 the authors propose another approach to linear subspaces in secant varieties of curves. Though weaker than Theorem 1, it might be of independent interest, especially because of Theorem 3, due to A. Granville. Granville's result computes the maximal length of a sequence of binominal coefficients, in a given line of Pascal's triangle, which have a common divisor. The answer turns out to be related to the distribution of primes among positive integers.
NTIS
Algorithms; Linearity; Matrices (Mathematics); Minima; Curves (Geometry)

20030052260 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Ramification Theory in the Imperfect Residue Field Case
Zhukov, I. B.; Dec. 2001; 34 pp.
Report No.(s): PB2003-102089; IHES/P/01/58; No Copyright; Avail: CASI; A03, Hardcopy

Let K be a complete discrete valuation field with the residue field K with straight line, char K with straight line = P > 0. If K with straight line is a perfect field, there exists a beautiful theory of ramification in algebraic extensions of K. Given a finite Galois extension L/K with the Galois group G, one can introduce a canonical filtration (G(sub i)) in G with quite a natural behavior with respect to subextensions in L/K.
NTIS
Charring; Algebra

20030052275 Technische Univ. Twente, Enschede (Netherlands)
WDVV Equations for Pure Super-Yang-Mills Theory
Hoevenaars, L. K.; Martini, R.; Jun. 2000; 54 pp.
Report No.(s): PB2003-102219; MEMO-1529; No Copyright; Avail: CASI; A04, Hardcopy

In the literature, there are two proofs (MMM) (IY98) that the prepotential of N=2 pure Super-Yang-Mills theory satisfies the Witten-Dijkgraaf-Verlinde-Verlinde (WDVV) equations. The authors show that these two methods are in fact equivalent.
NTIS
Proving; Yang-Mills Theory; Algebra

20030052281 Technische Univ. Twente, Enschede (Netherlands)
Z-Related Pairs in Microtonal Systems
Althuis, T. A.; Gobel, F.; Apr. 2000; 14 pp.
Report No.(s): PB2003-102223; MEMO-1524; No Copyright; Avail: CASI; A03, Hardcopy

Various infinite families of Z-related pairs in microtonal systems are presented. Soderberg's dual inversion is compared to a more special transformation, the one-pitch shift. The material is illustrated by several examples.
NTIS
Integers; Frequencies

60
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*.

20030052057 Lawrence Livermore National Lab., Livermore, CA
Effective File-I/O Bandwidth Benchmark
Koniges, A. E.; Rabenseifner, R.; Mar. 16, 2000; 16 pp.; In English
Report No.(s): DE2002-792810; UCRL-JC-137586; No Copyright; Avail: Department of Energy Information Bridge

The effective I/O bandwidth benchmark (b.eff.io) covers two goals: (1) to achieve a characteristic average number for the I/O bandwidth achievable with parallel MPI-I/O applications, and (2) to get detailed information about several access patterns and buffer lengths. The benchmark examines 'first write', 'rewrite' and 'read' access, strided (individual and shared pointers) and segmented collective patterns one file per application and non-collective access to one file per process. The number of parallel accessing processes is also varied and wellformed I/O is compared with non-wellformed. On systems, meeting the rule that the total memory can be written to disk in 10 minutes, the benchmark should not need more than 15 minutes for a first pass of all patterns. The benchmark is designed analogously to the effective bandwidth benchmark for message passing (b-eff) that characterizes the message passing capabilities of a system in a few minutes. First results of the b-eff-io benchmark are given for IBM SP and Cray T3E systems and compared with existing benchmarks based on parallel Posix-I/O.
NTIS
Bandwidth; Eigenvalues; Segments

20030052292 Sandia National Labs., Albuquerque, NM

Investigation into Reliability, Availability, and Serviceability (RAS) Features for Massively Parallel Processor Systems

Kelly, S. M.; Ogden, J. B.; Oct. 2002; In English

Report No.(s): DE2002-805832; No Copyright; Avail: National Technical Information Service (NTIS)

A study has been completed into the RAS features necessary for Massively Parallel Processor (MPP) systems. As part of this research, a use case model was built of how RAS features would be employed in an operational MPP system. Use cases are an effective way to specify requirements so that all involved parties can easily understand them. This technique is in contrast to laundry lists of requirements that are subject to misunderstanding as they are without context. As documented in the use case model, the study included a look at incorporating system software and end-user applications, as well as hardware, into the RAS system.

NTIS

Massively Parallel Processors; Reliability; Availability

61
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.

20030037150 Pacific Northwest National Lab., Richland, WA

User Instructions for the Systems Assessment Capability, Rev. O. Computer Codes. Volume 2: Impact Modules

Eslinger, P. W.; Arimescu, C.; Kanyid, B. A.; Miley, T. B.; Jun. 2002; 274 pp.; In English

Report No.(s): DE2002-15001052; No Copyright; Avail: Department of Energy Information Bridge

In late 1997, the U.S. Department of Energy (DOE) established the Groundwater/Vadose Zone Integration Project (Integration Project). One activity of the Integration Project is an assessment of cumulative impacts for Hanford Site wastes on the subsurface environment and the Columbia River. Through the application of a system assessment capability (SAC), decisions for each cleanup and disposal action will be able to take into account the composite effect of other cleanup and disposal actions. The SAC Systems Code is a tool used to simulate the migration of contaminants (analytes) present on the Hanford Site and assess the potential impacts of the analytes, including dose to humans, socio-cultural impacts, economic impacts, and ecological impacts. The system of codes includes existing computer programs, new computer programs, electronic data libraries, and data formatting processors (or data translators).

NTIS

System Effectiveness; Systems Analysis; Ground Water; Vadose Water; Computer Programs

20030038832 Lawrence Livermore National Lab., Livermore, CA

Creating Interoperable Meshing and Discretization Software: The Terascale Simulation Tools and Technology Center

Brown, D.; Freitag, L.; Glimm, J.; Mar. 28, 2002; 16 pp.

Report No.(s): DE2002-802821; UCRL-JC-147812; No Copyright; Avail: Department of Energy Information Bridge

We present an overview of the technical objectives of the Terascale Simulation Tools and Technologies center. The primary goal of this multi-institution collaboration is to develop technologies that enable application scientists to easily use multiple mesh and discretization strategies within a single simulation on terascale computers. The discussion focuses on our efforts to create interoperable mesh generation tools, high-order discretization techniques, and adaptive meshing strategies.

NTIS

Computerized Simulation; Grid Generation (Mathematics); Technology Utilization; Computer Programming; Interoperability

20030038837 Lawrence Livermore National Lab., Livermore, CA

Generating Composite Overlapping Grids on CAD Geometries

Henshaw, W. D.; Feb. 07, 2002; 16 pp.

Report No.(s): DE2002-802824; UCRL-JC-147161; No Copyright; Avail: Department of Energy Information Bridge

We describe some algorithms and tools that have been developed to generate composite overlapping grids on geometries that have been defined with computer aided design (CAD) programs. This process consists of five main steps. Starting from a description of the surfaces defining the computational domain we (1) correct errors in the CAD representation, (2) determine the topology of the patched-surface, (3) build a global triangulation of the surface, (4) construct structured surface and volume grids using hyperbolic grid generation, and (5) generate the overlapping grid by determining the holes and the interpolation

points. The overlapping grid generator which is used for the final step also supports the rapid generation of grids for block-structured adaptive mesh refinement and for moving grids. These algorithms have been implemented as part of the Overture object-oriented framework.
NTIS
Computer Aided Design; Grid Generation (Mathematics); Structured Grids (Mathematics); Computational Grids

20030038874 CH2M Hill Hanford Group, Inc., Richland, WA
Report on New Pumping System Software on Pumping Instrumentation and control Skids
Koch, M. R.; Jan. 26, 2001; 46 pp.; In English
Report No.(s): DE2002-805945; RPP-7567; No Copyright; Avail: Department of Energy Information Bridge
This supporting document documents the software changes to the PLC and DTAM to operate the new pumping system from the PIC skids.
NTIS
Computer Programs; Maintenance

20030038891 Fluor Hanford, Richland, WA
Software Development Guidelines for Visual Basic and SQL Server
2002; 34 pp.; In English
Report No.(s): DE2002-804229; No Copyright; Avail: Department of Energy Information Bridge
Development Guidelines are programming directions that focus not on the logic of the program but on its physical structure and appearance. These directions make the code easier to read, understand, and maintain. These guidelines will cover general development syntax, organization and documentation. The general information covers the high level areas of development, no matter what the environment. This guide will detail specific Visual Basic guidelines, following the same standard naming conventions set by Microsoft, with some minor additions. The guideline will finish with conventions specific to a Database or Microsoft's SQL Server specific environment.
NTIS
Computer Programs; Standardization

20030038895 CH2M Hill Hanford Group, Inc., Richland, WA
PLC Software Program for Leak Detector Station No. A1 'SALW-LDST-A1'
Koch, M. R.; Jan. 25, 2001; 46 pp.; In English
Report No.(s): DE2002-805943; RPP-7294; No Copyright; Avail: Department of Energy Information Bridge
This document describes the software program for the Programmable Logic Controller for the Leak Detector Station 'SALW-LD-ST-Al'. The Appendices contains a copy of the printout of the software program.
NTIS
Radioactive Wastes; Applications Programs (Computers)

20030038900 Lawrence Livermore National Lab., Livermore, CA
Chromium: A Stream-Processing Framework for Interactive Rendering on Clusters
Humphreys, G.; Houston, M.; Ng, V. R.; Frank, R.; Ahem, S.; Jan. 11, 2002; In English
Report No.(s): DE2002-803180; UCRL-JC-146802; No Copyright; Avail: National Technical Information Service (NTIS)
We describe Chromium, a system for manipulating streams of graphics API commands on clusters of workstations. Chromium's stream filters can be arranged to create sort-first and sort-last par- allel graphics architectures that, in many cases, support the same applications while using only commodity graphics accelerators. In addition, these stream filters can be extended programmatically, allowing the user to customize the stream transformations performed by nodes in a cluster. Because our stream processing mechanism is completely general, any cluster-parallel rendering algorithm can be either implemented on top of or embedded in Chromium. In this paper, we give examples of real-world applications that use Chromium to achieve good scalability on clusters of workstations, and describe other potential uses of this stream processing technology. By completely abstracting the underlying graphics architecture, network topology, and API command processing semantics, we allow a variety of applications to run in different environments.
NTIS
Data Processing; Computer Graphics; Architecture (Computers); Applications Programs (Computers)

20030039178 Lawrence Livermore National Lab., Livermore, CA
Modern Tools for Modern Software
Kumfert, G.; Epperly, T.; Oct. 31, 2001; 12 pp.; In English
Report No.(s): DE2002-15002233; UCRL-ID-146037; No Copyright; Avail: Department of Energy Information Bridge
This is a proposal for a new software configure/build tool for building, maintaining, deploying, and installing software. At its completion, this new tool will replace current standard tool suites such as autoconf, automake, l ibtoo l, aad the de facto standard build tool, make.
NTIS
Software Engineering; Applications Programs (Computers)

20030051441 Florida Research Center, Inc., Tallahassee
Development of a Statewide Model for Heavy Truck Freight Movement on External Road networks Connecting with Florida Ports, Phase 2 (on CD-ROM)
Jul. 2001; In English
Report No.(s): PB2002-500101; No Copyright; Avail: National Technical Information Service (NTIS)
Investigation of several Florida Ports has provided critical information for generating heavy truck trips based on computer models developed by applying Artificial Neural Networks (ANN) and utilizing vessel freight cargo data. 1026 days of truck counts from the field were collected to calibrate and validate the developed computer models. Over nine years of vessel data were analyzed. The computer models developed have the ability to accurately produce truck volumes for the identified port access roads. The models perform with a range of 88\% to 95\% accuracy, depending on the port model. The ports with available historical vessel records provided adequate data for building forecasting models using the time series approach. These forecasting models predicted vessel freight cargo data that was used as input into the developed ANN port truck trip generation models. These models subsequently output corresponding truck volumes for years 2001 through 2005. With 2000 as the base year, by the year 2005, the Port of Palm Beach was forecasted to have an 86\% average increase in daily heavy trucks, the Port of Everglades was forecasted to have a 31\% average increase in daily heavy trucks, and the Port of Tampa was forecasted to have a slight 3\% decrease in average daily truck traffic.
NTIS
Trucks; Cargo

20030051489 Technische Univ. Twente, Enschede (Netherlands)
Discretization in Semi-Infinite Programming: The Rate of Approximation
Still, G. J.; Jan. 2001; 28 pp.
Report No.(s): PB2003-102232; MEMO-1565; No Copyright; Avail: CASI; A03, Hardcopy
The discretization approach for solving semi-infinite optimization problems is considered. The authors are interested in the rate of the approximation error between the solution of the semi-infinite problem and the solution of the discretized program depending on the discretization mesh-size d. It will be shown how this rate depends on whether the minimizer is strict of order one or two and on whether the discretization includes boundary points of the index set in a consistent way. This is done for common and for generalized semi-infinite problems.
NTIS
Computer Programming; Discretization (Mathematics); Approximation

20030051548 National Defence Research Establishment, Stockholm
Annual Report 2001 on FOI's Research on Modelling and Simulation
Sporre, L.; Feb. 2002; 32 pp.; In Swedish
Report No.(s): PB2003-103196; FOI-R-0348-SE; No Copyright; Avail: CASI; A03, Hardcopy
This report summarizes the research from the fiscal year 2001 within the Swedish Defense Research Agency in the domain of Modeling and Simulation. In the report you will find a summing-up of the aim and direction of the research domain and the national and international development. The results of the research are summarized and the activities in each project are described. Efforts have been made to increase the competence in modeling and simulation generally as well as within specific areas. FOI research and MoS is aimed at supporting the Swedish Armed Forces by developing and assessing technologies, methodologies and tools to be used in a range of modeling and simulation applications.
NTIS
Armed Forces (Foreign); Simulation

20030051569 Technische Univ. Twente, Enschede (Netherlands)
Condorcet Final Report
van Bakel, B.; Boon, R. T.; Mars, N. J. I.; Oltmans, E.; Jan. 28, 2000; 60 pp.
Report No.(s): PB2003-103124; No Copyright; Avail: CASI; A04, Hardcopy

The Condorcet project was funded by the Dutch Technology Foundation (STW) through the Werkgemeenschap Informatiewetenschap. The project was carried out at the Vossius Laboratory of the University of Twente. The main objective of the Condorcet project was to design, build and evaluate a prototype automated indexing system, supporting Information Retrieval from large, reality-level volumes (tens of thousands) of documents. The prototype has been tested on some 400 documents from two scientific domains: mechanical properties of engineering ceramics as a field of engineering, and epilepsy as a subfield of medicine.
NTIS
Prototypes; Indexing (Information Science); Computer Systems Design; Automatic Control; Information Retrieval

20030051571 Technische Univ. Twente, Enschede (Netherlands)
Temporal Logic for Object-Based Systems
Distefano, D.; Katoen, J. P.; Rensink, A.; 2003; 22 pp.
Report No.(s): PB2003-103127; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a logic, called BOTL (Object-Based Temporal Logic), that facilitates the specification of dynamic and static properties of object-based systems. The logic is based on the branching temporal logic CTL and the Object Constraint Language (OCL), an optional part of the UML standard for expressing static properties over class diagrams. The formal semantics of BOTL is defined in terms of a general operational model that is aimed to be applicable to a wide range of object-oriented languages. A mapping of a large fragment of OCL onto BOTL is defined, thus providing a formal semantics to OCL.
NTIS
Object-Oriented Programming; Programming Languages

20030052009 Lawrence Livermore National Lab., Livermore, CA
Prosthetic Knee Design by Simulation
Hollerback, K.; Hollister, A.; Jul. 30, 1999; 8 pp.; In English
Report No.(s): DE2002-15002379; UCRL-ID-138971; No Copyright; Avail: Department of Energy Information Bridge

Although 150,000 total knee replacement surgeries are performed annually in North America, current design of knee prostheses have mechanical problems that include a limited range of motion, abnormal gait patterns, patellofemoral joint dysfunction, implant loosening or subsidence, and excessive wear. Modern computer technology can be used to design, prototype, and test new total knee implants. Our design team uses the full range of CAD-CAM to design and produce implant prototypes for mechanical and clinical testing. The implant's CAD model should closely replicate movements of the normal knee. The CAD solid model is converted to a three-dimensional (3-D) finite element model, which can be evaluated with 3-D nonlinear finite element analysis (FEA) techniques.
NTIS
Prosthetic Devices; Computer Aided Design; Knee (Anatomy)

20030052071 Lawrence Livermore National Lab., Livermore, CA
Open Source software licenses for Livermore National Laboratory
Busby, L.; Aug. 24, 2000; 14 pp.; In English
Report No.(s): DE2002-793928; UCRL-ID-140250; No Copyright; Avail: Department of Energy Information Bridge

This paper attempts to develop supporting material in an effort to provide new options for licensing Laboratory-created software. Where employees and the Lab wish to release software codes as so-called Open Source, they need, at a minimum, new licensing language for their released products. Several open source software licenses are reviewed to understand their common elements, and develop recommendations regarding new language.
NTIS
Software Engineering; Open Source Licensing (Computers); Computer Programs

20030052107 Technische Univ., Eindhoven
Multiprocessor Scheduling with Rejection
Bartal, S.; Leonardi, S.; Marchetti-Spaccamela, A.; Sgall, J.; Stougie, L.; Apr. 1999; 24 pp.
Report No.(s): PB2003-101971; MEMO-COSOR-99-06; No Copyright; Avail: CASI; A03, Hardcopy

The authors consider a version of multiprocessor scheduling with the special feature that jobs may be rejected at a certain penalty. An instance of the problem is given by m identical parallel machines and a set of n jobs, each job characterized by a processing time and a penalty. In the on-line version the jobs become available one by one and the authors have to schedule or reject a job before they have any information about future jobs. The objective is to minimize the makespan of the schedule for accepted jobs plus the sum of the penalties of rejected jobs.
NTIS
Multiprocessing (Computers); Programming (Scheduling); Parallel Computers; Microprocessors

20030052109 Technische Univ., Eindhoven
Single Node Service Provision with Fixed Charges
Dye, S.; Stougie, L.; Tomasgard, A.; Feb. 1999; 36 pp.
Report No.(s): PB2003-101969; MEMO-COSOR-99-04; No Copyright; Avail: CASI; A03, Hardcopy

The service provision problem described in this paper comes from an application of distributed processing in telecommunication networks. The objective is to maximize a service provider's profit from offering computational based services to customers. The services are built from software applications called subservices. The service provider has limited capacity of some resources and therefore must choose from a set of software subservices those he would like to offer. He maximizes profit which depends both on the number of requests met and fixed charges for installing the subservices. A fixed charge is positive when it is charged by the service provider and negative if it is an amount the service provider must pay for example to license the subservice. The authors' main interest in this problem comes from it being a subproblem in a scenario decomposition of the service provision problem with stochastic demand.
NTIS
Distributed Processing; Telecommunication; Nodes (Standing Waves); Approximation; Computer Programs

20030052178 Lawrence Livermore National Lab., Livermore, CA
Damage Detection and Identification of Finite Element Models Using State-Space Based Signal Processing
Burnett, G. C.; Apr. 28, 2000; 218 pp.; In English
Report No.(s): DE2002-793960; UCRL-ID-139186; No Copyright; Avail: Department of Energy Information Bridge

Until recently, attempts to update Finite Element Models (FEM) of large structures based upon recording structural motions were mostly ad hoc, requiring a large amount of engineering experience and skill. Studies have been undertaken at LLNL to use state-space based signal processing techniques to locate the existence and type of model mismatches common in FEM. Two different methods (Gauss-Newton gradient search and extended Kalman filter) have been explored, and the progress made in each type of algorithm as well as the results from several simulated and one actual building model will be discussed. The algorithms will be examined in detail, and the computer programs written to implement the algorithms will be documented.
NTIS
Finite Element Method; Computerized Simulation; Detection; Damage; Structural Engineering; Algorithms

20030052191 Physics and Electronics Lab. TNO, The Hague, Netherlands
A Software Tool for Interactive Missile Autopilot Design under MATLAB
vanderLans, M. J.; Banning, R.; November 2002; 116 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): TNO Proj. 015-29718
Report No.(s): FEL-02-A169; TD01-0334; Copyright; Avail: Other Sources

The TNO-FEL missile simulation program environment MIST (Missile Simulation Toolbox) currently lacks a dedicated design tool for the missile autopilot. It is for this reason that such a tool with interactive graphical user interface is now developed. This missile autopilot design (MAD) tool is tailored to suit the classical three-loop autopilot and the generic tail-controlled missile. The MAD-tool is based on an analytical design procedure for this particular autopilot and missile that is available in the open literature. In addition, it also interfaces with a numerical linearization procedure already present in the MIST environment. The structure of MAD and its accompanying GUI are such that they can be altered to cope with either a different autopilot of a different type of missile.
Author
Computerized Simulation; Applications Programs (Computers); Missile Design; Graphical User Interface; Automatic Pilots; Missile Control; Control Systems Design

20030052296 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Precipitation Processes developed during ARM (1997), TOGA COARE (1992), GATE (1974), SCSMEX (1998), and KWAJEX (1999), Consistent 2D, semi-3D and 3D Cloud Resolving Model Simulations

Tao, Wei-Kuo; Hou, A.; Atlas, R.; Starr, D.; Sud, Y.; [2003]; 1 pp.; In English; 2nd Workshop on Super Parameterization, 6-11 May 2003, Kauai, HI, USA; No Copyright; Avail: Other Sources; Abstract Only

Real clouds and cloud systems are inherently three-dimensional (3D). Because of the limitations in computer resources, however, most cloud-resolving models (CRMs) today are still two-dimensional (2D). A few 3D CRMs have been used to study the response of clouds to large-scale forcing. In these 3D simulations, the model domain was small, and the integration time was 6 hours. The major objectives of this paper are: (1) to assess the performance of the super-parameterization technique (i.e. is 2D or semi-3D CRM appropriate for the super-parameterization?); (2) calculate and examine the surface energy (especially radiation) and water budgets; (3) identify the differences and similarities in the organization and entrainment rates of convection between simulated 2D and 3D cloud systems.

Derived from text

Clouds (Meteorology); Precipitation (Meteorology); Computerized Simulation; Mathematical Models; Two Dimensional Models; Three Dimensional Models

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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.

20030038790 Federal Highway Administration, Washington, DC

Database Design for Developing Pavement Performance Equations (on CD-ROM)

Aug. 04, 1998; In English

Report No.(s): PB2002-500116; FHWA/OH-99/002; No Copyright; Avail: National Technical Information Service (NTIS)

A comprehensive Database Management System (DBMS) software called 'RESEARCH' was developed to manage the data which will be collected by ODOT to develop the Pavement Performance Prediction Models. This software uses 'Visual FoxPro Version 5.0, Windows' and incorporates all the latest features of a PC-based DBMS as well as Windows. The database was designed to perform all the necessary functions of a comprehensive DBMS, such as: data entry and editing, retrieval of the data, and reports. To facilitate the data entry, a menu driven feature call 'FORM' was used in this system. Each data table is displayed on the screen as a Form and valid data entry is displayed as the user enters the data. This allows the user to check the data immediately and correct any typing errors before storing the data in the database. It also contains lookup tables to help the user in entering the proper codes, when necessary. A description of various fields of the database is also included in the report. This report contains recommendations regarding the selection of the test sections, guidelines for data collection, and methods of data analysis.

NTIS

Data Bases; Data Management; Pavements; Performance Prediction

20030045764 Fermi National Accelerator Lab., Batavia, IL

Fault Tolerant Issues in the BTeV Trigger

Haney, M. H.; Iyer, R. K.; Kalbarczyk, Z. T.; Stens, M.; Dec. 2002; 10 pp.

Report No.(s): DE2002-805437; No Copyright; Avail: Department of Energy Information Bridge

The BTeV trigger performs sophisticated computations using large ensembles of FPGAs, DSPs, and conventional microprocessors. This system will have between 5,000 and 10,000 computing elements and many networks and data switches. While much attention has been devoted to developing efficient algorithms, the need for fault-tolerant, fault-adaptive, and flexible techniques and software to manage this huge computing platform has been identified as one of the most challenging aspects of this project. They describe the problem and offer an approach to solving it based on a distributed, hierarchical fault management system.

NTIS

Particle Accelerators; Fault Tolerance; Microprocessors; Distributed Processing

20030045808 Technische Univ. Twente, Enschede (Netherlands)
Scheduling Split-Jobs on Parallel Machines
Hurink, J. L.; Kern, W.; Nawijn, W. M.; Jun. 2000; 12 pp.
Report No.(s): PB2003-103560; MEMO-1530; No Copyright; Avail: CASI; A03, Hardcopy

In classical shop scheduling, the tasks corresponding to a job may not be executed in parallel, i.e., their processing times may not overlap. In case these tasks are processes, independent of each other, this assumption is no longer justified. We consider corresponding scheduling problems where each job splits into a number of pairwise independent processes that have to be executed on dedicated machines.

NTIS
Scheduling; Parallel Processing (Computers)

20030051541 General Accounting Office, Washington, DC
Customs Service Modernization: Automated Commercial Environment Progressing, but Further Acquisition Management Improvements Needed
Feb. 2003; 64 pp.
Report No.(s): PB2003-102926; GAO-03-406; No Copyright; Avail: CASI; A04, Hardcopy

Customs' November 2002 ACE expenditure plan, the fourth in a series of legislatively required plans, provides for certain project management tasks as well as the definition, design, and development of the first release of the second of four planned ACE increments. GAO's analysis of the plan shows that it meets the legislative conditions imposed by the Congress. In its series of reports on Customs' management of ACE, GAO has made a number of recommendations, which Customs is currently addressing. However, Customs has been slow to correct weaknesses in two areas fundamental to effective acquisition management-people and processes. These weaknesses increase the risk that ACE will be late, cost more than necessary, and not perform as intended. While the Customs Modernization Office (CMO) has developed a human capital strategy, neither the strategy nor supporting documentation identifies how the commitments made in the strategy will be met, including what steps will be taken and what resources are needed to execute the steps. Further, based on the strategy's timeline, it will be over a year before the CMO fully implements the strategy. Customs' has made slow progress in implementing key acquisition practices, such as project office management and acquisition risk management, which GAO first recommended Customs do in 1999. Since that time many practices have been developed, but almost none of them have been implemented.

NTIS
Project Management; Automatic Control; Law (Jurisprudence); Information Systems

20030052003 Forest Service, Washington, DC
National GIS Core Layer Standards
2003; In English
Report No.(s): PB2003-500027; No Copyright; Avail: National Technical Information Service (NTIS)

This CD-ROM provides some examples of the utility of a standardized integrated GIS database. Data on this disk are taken from an actual operational Ranger District database in the Southern Region. Not all core layers proposed by the Ecosystem Management Corporate Team are represented in this demonstration database, as no such complete GIS database exists.

NTIS
Data Bases; Standardization; Ecosystems

20030052173 Physics and Electronics Lab. TNO, The Hague, Netherlands
Development Methodology Model Scenarios
Voogd, J. M.; Kamstra, M.; Bakker, R. T.; November 2002; 64 pp.; In Dutch
Contract(s)/Grant(s): A00/D/850; TNO Proj. 015.30492
Report No.(s): FEL-01-A276; TD01-0247; Copyright; Avail: Other Sources

The implementation of scenarios for simulators (model scenarios) is a time consuming task. Nowadays the simulators of the Royal Netherlands Army are often linked. Therefore correlated scenarios for the joined simulators are necessary. To facilitate the development of correlated distributed model scenarios a process is defined. During this process choices on resources (e.g. simulators and terrain databases) are made. A description is supplied on how the process can be automated such

that based on a general description of the scenario the necessary model scenarios can be generated.
Author
Simulators; Armed Forces (Foreign); Netherlands; Models

20030052175 Physics and Electronics Lab. TNO, The Hague, Netherlands
XML-S with Entrust/PKI
Martis, E. R.; Lachman, R.; October 2002; 101 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.31671
Report No.(s): FEL-02-A194; TD01-0337; Copyright; Avail: Other Sources

To successfully implement XML-S, the use of secure key management systems is essential. A Public Key Infrastructure (PKI) is a secure key management environment. A PKI is a suitable solution in large computer environments like the one of the Koninklijke Landmacht. During this project, we studied the possibilities to realize a connection between XML-S and the PKI of Entrust. From this study and the tests done, we can conclude that it is not possible to realize a connection between these two. The major reason is because Entrust/PKI version 5.0 does not support XML. Further conclusions of this project are. The use of a PKI improves the management of cryptographic keys when implementing Multilevel Security (MLS) in documents. PKI's are difficult to implement because of incompatibilities between client and server applications. Also because software developers are required to have thorough technical knowledge of the X.500 LDAP protocol, Before starting with the implementation of a PKI environment. Furthermore, we concluded that Multiple Levels 3f Security (MLOS) is less complex to implement than Multilevel Security (MLS). MLOS has been implemented in XML-S. In the future, there will be PKI environments supporting XML, like the new open Internet standard, XML Key Management Service (XKMS).
Author
Computer Information Security; Management Systems; Computer Networks; Protocol (Computers)

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*.

20030045713 Physics and Electronics Lab. TNO, The Hague, Netherlands
Exploration of the Relation Between Platform Automation and Operational Task Performance
Gillis, M. P. W.; March 2003; 39 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.30170
Report No.(s): FEL-02-B281; TD02-0213; Copyright; Avail: Other Sources

Developments in the ICT industry enable high automation levels aboard navy ships. Each generation of the Royal Dutch Navy shows an increased level of automation. At the moment, platform automation is mainly intended for monitoring and control of the ships systems. The operational context is not yet included in the monitor and control system. This project aims at investigating the dependencies between automated platform management and the operational context. For this purpose, the information flows in and between the Command Information Centre, the Technical Centre and the bridge are investigated. The study shown that the operational rooms have each its own perception. Automated systems should be helpful in translating the perception between operational rooms. Functional modelling and the abstraction hierarchy from Rasmussen are promising techniques for analyzing the information flows.
Author
Automatic Control; Command And Control; Mathematical Models; Functional Analysis; Computer Techniques

20030051612 Physics and Electronics Lab. TNO, The Hague, Netherlands
Study Command Input DO-2: Information Management Module
Neef, R. M.; Arciszewski, H. F. R.; vanDam, B. J.; October 2002; 27 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 30048/2-2
Report No.(s): FEL-02-A189; TD01-0325; Copyright; Avail: Other Sources

This report describes a concept of a information management module which aims to organize automated task support in the area of picture compilation especially the identification process. This information management module enables the user to delegate specific identification tasks to an automated identification process. This information module in fact enables the user to precisely define the support he needs. In addition this module alerts the user when he notifies that the automated

identification process has obtained new information that might be relevant to the user.
Author
Information Management; Support Systems; Image Analysis; Automation

64
NUMERICAL ANALYSIS

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

20030051496 Technische Univ. Twente, Enschede (Netherlands)
Alternative Proof of the Nowhere-Zero 6-Flow Theorem
Hoede, C.; Uttunggadewa, S.; Jan. 2001; 16 pp.
Report No.(s): PB2003-102234; MEMO-1564; No Copyright; Avail: CASI; A03, Hardcopy
The nowhere-zero 6-flow theorem of Seymour is proven by construction.
NTIS
Flow Distribution; Theorems

20030051588 Swedish Defence Research Establishment, Stockholm
Frequency Optimized Computation Methods
Jackobsson, S.; Mar. 19, 2002; 54 pp.
Report No.(s): PB2003-103174; FOI-R-0407-SE; No Copyright; Avail: CASI; A04, Hardcopy
In this paper the authors develop an alternative method to derive finite difference approximations of derivatives. The purpose is to find schemes which work for a broader range of frequencies than the usual approximations based on polynomial fitting and Taylor's Theorem to the expense of less accuracy for low frequencies. The numerical schemes are obtained as solutions to constrained optimizations problems in a weighted L2-norm in the frequency domain. The authors examine the accuracy of these schemes and compare them with the standard approximations. The authors also use the same approach to derive numerical schemes for time integration for differential equations with time independent operators. To test the accuracy of the different schemes, the authors study dispersion errors for a simple wave equation in one space dimension. The authors examine the number of points per wave length which is needed in order for the relative error in the phase velocity to be below a certain bound. A similar examination is carried out for the different time integration schemes.
NTIS
Finite Difference Theory; Derivation; Approximation

20030052258 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Estimating Uncertainty in GPCP and TRMM Multi-Satellite Precipitation Estimates
Huffman, G. J.; Adler, R. F.; Bolvin, D. T.; Nelkin, E. J.; [2003]; 1 pp.; In English; IUGG 2003, 11 Jun. - Jul. 2003, Sapporo, Japan; No Copyright; Avail: Other Sources; Abstract Only
One of the high-priority problems in satellite precipitation estimation is developing algorithms for estimating the errors in precipitation retrievals by individual sensors and subsequent multi-satellite combinations. Classically, we distinguish between 'random' and 'bias' errors, which do and do not, respectively average to zero over a 'big enough' time/space sample. The current operational GPCP and TRMM multi-satellite algorithms are nearly unique in estimating random error for the monthly precipitation estimates from individual sensor systems (including gauge), following Huffman, and then making multi-sensor combinations. No routinely operational global precipitation produces estimates of bias error. Subsequently, a similar scheme has been followed to provide random error estimates for the Multi-satellite Precipitation Analysis (MPA) being computed in real time and after real time for TRMM. The Huffman algorithm for random error is briefly reviewed, including a discussion of the limitations imposed on the algorithm by standard monthly precipitation data sets. Starting from a very simple theoretical treatment of the histogram of precipitation samples in a month, an equation is developed that depends on the estimated average precipitation rate for the month, the number of samples in the month, and two constants. The constants are set separately for each source of precipitation estimate (such as 'raingauge') by calibration at selected ground sites. We discuss recent work validating the random error estimates to highlight the successes and limitations of this first-generation approach. We then consider what information is needed from the individual sensor algorithms to facilitate additional accuracy in the estimation of random errors across the time/space span of climate regimes which a global estimation system must handle. In addition, the thorny issue of estimating bias is raised. Finally, the role of error estimates (and the qualitative errors!) in creating combinations of precipitation estimates from different individual sensors is discussed. This issue is particularly

important when fine scales in space and time are being considered, say the 0.25 x 0.25-deg 3-hourly estimates in the MPA. Author
Accuracy; Algorithms; Precipitation (Meteorology); Error Analysis; Measuring Instruments

65
STATISTICS AND PROBABILITY

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

20030038363 Lawrence Livermore National Lab., Livermore, CA
Stochastic Engine Initiative: Improving Prediction of Behavior in Geologic Environments We Cannot Directly Observe
Aines, R.; Nitao, J.; Newmark, R.; Carle, S.; Ramirez, A.; Sep. 30, 2001; In English
Report No.(s): DE2002-15002143; UCRL-ID-148221; No Copyright; Avail: National Technical Information Service (NTIS)
The stochastic engine uses modern computational capabilities to combine simulations with observations. We integrate the general knowledge represented by models with specific knowledge represented by data, using Bayesian inferencing and a highly efficient staged Metropolis-type search algorithm. From this, we obtain a probability distribution characterizing the likely configurations of the system consistent with existing data. The primary use will be optimizing knowledge about the configuration of a system for which sufficient direct observations cannot be made. Programmatic applications include underground systems ranging from environmental contamination to military bunkers, optimization of complex nonlinear systems, and timely decision-making for complex, hostile environments such as battlefields or the detection of secret facilities. NTIS
Stochastic Processes; Hydrogeology; Computerized Simulation; Radioactive Isotopes; Migration

20030038798 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Random Walk in Random Groups
Gromov, M.; Jan. 2002; 78 pp.
Report No.(s): PB2003-102078; IHES/M/02/03; No Copyright; Avail: CASI; A05, Hardcopy
Contents include the following: Random groups associated with graphs; Small cancellation; Diffusion and contraction; Scaling limits and entropy.
NTIS
Random Walk; Groups

20030038850 Technische Univ., Eindhoven
Strong Approximation of the Shortt Process
Einmahl, J. H. J.; Geilen, M.; Nov. 1998; 18 pp.
Report No.(s): PB2003-101973; MEMO-COSOR-98-26; No Copyright; Avail: CASI; A03, Hardcopy
A shortt of a one dimensional probability distribution is defined to be an interval which has at least probability t and minimal length. The length of a shortt, U(t), and its obvious estimator, U(sub n)(t), are significant measures of scale of a probability distribution and the corresponding random sample, respectively. The shortt process is defined to be (square root of n)(U(sub n)(t)-U(t))/U(sup line)(t), similarly to the definition of the quantile process. It is known that this process converges weakly, under natural regularity conditions, to a Brownian bridge. In this note a strong approximation of the short process by a Kiefer process is established, which yields the weak convergence as a corollary. Applications of the result to the global and local strong limiting behavior of the short process are also presented.
NTIS
Length; Scale; Estimates; Probability Distribution Functions; Random Sampling

20030038856 Technische Univ. Delft (Netherlands)
Power Algorithms for (max, +)- and Bipartite (min, max, +)-Systems
van der Woude, J.; 1998; 22 pp.
Report No.(s): PB2003-102151; REPT-98-29; Copyright; Avail: National Technical Information Service (NTIS)
In this paper the authors consider (max, +)-systems and bipartite (min, max, +)-systems. The authors present so-called power algorithms that under some mild conditions on the structure of the systems determine eigenvalues and corresponding eigenvectors in an iterative way. The authors present simple proofs for their algorithms and they illustrate their algorithms by

means of some examples also clarifying the difference with existing power algorithms.
NTIS
Algorithms; Events; Eigenvalues; Eigenvectors

20030038914 Technische Univ., Eindhoven
Least Squares Method in Heteroscedastic Censored Regression Models
Van Keilegom, I.; Akritas, M. G.; 1999; 24 pp.
Report No.(s): PB2003-101951; MEMO-COSOR-99-18; No Copyright; Avail: CASI; A03, Hardcopy

Consider the heteroscedastic polynomial regression model Y=Beta(sub 0) + Beta(sub 1)X++Beta(sub p)X(sup p)+square root of Var(Y(straight line)X)epsilon where epsilon is independent of X, and Y is subject to random censoring. Provided that the censoring on Y is 'light' in some region of X, the authors construct a least squares estimator for the regression parameters whose asymptotic bias is shown to be as small as desired. The least squares estimator is defined as a functional of the Van Keilegom and Akritas (1999) estimator of the bivariate distribution P(X less than or equal to x, Y less than or equal to y), and its asymptotic normality is obtained.
NTIS
Regression Analysis; Mathematical Models; Asymptotic Methods

20030038924 Technische Univ., Eindhoven
Inference on the Bivariate L1 Median with Censored Data
Van Keilgom, I.; Hettmansperger, T. P.; Oct. 1999; 26 pp.
Report No.(s): PB2003-101947; MEMO-COSOR-99-16; No Copyright; Avail: CASI; A03, Hardcopy

Consider two random variables subject to random right censoring, like the time two different diseases for individuals under study or the survival times of twins. Of interest is the bivariate median of these two random variables. There are various ways that the univariate median has been extended to higher dimensions for completely observed data. The authors concentrate on the so-called bivariate L(sub 1) median and extend this estimator to the censored data situation. The estimator is based on van der Laan (1996)'s estimator of the bivariate distribution of two random variables that are subject to censoring. Asymptotic results for the proposed estimator are established. The obtained results include the asymptotic normality of the estimator, its local power and the construction of a confidence region for the true median. Finally, the authors consider a data set on kidney dialysis patients and estimate the median time to two different infectious for these individuals.
NTIS
Asymptotic Methods; Median (Statistics); Censored Data (Mathematics)

20030038938 Technische Univ., Eindhoven, Alabama Univ., Tuscaloosa. Dept. of Management Science and Statistics
Class of Distribution-Free Control Charts
Chakraborti, S.; van der Laan, P.; van de Wiel, M. A.; Jun. 2000; 48 pp.; In English
Report No.(s): PB2003-101954; SPOR-2000-11; No Copyright; Avail: CASI; A03, Hardcopy

Distribution-free Shewhart-type control charts are proposed for future sample percentiles based on a reference sample. These charts have a key advantage that their in-control run length distribution does not depend on the underlying continuous process distribution. Tables are given to help implement the charts for given sample sizes and false alarm rates. Expressions for the exact run length distribution and the average run length (ARL) are obtained using expectation by conditioning. Properties of the charts are studied, via evaluations of the run length distributions and the ARL. These computations show that in certain cases the proposed charts have attractive ARL properties over standard parametric charts such as the CUSUM and the EWMA. Calculations are illustrated with several short examples. Also included is a numerical example, using data from Montgomery (1997), where an application of the precedence chart produced slightly different results.
NTIS
False Alarms; Run Time (Computers); Hazards; Control

20030038966 Technische Univ. Eindhoven (Netherlands), California Univ., Los Angeles. Dept. of Biostatistics
Likelihood Ratio Confidence Bands in Nonparametric Regression with Censored Data
Li, G.; Van Keilegom, I.; May 11, 2000; 26 pp.; In English
Report No.(s): PB2003-103122; No Copyright; Avail: CASI; A03, Hardcopy

Let (X, Y) be a random vector, where Y denotes the variable of interest possibly subject to random right censoring, and X is a covariate. We construct confidence intervals and bands for the conditional survival and quantile function of Y given X

using a nonparametric likelihood ratio approach. This approach was introduced by Thomas and Grunkemeier, who estimated confidence intervals of survival probabilities based on right censored data. The method is appealing for several reasons: it always produces intervals inside (0, 1), it does not involve variance estimation, and can produce asymmetric intervals. Asymptotic results for the confidence intervals and bands are obtained, as well as simulation results, in which the performance of the likelihood ratio intervals and bands is compared with that of the normal approximation method. We also propose a bandwidth selection procedure based on the bootstrap and apply the technique on a real data set.
NTIS
Confidence Limits; Likelihood Ratio; Regression Analysis

20030045708 Lawrence Livermore National Lab., Livermore, CA
Markov-Chain-Monte-Carlo-Based Method for System Identification
Glaser, R. E.; Lee, C. L.; Nitao, J. J.; Hanley, W. G.; Oct. 22, 2002; 14 pp.; In English
Report No.(s): DE2002-15002274; UCRL-JC-150494; No Copyright; Avail: Department of Energy Information Bridge

This paper describes a novel methodology for the identification of mechanical systems and structures from vibration response measurements. It combines prior information, observational data and predictive finite element models to produce configurations and system parameter values that are most consistent with the available data and model. Bayesian inference and a Metropolis simulation algorithm form the basis for this approach. A series of test cases based on a simple fixed-free cantilever beam is presented. These results demonstrate that the algorithm is able to identify the system, based on the stiffness matrix, given applied force and resultant nodal displacements. Moreover, it effectively identifies locations on the beam where damage (represented by a change in elastic modulus) was specified.
NTIS
Markov Chains; System Identification; Finite Element Method; Vibration Measurement

20030051444 Technische Univ., Eindhoven
Subset Selection
van der Laan, P.; Jun. 2000; 20 pp.
Report No.(s): PB2003-101955; SPOR-2000-10; No Copyright; Avail: CASI; A03, Hardcopy

Assume k populations are given. The associated independent random variables have continuous distribution functions differing only in their unknown location parameter. The statistical selection goal of subset selection is to select a non-empty subset which contains the best population with confidence level P(sup star), with k(sup -1)<P(sup star)<1. In this context, best population means the population with the largest value of the location parameter. The subset selection approach is described and some properties are presented.
NTIS
Selection; Population Theory

20030051487 Technische Univ. Twente, Enschede (Netherlands)
Deviation Matrix of a Continuous-Time Markov Chain
Coolen-Schrijner, P.; Van Doorn, E. A.; Jan. 2001; 28 pp.
Report No.(s): PB2003-102231; No Copyright; Avail: CASI; A03, Hardcopy

The deviation matrix of an ergodic, continuous-time Markov chain with transition probability matrix P(.) and ergodic matrix II is the matrix D integrated from infinity to zero (P(t)=II)dt. The authors give conditions for D to exist and discuss properties and a representation of D. The deviation matrix of a birth-death process is investigated in detail. The authors also describe a new application of deviation matrices by showing that a measure for the convergence to stationarity of a stochastically increasing Markov chain can be expressed in terms of the elements of the deviation matrix of the chain.
NTIS
Markov Chains; Stochastic Processes; Transition Probabilities; Matrices (Mathematics)

20030051495 Technische Univ. Twente, Enschede (Netherlands)
Estimation in Shewhart Control Charts
Albers, W.; Kallenberg, W. C. M.; Dec. 2000; 40 pp.
Report No.(s): PB2003-102238; MEMO-1559; No Copyright; Avail: CASI; A03, Hardcopy

The influence of the estimation of parameters in Shewhart control charts is investigated. It is shown by simulation and asymptotics that (very) large sample sizes are needed to accurately determine control charts if estimators are plugged in.

Correction terms are developed to get accurate control limits for common sample sizes in the in-control situation. Simulation and theory show that the new corrections work very well. The performance of the corrected control charts in the out-of-control situation is studied as well. It turns out that the correction terms do not disturb the behavior of the control charts in the out-of-control situation. On the contrary, for moderate sample sizes the corrected control charts remain powerful and therefore, the recommendation to take at least 300 observations can be reduced to 40 observations when corrected control charts are applied.
NTIS
Estimating; Statistical Analysis

20030051568 Technische Univ. Eindhoven (Netherlands), Pennsylvania State Univ., University Park
Estimation of the Bivariate and Marginal Distributions with Censored Data
Akritas, M.; Van Keilegom, E.; May 22, 2000; 26 pp.; In English
Report No.(s): PB2003-103123; No Copyright; Avail: CASI; A03, Hardcopy

Two new estimators for the bivariate distribution when both variables are subject to censoring are proposed. One of the estimators is valid under the assumption that the censoring variables are independent from the variables of interest, and leads to an estimator of the marginal distribution that out performs the Kaplan-Meier estimator. The other assumes only that one of the censoring variables is conditionally independent of the survival time it censors given the other survival time. Both estimators require estimation of the conditional distribution when the conditioning variable is subject to censoring. Such a method of estimation is proposed. The weak convergence of the proposed estimators is obtained. Simulation results suggest that they perform well relative to existing estimators.
NTIS
Censored Data (Mathematics); Estimating

20030051601 Technische Univ., Eindhoven
Randomized Algorithms for On-Line Scheduling Problems: How Low Can't You Go
Stougie, L.; Vestjens, A.P.A.; 2002; 16 pp.
Report No.(s): PB2003-101953; SPOR-2000-13; No Copyright; Avail: CASI; A03, Hardcopy

The authors prove lower bounds on the competitive ratio of randomized algorithms for several on-line scheduling problems. The main result is a bound 9f e/(e-1) for the on-line problem with objective minimizing the sum of completion times of jobs that arrive over time at their release times and are to be processed on a single machine. This lower bound shows that a randomized algorithm designed in (Chekuri et al. 1997) is a best possible randomized algorithm for this problem.
NTIS
Algorithms; On-Line Systems; Scheduling; Tasks; Random Processes

20030051607 Center for Mathematics and Computer Science, Amsterdam
Maximum Likelihood Estimation for the Bombing Model. Probability, Networks and Algorithms (PNA)
van Lieshout, M. N. M.; van Zwet, E. W.; Aug. 31, 2000; 24 pp.
Report No.(s): PB2003-103145; PNA-R0008; No Copyright; Avail: CASI; A03, Hardcopy

Perhaps the best known example of a random set is the Boolean model. It is the union of 'grains' such as discs, squares or triangles which are placed at the points of a Poisson point process. The Poisson points are called the 'germs'. We are interested in estimating the intensity, say lambda, of the Poisson process from a sample of a Boolean model of discs (the bombing model). A natural estimate is the number of germs in the observation region divided by the area of that region. Unfortunately, we do not observe the presence of a given germ when its associated disc is completely covered by other discs. On the other hand, we observe the exact location of a germ when we observe any part of its associated disc's boundary. We demonstrate how to apply Coupling From The Past to sample from the conditional distribution, given the data, of the unobserved germs. Such samples allow us to approximate the maximum likelihood estimator of the intensity. We discuss and compare two methods to do so. The first method is based on a Monte Carlo approximation of the likelihood function. The second is a stochastic version of the EM algorithm.
NTIS
Maximum Likelihood Estimates; Poisson Density Functions; Boolean Algebra

20030052025 Lawrence Livermore National Lab., Livermore, CA
Managing Performance Analysis with Dynamic Statistical Projection Pursuit
Vetter, J. S.; Reed, D. A.; May 22, 2000; 24 pp.; In English
Report No.(s): DE2002-791439; UCRL-JC-136327; No Copyright; Avail: Department of Energy Information Bridge

Computer systems and applications are growing more complex. Consequently, performance analysis has become more difficult due to the complex, transient interrelationships among runtime components. To diagnose these types of performance issues, developers must use detailed instrumentation to capture a large number of performance metrics. Unfortunately, this instrumentation may actually influence the performance analysis, leading the developer to an ambiguous conclusion. In this paper, we introduce a technique for focussing a performance analysis on interesting performance metrics. This technique, called dynamic statistical projection pursuit, identifies interesting performance metrics that the monitoring system should capture across some number of processors. By reducing the number of performance metrics, projection pursuit can limit the impact of instrumentation on the performance of the target system and can reduce the volume of performance data.
NTIS
Computers; Reliability Analysis

20030052104 Technische Univ., Eindhoven
Precedence Probability and Prediction Intervals
Chakraborti, S.; van der Laan, P.; 1999; 31 pp.
Report No.(s): PB2003-101963; MEMO-COSOR-99-19; No Copyright; Avail: CASI; A03, Hardcopy

Precedence tests are simple yet useful nonparametric tests based on two specified order statistics from two independent random samples or, equivalently, on the count of the number of observations from one of the samples preceding some order statistic of the other sample. The probability that an order statistic from the second sample exceeds an order statistic from the first sample is termed the precedence probability. When the distributions are the same, this probability can be calculated exactly, without any specific knowledge of the underlying common continuous distribution. This fact can be utilized to set up nonparametric prediction intervals in a number of situations. In this paper, prediction intervals are considered for the number of second sample observations that exceed a particular order statistic of the first sample. To aid the user, tables are provided for small sample sizes, where exact calculations are most necessary. The same tables can be used to implement a precedence test for small sample sizes.
NTIS
Probability Theory; Random Sampling; Nonparametric Statistics; Prediction Analysis Techniques

20030052177 Technische Univ. Twente, Enschede (Netherlands)
Moderate Deviations of Maximum Likelihood Estimators Under Alternatives
Inglot, T.; Kallenberg, W. C. M.; Mar. 2000; 32 pp.
Report No.(s): PB2003-103559; MEMO-1519; No Copyright; Avail: CASI; A03, Hardcopy

Since statistical models are simplifications of reality, it is important in estimation theory to study the behavior of estimators also under distributions (slightly) different from the proposed model. In testing theory, when dealing with test statistics where nuisance parameters are estimated, knowledge of the behavior of the estimators of the nuisance parameters is needed under alternatives to evaluate the power. In this paper the moderate deviation behavior of the (multivariate) maximum likelihood estimator determined within a proposed model is investigated not only under this model, but also under distributions close to the model. The set-up is quite general, including for instance also discrete distributions. It turns out that under the model the asymptotic optimality of the maximum likelihood estimator in the local sense continuous to hold in the moderate deviation area. The rate of convergence under alternatives is determined both when comparing the maximum likelihood estimator with a 'natural' parameter in the parameter space and when comparing it with the proposed 'true' value in the parameter space. The methods can also be applied to general M-estimators.
NTIS
Maximum Likelihood Estimates; Multivariate Statistical Analysis; Alternatives

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20030038923 Center for Mathematics and Computer Science, Amsterdam
Uniform Convergence of Curve Estimators for Ergodic Diffusion Processes. Probability, Networks and Algorithms (PNA)
van Zanten, J. H.; Aug. 31, 2000; 26 pp.
Report No.(s): PB2003-102644; PNA-R0006; Copyright; Avail: National Technical Information Service (NTIS)

Ergodic diffusions, we consider kernel-type estimators for the invariant density, its derivatives and the drift function. Using empirical process theory for martingales, we first prove a theorem regarding the uniform weak convergence of the empirical density. This result is then used to derive uniform weak convergence for the kernel estimator of the invariant density. For kernel estimators of the derivatives of the invariant density and for a nonparametric drift estimator that was proposed by Banon, we give bounds for the rate at which the uniform distance between the estimator and the true curve vanishes. We also consider the problem of estimation from discrete-time observations. In that case, obvious estimators can be constructed by replacing Lebesgue integrals by Riemann sums. We show that these approximations are also uniformly consistent, provided that the bandwidths and the time between the observations are correctly balanced.
NTIS
Ergodic Process; Diffusion; Probability Theory; Kernel Functions; Algorithms

20030038935 Technische Univ. Twente, Enschede (Netherlands)
Average- Convexity of Common Pool and Oligopoly TU-Games
Driessen, T. S. H.; Meinhardt, H.; Dec. 2000; 26 pp.
Report No.(s): PB2003-102239; MEMO-1558; No Copyright; Avail: CASI; A03, Hardcopy

The paper studies both the convexity and average-convexity properties for a particular class of cooperative TU-games called common pool games. The common pool situation involves a cost function as well as a (weakly decreasing) average joint production function. Firstly, it is shown that, if the relevant cost function is a linear function, then the common pool games are convex games. The convexity, however, fails whenever cost functions are arbitrary. The authors present sufficient conditions involving the cost functions (like weakly decreasing marginal costs as well as weakly decreasing average costs) and the average joint production functions in order to guarantee the convexity of the common pool game. A similar approach is effective to investigate a relaxation of the convexity property known as the average-convexity property for a cooperative game. An example illustrates that oligopoly games are a special case of common pool games whenever the average joint production function represents an inverse demand function.
NTIS
Game Theory; Convexity; Functions (Mathematics)

20030038961 Technische Univ. Twente, Enschede (Netherlands)
Note on a Tandem Queue with Delayed Server Release
Nawijn, W. M.; Jun. 2000; 20 pp.
Report No.(s): PB2003-102240; MEMO-1531; No Copyright; Avail: CASI; A03, Hardcopy

The authors consider a tandem queue with two stations. The first station is an s-server queue with Poisson arrivals and exponential service times. After terminating his service in the first station, a customer enters the second station to require service at a single server, while in the meantime he is blocking his server in station 1 until he completes services in station 2, whereupon the server in station 1 is released. Two cases are considered. In the first case it is assumed that the service times in the second station are exponentially distributed. The solution of this model can be formulated using the matrix-geometric method. In the second case s=2 and, the service times are generally distributed. The model is analyzed using the supplementary variable technique, obtaining the relevant probability generating functions.
NTIS
Matrix Methods; Queueing Theory

20030045786 Prins Maurits Lab. TNO, Rijswijk, Netherlands
The Operational Effectiveness of Weapons of the Dismounted Infantryman
Knijnenburg, S. G.; Bakema, G. H.; vanSon-deWaard, E. N.; February 2003; 80 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/KL/467; TNO Proj. 014.14019
Report No.(s): PML-2002-A85; TD-2002-0159; Copyright; Avail: Other Sources

Within the framework of the Soldier Modernisation Programme several projects are carried out with the objective to increase the effectiveness of the Dutch dismounted soldier. This project concerns the armament of the soldier. Purpose of the study was to establish the weapon effectiveness of the current infantry squad weapons: the Diemaco rifle, the Minimi light machinegun and the 4Omm Underslung grenade launcher UGL). Therefore several vignettes were developed in cooperation with OTCMan. These vignettes were simulated with the English close combat simulation model Close Action Environment (CAEn) and some Measures of Effectiveness or metrics were calculated using the model output. The used metrics show the

weapon's ability to incapacitate and to suppress different type of targets. The results show that the main effectiveness of the rifle is to incapacitate targets and that its ability to suppress targets is negligible with the used suppression model. The light machinegun possesses both abilities; however at larger operational distances up to 600 meters, these reduce significantly. For the grenade launcher, both incapacitation and suppression effect are large. However, this last result was obtained using weapon data of which field trials shows that they were too optimistic.
Author
Combat; Weapons; Effectiveness; Armed Forces (Foreign); Netherlands; Simulation

20030051445 Technische Univ., Eindhoven
Exact Asymptotics for Fluid Queues Fed by Multiple Heavy-Tailed On-Off Flows
Zwart, A. P.; Borst, S. C.; Mandjes, M.; 2002; 66 pp.
Report No.(s): PB2003-101961; SPOR-2000-14; No Copyright; Avail: CASI; A04, Hardcopy

The authors consider a fluid queue fed by multiple On-Off flows with heavy-tailed (regularly varying) On-periods. Under fairly mild assumptions, the authors prove that the workload distribution is asymptotically equivalent to that in a reduced system. The reduced system consists of a 'dominant' subset of the flows, with the original service rate subtracted by the mean rate of the other flows. The authors describe how a dominant set may be determined from a simple knapsack formulation.
NTIS
Queueing Theory; Workloads (Psychophysiology); Economic Factors

20030051485 Technische Univ. Twente, Enschede (Netherlands)
Resource-Constrained Two-Echelon Inventory Models for Repairable Item Systems
Avsar, Z. M.; Zijm, W. H. M.; Apr. 2000; 36 pp.
Report No.(s): PB2003-102226; MEMO-1521; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, the authors consider two-echelon maintenance systems with repair facilities both at a number of local service centers (called bases) and at a central location. Each repair facility may be considered to be a job shop and is modeled as a (limited capacity) open queuing network, while any transport from the central facility to the bases (and vice versa) is modeled as an ample server. At all bases as well as at the central repair facility, ready-for-use spare parts are kept in stock. Once an item in the field fails, it is returned to one of the bases and replaced by a ready-for-use item from the spare parts stock, if available. The returned failed item is either repaired at the base or shipped and repaired at the central facility. In the case of local repair, the item is added to the local base stock as a ready-for-use item after repair. If a repair at the central facility is needed, the base orders an item from the central spare parts stock to replenish its local stock, while the failed item is added to the central stock after repair. Orders are satisfied on a first-come-first-serve basis while any requirement that cannot be satisfied immediately either at the bases or at the central facility is backlogged.
NTIS
Maintenance; Systems Analysis

20030051492 Technische Univ. Twente, Enschede (Netherlands)
Vizing-Type Theorem for Matching Forests
Keijsper, J. C. M.; Feb. 2000; 14 pp.
Report No.(s): PB2003-102227; MEMO-1517; No Copyright; Avail: CASI; A03, Hardcopy

A well-known Theorem of Vizing states that one can color the edges of a graph by Delta + Alpha colors, such that edges of the same color form a matching. Here, Delta denotes the maximum degree of a vertex, and Alpha the maximum multiplicity of an edge in the graph. An analogue of this Theorem for directed graphs was proved by Frank. It states that one can color the arcs of a digraph by Delta + Alpha colors, such that arcs of the same color form a branching. For a digraph, Delta denotes the maximum in degree of a vertex, and Alpha the maximum multiplicity of an arc. The authors prove a common generalization of the above two theorems concerning the coloring of mixed graphs (these are graphs having both directed and undirected edges) in such a way that edges of the same color form a matching forest.
NTIS
Color; Forests; Graph Theory; Analogs

20030051494 Technische Univ., Eindhoven
Consistency and Potentials in Cooperative TU-Games: Sobolev's Reduced Game Revived
Driessen, T. S. H.; Dec. 2000; 24 pp.
Report No.(s): PB2003-102236; MEMO-1561; No Copyright; Avail: CASI; A03, Hardcopy

It was a quarter of a century ago that Sobolev proved the reduced game (otherwise called consistency) property for the much-discussed Shapley value of cooperative TU-games. The purpose of this paper is to extend Sobolev's result in two ways. On the one hand the unified approach applies to the enlarged class consisting of game-theoretic solutions that possess a so-called potential representation; on the other Sobolev's reduced game is strongly adapted in order to establish the consistency property for solutions that admit a potential. Actually, Sobolev's explicit description of the reduced game is now replaced by a similar, but implicit definition of the modified reduced game; the characteristic function of which is implicitly determined by a bijective mapping on the universal game space (induced by the solution in question). The resulting consistency property solves an outstanding open problem for a wide class of game-theoretic solutions.
NTIS
Game Theory; Consistency

20030051570 Technische Univ., Eindhoven
Asymptotic Behavior of the Tandem Queueing System with Identical Service Times at Both Queues
Boxma, O. J.; Deng, Q.; Jan. 1999; 22 pp.
Report No.(s): PB2003-101979; MEMO-COSOR-99-02; No Copyright; Avail: CASI; A03, Hardcopy
Consider a tandem queue consisting of two single-server queues in series, with a Poisson arrival process at the first queue and arbitrarily distributed service times, which for any customer are identical in both queues. For this tandem queue, the authors relate the tail behavior of the sojourn time distribution and the workload distribution at the second queue to that of the (residual) service time distribution.
NTIS
Asymptotic Properties; Queueing Theory; Time Constant

20030051581 Technische Univ., Eindhoven
Queueing Model with Dependence Between Service and Interarrival Times
Boxma, O. J.; Perry, D.; Nov. 1998; 24 pp.
Report No.(s): PB2003-101975; MEMO-COSOR-98-27; No Copyright; Avail: CASI; A03, Hardcopy
The authors consider a storage model that can be either interpreted as a certain queueing model with dependence between a service request and the subsequent interarrival time, or as a fluid production/inventory model with a two-state random environment. The authors establish a direct link between the workload distributions of the queueing model and the production/inventory model, and they present a detailed analysis of the workload and waiting time process of the queueing system.
NTIS
Queueing Theory; Models; Time Dependence

20030052036 Technische Univ. Delft (Netherlands)
Semidefinite Programming Approaches for MAX-2-SAT and MAX-3-SAT: Computational Perspectives
De Klerk, E.; Warners, J. P.; 1998; 24 pp.
Report No.(s): PB2003-102150; REPT-98-34; Copyright; Avail: National Technical Information Service (NTIS)
Semidefinite programming (SDP) relaxations - in conjunction with randomized rounding schemes -yield 7/8 and 0.931 approximation algorithms for MAX-3-SAT and MAX-2-SAT respectively. In spite of these powerful theoretical results, it is not clear if SDP can be used as a practical tool for solving MAX-SAT problems to optimality. In this regard, the usefulness of the SDP approach will ultimately depend on the ability to exploit sparsity in the SDP relaxations of large dimension. (The dimension corresponds to the number of variables and the sparsity is related to the number of clauses.) The authors present an investigation of sparsity issues for the SDP relaxations of Goemans and Williamson, and Feige and Goemans for MAX-2-SAT. Moreover, the authors test a branch and cut procedure to solve MAX-2-SAT to optimality, where the dual of the SDP relaxation is solved by interior point methods in order to exploit sparsity.
NTIS
Computer Programming; Approximation; Algorithms

20030052079 Technische Univ. Delft (Netherlands)
Simplical Pivoting Algorithms for a Tractable Class of Integer Programs
van Maaren, H.; 1998; 24 pp.
Report No.(s): PB2003-102148; REPT-98-33; Copyright; Avail: National Technical Information Service (NTIS)

The authors present a tractable class of integer feasibility problems. This class of max-closed IP problems was studied in somewhat restricted form by Glover, Pnueli, Hochbaum and Chandrasekaran and has a logic counterpart known as the class of Horn formulas. First, the authors modify the existing algorithms in order to avoid the related recognition problem. Further, the authors argue that in order to solve max-closed IP problems simplical path following methods are flexible with respect to starting conditions, which make them more suitable than the top-down truncation algorithms that have been suggested. A new vector labeling based simplical algorithm is developed which also runs outside this class and reveals useful information for search tree design.
NTIS
Algorithms; Integers; Problem Solving

20030052108 Technische Univ., Eindhoven
Algorithms for the On-Line Travelling Salesman
Ausiello, G.; Feuerstein, E.; Leonardi, S.; Stougie, L.; Talamo, M.; Aug. 1999; 38 pp.
Report No.(s): PB2003-101967; MEMO-COSOR-99-09; No Copyright; Avail: CASI; A03, Hardcopy

In this paper the problem of efficiently serving a sequence of requests presented in an on-line fashion located at points of a metric space is considered. The authors call this problem the On-Line Travelling Salesman Problem (OLTSP). It has a variety of relevant applications in logistics and robotics. The authors consider two versions of the problem. In the first one the server is not required to return to the departure point after all presented requests have been served. For this problem the authors derive a lower bound on the competitive ratio of 2 on the real line. Besides, a 2.5-competitive algorithm for a wide class of metric spaces, and a 7/3-competitive algorithm for the real line are provided. For the other version of the problem, in which returning to the departure point is required, the authors present an optimal 2-competitive algorithm for the above mentioned general class of metric spaces. If in this case the metric space is the real line the authors present a 1.75-competitive algorithm that compares with an approximately 1.64 lower bound.
NTIS
Algorithms; On-Line Systems; Traveling Salesman Problem; Systems Analysis

20030052112 Technische Univ., Eindhoven
Coupled Processors with Regularly Varying Service Times
Borst, S.; Boxma, O.; Jelenkovic, P.; Aug. 1999; 24 pp.
Report No.(s): PB2003-101965; MEMO-COSOR-99-11; No Copyright; Avail: CASI; A03, Hardcopy

Consider two M/G/1 queues that are coupled in the following way. Whenever both queues are non-empty, each server serves its own queue at unit speed. However, if server 2 has no work in its own queue, then it assists server 1, resulting in an increased service speed r(sup asterisk)(sub 1) less than 1 in the first queue. This kind of coupling is related to generalized processor sharing. The authors assume that the service request distributions at both queues are regularly varying at infinity of index -v(sub 1) and -v(sub 2), viz., they are heavy-tailed. Under this assumption, the authors present a detailed analysis of the tail behavior of the workload distribution at each queue. If the guaranteed unit speed of server 1 is already sufficient to handle its offered traffic, then the workload distribution at the first queue is shown to be regularly varying at infinity of index 1 -v(sub 1). But if it is not sufficient, then the workload distribution at the first queue is shown to be regularly varying at infinity of index 1 - min(v(sub 1), v(sub 2)). In particular, traffic at server 1 is then no longer protected from worse behaving (heavier-tailed) traffic at server 2.
NTIS
Queueing Theory; Central Processing Units

20030052119 Technische Univ., Eindhoven
Tail Asymptotics for the Busy Period in the G1/G/1 Queue
Zwart, A. P.; Aug. 1999; 18 pp.
Report No.(s): PB2003-101964; MEMO-COSOR-99-12; No Copyright; Avail: CASI; A03, Hardcopy

The authors characterize the tail behavior of the busy period distribution in the GI/G/1 queue under the assumption that the tail of the service time distribution is of intermediate regular variation. This extends a result of De Meyer and Teugels who treated the M/G/1 queue with a regularly varying service time distribution. The authors' method of proof is, opposed to the one in probabilistic and reveals an insightful relationship between the busy period and the cycle maximum.
NTIS
Queueing Theory; Probability Theory

20030052120 Technische Univ., Eindhoven

Polling Systems with Regularly Varying Service and/or Switchover Times

Boxma, O. J.; Deng, Q.; Resing, J. A. C.; Aug. 1999; 36 pp.

Report No.(s): PB2003-101966; MEMO-COSOR-99-10; No Copyright; Avail: CASI; A03, Hardcopy

The authors consider a polling system consisting of K queues and a single server S who visits the queues in a cyclic order. The polling discipline in each queue is the gated or exhaustive service discipline. The authors investigate the tail behavior of the waiting time distributions at the various queues in the case that at lease one of the service time or switchover time distributions has a regularly varying tail.

NTIS

Queueing Theory; Systems Analysis; Operations Research

20030052121 Technische Univ., Eindhoven

Nonparametric Statistical Process Control: an Overview and Some Results

Chakraborti, S.; van der Laan, P.; Bakir, S. T.; Jun. 1999; 22 pp.

Report No.(s): PB2003-101968; MEMO-COSOR-99-08; No Copyright; Avail: CASI; A03, Hardcopy

An overview of the literature on some nonparametric or distribution-free quality control procedures is presented for univariate data. A nonparametric control chart is defined along with some general motivations and formulations. Various advantages of these charts are highlighted while some disadvantages of the more traditional, distribution-based, control charts are pointed out. Specific observations are made in the course of the review of articles and constructive criticism is offered, so that opportunities for further research can be identified. Connections to some areas of active research are made, such as sequential analysis, that are of relevance to process control. It is hoped that this article would lead to a wider acceptance of distribution-free control charts among the practitioners and would serve as an impetus to future research and development in this area.

NTIS

Charts; Statistical Analysis

20030052248 Technische Univ., Eindhoven

Two-Dimensional Markov Chains with Geometric Jumps

Adan, I. J. B. F.; Visschers, J. W. C. H.; Wessels, J.; Jan. 1999; 36 pp.

Report No.(s): PB2003-101978; MEMO-COSOR-99-01; No Copyright; Avail: CASI; A03, Hardcopy

Several queuing problems lead to Markov chains with jumps of unbounded length, particularly with geometric behavior in one or more directions. In the present paper the equilibrium behavior is analyzed for two-dimensional nearest neighbor random walks, which may make geometric jump in one direction. The first step in the analysis consists of searching for product forms satisfying the equilibrium equations for inner states. This is made possible by simplifying the equations by taking differences of equations for neighboring states in a well-chosen direction. Such a difference is called delta-equation. It appears that the delta-equation is state-independent. Therefore one obtains two equations, the starting equation and the delta-equation; these equations have a large set of product form solutions S. It appears that, in the case of no transitions from inner states to the North, North-East and East, plus some restrictions on the horizontal boundary, there is a linear combination of countably many product forms from S which satisfies the boundary equations.

NTIS

Markov Chains; Queueing Theory

20030052249 Technische Univ., Eindhoven

Queueing Model for Due Date Control in a Multi Server Repair Shop with Subcontracting

Keizers, J.; Adan, I. J. B. F.; van der Wal, J.; Nov. 1998; 36 pp.

Report No.(s): PB2003-101977; MEMO-COSOR-98-29; No Copyright; Avail: CASI; A03, Hardcopy

This paper deals with a repair shop with multiple parallel servers, which has to carry out planned overhauls, consisting of a lot of maintenance jobs. These overhauls are disturbed by randomly arriving emergency jobs. To control the delivery performance of the overhauls, knowledge about the overhaul makespan distribution should be available. However, past approaches do not have an answer to this problem. Using a 2-dimensional Markov model, the authors derive theoretical solutions for the first and second moment of the overhaul makespan for the case that the repair times of all overhaul jobs are identically and exponentially distributed. In case of non identical repair time distributions, an approximation for the moments is presented. These moments are used to approximate the makespan distribution by a mixture of two Erlang distributions. The

authors show by simulation that this approximation gives very good results.
NTIS
Queueing Theory; Parallel Processing (Computers); Client Server Systems; Systems Analysis; Mathematical Models; Control Theory

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THEORETICAL MATHEMATICS

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

20030038802 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
A-Genus on Non-Spin Manifolds with S1 Actions and the Classification of Positive Quaternion-Kaehler 12-Manifolds
Herrera, H.; Herrera, R.; Oct. 2001; 38 pp.
Report No.(s): PB2003-102091; IHES/M/01/46; No Copyright; Avail: CASI; A03, Hardcopy

The authors prove that the A-genus vanishes on certain non-spin manifolds. Namely, A(M) vanishes on any oriented, compact, connected, smooth manifold M with finite second homotopy group and endowed with non-trivial (isometric) smooth S1 actions. This result extends that of Atiyah and Hirzebruch on spin manifolds endowed with smooth S1 actions, to manifolds which are not necessarily spin. We do this by means of the elliptic genus defined by Ochanine and Witten showing that it also has the special property of being 'rigid under S1 actions' on these manifolds, although they are not necessarily spin as is the usual assumption. The authors conclude with a beautiful application of this new vanishing theorem by classifying all positive quaternion-Kahler 12-manifolds. Namey, the authors prove that every quaternion-Kahler 12-manifold with a complete metric of positive scalar curvature must be a symmetric space.
NTIS
Rigidity; Quaternions; Manifolds (Mathematics)

20030038864 Lawrence Livermore National Lab., Livermore, CA
Some Aspects of Non-Split Vlasov Simulation Methods
Friedman, A.; Sonnendrucker, E.; Aug. 07, 2002; 12 pp.
Report No.(s): DE2002-15002126; UCRL-ID-149684; No Copyright; Avail: Department of Energy Information Bridge

This note summarizes some of the work done on Vlasov simulation methods during the two-week visit of E. Sonnendrucker to LBNL in July-August, 2002. It describes a variety of algorithms which might be employed in solving the coupled Vlasov-Poisson system on a grid in phase space. In particular, it emphasizes a class of methods which do not employ the sort of operator splitting commonly used in Vlasov methods, whereby the distribution function information is alternately updated along planes of constant x and constant v. Instead, the distribution function information on the phase space nodes is given by either (1) multi-dimensional interpolation of the gridded f at an earlier time onto a set of phase space locations which are obtained by tracking the nodes back to that earlier time ('backward semi-Lagrangian'), or (2) weighted deposition or averaging of f values from orbits onto nodes ('forward semi-Lagrangian' or 'fully Lagrangian').
NTIS
Vlasov Equations; Computerized Simulation

20030039168 Technische Univ., Eindhoven
Benjamin's Pentomino Cube
Bouwkamp, C. J.; Dec. 1997; 32 pp.
Report No.(s): PB2003-102891; EUT-97-WSK-01; No Copyright; Avail: CASI; A03, Hardcopy

In the terminology of Martin Gardner, a pentomino cube is defined as a cube covered with a set of the twelve (folded) pentominoes. The very first pentomino cube was published in 1948 by H.D. Benjamin, but virtually ignored in the literature, which instead deals with the second example published in 1954 by W. Stead, also in The Fairy Chess Review. Until 1994 only three other unpublished and unidentified pentomino cubes were known to the author. In spite of George Martin's referring to a 'fiendishly difficult problem,' the author constructed more than twenty pentomino cubes by hand. In the mean time he realized that penetominoes folded around the cube are very different from the usual ones in the plane, in that two non-neighboring squares of a pentomino in the plane can become neighbors when folded around a corner of the cube. They then get, what the author calls, an internal edge and they are not easy to recognize.
NTIS
Cubes (Mathematics); Surfaces; Permutations; Numerical Analysis; Folding

20030051447 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Gauss-Bonnet Type Theorems in Any Dimension
Dolotin, V.; Dec. 2001; 12 pp.
Report No.(s): PB2003-102073; IHES/M/01/56; No Copyright; Avail: CASI; A03, Hardcopy

Given a construction of smooth homotopy class invariants of smooth immersions M(sup n) -> R (sup n+k). The particular case of k = 1, n > or = 1 is a sequence of non-zero integrals, where the n=2 term is the Gauss-Bonnet integral.
NTIS
Theorems; Manifolds (Mathematics)

20030051454 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Stress Energy Tensor in LCFT and the Logarithmic Sugawara Construction
Kogan, I. I.; Nichols, A.; Nov. 2001; 28 pp.
Report No.(s): PB2003-102094; IHES/P/01/48; No Copyright; Avail: CASI; A03, Hardcopy

The authors discuss the partners of the stress energy tensor and their structure in Logarithmic conformal field theories. In particular the authors draw attention to the fundamental differences between theories with zero and non-zero central charge. However, they are both characterized by at least two independent parameters. The authors show how, by using a generalized Sugawara construction, one can calculate the logarithmic partner of T. The authors show that such a construction works in the c=-2 theory using the conformal dimension one primary currents which generate a logarithmic extension of the Kac-Moody algebra.
NTIS
Logarithms; Field Theory (Algebra); Stress Tensors

20030051467 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, Texas Univ. at Austin, Harvard Univ., Cambridge, MA
Visibility of Shafarevich-Tate Groups of Abelian Varieties
Agashe, A.; Stein, W.; Nov. 2001; 24 pp.; In English
Report No.(s): PB2003-102097; IHES/M/01/51; No Copyright; Avail: CASI; A03, Hardcopy

The authors investigate Mazur's notion of visibility of elements of Shafarevich-Tate groups of abelian varieties. The authors give a proof that every cohomology class is visible in a suitable abelian variety, discuss the visibility dimension, and describe a construction of visible elements of certain Shafarevich-Tate groups. This construction can be used to give some of the first evidence for the Birch and Swinnerton-Dyer Conjecture for abelian varieties of large dimension. The authors then give examples of visible and invisible Shafarevich-Tate groups.
NTIS
Abel Function; Visibility; Dimensions

20030051603 Technische Univ. Twente, Enschede (Netherlands)
Optimal Strategies for a Replacement Model
Bruns, P. B.; 2002; 26 pp.
Report No.(s): PB2003-102228; MEMO-1518; No Copyright; Avail: CASI; A03, Hardcopy

The authors examine a replacement system with discrete-time Markovian deterioration and finite state space (0,,N). State 0 stands for a new system, and the higher the state the worse the system; a system in state N is considered to be in a bad state. The authors impose the condition that the fraction of replacements in state N should not be larger than some fixed number. The authors prove that a generalized control limit policy maximizes the expected time between two successive replacements and the authors explain explicitly how to derive this optimal policy. Some numerical examples are given.
NTIS
Mathematical Models; Replacing; Optimization; Markov Processes

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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*.

20030037044 Fluor Hanford, Richland, WA
Pulse Rise Time Characterization of a High Pressure Xenon Gamma Detector for Use in Resolution Enhancement
2002; 24 pp.; In English
Report No.(s): DE2002-804476; No Copyright; Avail: Department of Energy Information Bridge

High pressure xenon ionization chamber detectors are possible alternatives to traditional thallium doped sodium iodide (NaI(T1)) and hyperpure germanium as gamma spectrometers in certain applications. Xenon detectors incorporating a Frisch grid exhibit energy resolutions comparable to cadmium/zinc/telluride (CZT), but with far greater sensitive volumes. The Frisch grid reduces the position dependence of the anode pulse risetimes, but it also increases the detector vibration sensitivity, anode capacitance, voltage requirements and mechanical complexity. We have been investigating the possibility of eliminating the grid electrode in high-pressure xenon detectors and preserving the high energy resolution using electronic risetime compensation methods. A two-electrode cylindrical high pressure xenon gamma detector coupled to time-to-amplitude conversion electronics was used to characterize the pulse rise time of deposited gamma photons. Time discrimination was used to characterize the pulse rise time versus photo peak position and resolution. These data were collected to investigate the effect of pulse rise time compensation on resolution and efficiency.
NTIS
Gamma Rays; High Pressure; Ionization Chambers; Xenon; Detectors; Pulse Time Modulation; Temporal Resolution

20030037057 Fermi National Accelerator Lab., Batavia, IL, Hawaii Univ. at Manoa, Honolulu
Synchro-Betatron Resonances in the 8 GeV Proton Driver
Ohnuma, S.; Nov. 2000; 16 pp.; In English
Report No.(s): DE2002-805246; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
NTIS
Betatrons; Protons; Synchrotrons

20030037063 Fermi National Accelerator Lab., Batavia, IL
Beam Simulation Tools for GEANT4 (BT-v1.0). User's Guide
Elvira, V. D.; Labrun, P.; Spentzouris, P.; Dec. 2002; In English
Report No.(s): DE2002-805249; No Copyright; Avail: National Technical Information Service (NTIS)

Geant4 is a tool kit developed by a collaboration of physicists and computer professionals in the high energy physics field for simulation of the passage of particles through matter. The motivation for the development of the Beam Tools is to extend the Geant4 applications to accelerator physics. The Beam Tools are a set of C++ classes designed to facilitate the simulation of accelerator elements: r.f. cavities, magnets, absorbers, etc. These elements are constructed from Geant4 solid volumes like boxes, tubes, trapezoids, or spheers. There are many computer programs for beam physics simulations, but Geant4 is ideal to model a beam through a material or to integrate a beam line with a complex detector. There are many such examples in the current international High Energy Physics programs.
NTIS
Computerized Simulation; User Manuals (Computer Programs); Beams (Radiation); Standard Model (Particle Physics)

20030037066 Argonne National Lab., IL, Stanford Linear Accelerator Center, CA
Theory and Simulation of CSR Microbunching in Bunch Compressors
Huang, Z.; Borland, M.; Emma, P.; Je Kim, K.; 2002; 8 pp.; In English
Report No.(s): DE2002-805258; No Copyright; Avail: Department of Energy Information Bridge

CSR microbunching instability in bunch compressors is studied both analytically and numerically. The iterative solutions of the integral equation for the instability provide approximate expressions of CSR microbunching due to initial density and energy modulation, and can be applied to a series of bending systems of multiple compressor chicanes and transport lines. Two similar but independent simulation methods are developed and are compared to each other as well as with theory. We

determine the total gain in density modulation for all bend systems of the Linac Coherent Light Source and discuss initial conditions that start the unstable process.
NTIS
Beams (Radiation); Relativistic Electron Beams; Electron Bunching; Iterative Solution; Compressors; Computerized Simulation

20030037067 Brookhaven National Lab., Upton, NY
Muon EDM Experiment Using Stage II of the Neutrino Factory
Ferno, R. C.; Gallardo, J. C.; Morse, W. M.; Semertzidis, Y. K.; Oct. 2002; 10 pp.; In English
Report No.(s): DE2002-805488; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Muons; Neutrinos; Standard Model (Particle Physics); Dipole Moments; Particle Beams

20030037071 Jefferson Lab., Newport News, VA
Relativistic Theory of Few-Body Systems
Gross, F.; 2002; 18 pp.
Report No.(s): DE2002-805556; No Copyright; Avail: Department of Energy Information Bridge
Very significant advances have been made in the relativistic theory of few body systems since I visited Peter Sauer and his group in Hannover in 1983. This talk provides an opportunity to review the programs in this field since then. Different methods for the relativistic calculation of few nucleon systems are briefly described. As an example, seven relativistic calculations of the deuteron elastic structure functions, A, B, and T (sub 20), are compared. The covariant SPECTOR theory, among the more successful and complete of these methods, is described in more detail.
NTIS
Relativistic Theory; Deuterons

20030037072 Stanford Linear Accelerator Center, CA, Lawrence Berkeley National Lab., CA, Fermi National Accelerator Lab., Batavia, IL
Report of the Snowmass T7 Working Group on High Performance Computing
Ko, K.; Ryne, R.; Spentzouris, P.; Aug. 10, 2001; 28 pp.; In English
Report No.(s): DE2002-805413; No Copyright; Avail: Department of Energy Information Bridge
Computers have played a larger and larger role in the theory, design and development of accelerators and the associated technologies. Some examples are calculations of beam optics, simulation of instabilities, electromagnetic field calculations, simulation of space-charge dominated beams and halo formation, beam-beam simulations, start-to-end simulations of systems, real-time modeling of accelerators, and simulations of new accelerator ideas such as those involving lasers and plasmas. This group should explore the impact that advanced computational techniques using the most powerful computers would have on research and development in particle beams and accelerator technology. The group should document past success and look at the immediate and long term future of high performance computing (HPC) as applied to particle beams and accelerator technology.
NTIS
Particle Accelerators; Computerized Simulation; Computers; Beams (Radiation); Particle Theory

20030037093 Fermi National Accelerator Lab., Batavia, IL
Overview of Tevatron Collider Run II at Fermilab
Moore, R. S.; Dec. 2002; 10 pp.
Report No.(s): DE2002-805567; No Copyright; Avail: Department of Energy Information Bridge
The Run II era at Fermilab began in March 2001. Many changes to the accelerator complex were made to support the Tevatron proton-antiproton collider operation with peak luminosities of 2-4 times 10 the 32nd power square centimeters s to the minus 1 power while delivering greater than 5 fb to the minus 1 power of integrated luminosity before the LHC begins its physics program. This report describes the current status of Run II operations and the machine performances needed to achieve our goals.
NTIS
Beamforming; Beam Injection

20030037094 Jefferson Lab., Newport News, VA, Fermi National Accelerator Lab., Batavia, IL

Beam Dynamics Issues of Muon Acceleration in RLA

Bogacz, S. A.; Lebedev, V. A.; Dec. 2002; 8 pp.; In English

Report No.(s): DE2002-805573; No Copyright; Avail: Department of Energy Information Bridge

A conceptual design of a muon acceleration based on recirculating superconducting linacs is proposed. In the presented scenario, acceleration starts after ionization cooling at 210 MeV/c and proceeds to 20 GeV, where the beam is injected into a neutrino factory storage ring. The key technical issues are addressed: such as: the choice of acceleration technology (superconducting versus normal conducting) and the choice of RF frequency, and finally, implementation of the overall acceleration scheme: capture, acceleration, transport and preservation of large phase space of fast decaying species. Beam transport issues for large-momentum-spread beams are accommodated by appropriate lattice design choices. The proposed arc optics is further optimized with a sextupole correction to suppress chromatic effects contributing to emittance dilution. The presented proof-of-principle design of the arc optics with horizontal separation of multi-pass beams is extended for all passes. NTIS

Linear Accelerators; Muons; Particle Acceleration; Particle Production; Particle Beams

20030037113 Helsinki Univ. of Technology, Espoo (Finland)

Diffusive Dynamics of Interacting Particles in Equilibrium and under Hydrodynamic Sedimentation

Lahtinen, J. M.; Aug. 2002; 130 pp.

Report No.(s): PB2003-101272; TKK-DISS-115(2002); Copyright; Avail: National Technical Information Service (NTIS)

Diffusive motion of particles plays an important role in phenomena in surface physics, for example in chemical reactions, surface growth, and spreading. Diffusive motion can be observed in many different systems. In this thesis the authors study diffusion and dynamics in two fundamentally different kinds of systems: (1) in Brownian surface system and (2) in a non-Brownian system of sedimenting particles with full hydrodynamic interactions. The quantities of central importance are the diffusion coefficients and the related correlation functions. In the sedimentation system the authors also discuss the behavior of the velocity fluctuations which has attracted a lot of attention recently. First the authors study the system of spherical Brownian particles on a smooth surface. Then the authors consider the influence of a periodic surface potential and the relation of the continuum model to the lattice gas model. Next we present the corresponding results in a system of rodlike molecules.

NTIS

Brownian Movements; Diffusion Coefficient; Hydrodynamics; Particle Diffusion; Equilibrium; Sediments; Continuum Modeling

20030037171 Lawrence Livermore National Lab., Livermore, CA

1-10 Mbar Laser-Driven Shocks Using the JANUS Laser

Dunn, J.; Price, D. F.; Moon, S. J.; Cauble, R. C.; Springer, P. T.; Aug. 10, 2001; In English

Report No.(s): DE2002-15002088; UCRL-JC-145171; No Copyright; Avail: National Technical Information Service (NTIS)

We report preliminary results using the Lawrence Livermore National Laboratory (LLNL) Janus laser facility to generate high pressure laser-driven shocks in the 1 - 10 Mbar regime. These experiments address various issues, including shock steadiness, planarity, uniformity and low target preheat, important for making precision equation of state (EOS) measurements on a small laser facility. A brief description of the experimental techniques, target design and measurements will be given. NTIS

Lasers; Shock Waves

20030037180 Lawrence Livermore National Lab., Livermore, CA

Modeling Chamber Transport for Heavy-Ion Fusion

Sharp, W. M.; Callahan-Miller, D. A.; Tabak, M.; Yu, S. S.; Peterson, P. F.; Aug. 02, 2002; In English

Report No.(s): DE2002-15002125; UCRL-JC-149578; No Copyright; Avail: National Technical Information Service (NTIS)

In a typical thick-liquid-wall scenario for heavy-ion fusion (HIF), between seventy and two hundred high-current beams enter the target chamber through ports and propagate about three meters to the target. Since molten-salt jets are planned to protect the chamber wall, the beams move through vapor from the gas molecules. Radiation from the preheated target causes further beam stripping and gas ionization. Due to this stripping, beams for heavy-ion fusion are expected to require substantial neutralization in a target chamber. Much recent research has, therefore, focused on beam neutralization by electron sources that were neglected in earlier simulations, including emission from walls and the target, photoionization by the target radiation,

and pre-neutralization by a plasma generated along the beam path. When these effects are included in simulations with practicable beam and chamber parameters, the resulting focal spot is approximately the size required by a distributed radiator target.
NTIS
Test Chambers; Beam Neutralization

20030038852 Technische Univ. Delft (Netherlands), Russian Academy of Sciences, Nizhny Novgorod. Inst. of Mechanical Engineering
Stability of Two Oscillators on an E-B Beam
Wolfert, A. R. M.; Metrikine, A. V.; Dieterman, H. A.; Apr. 1997; 26 pp.; In English
Report No.(s): PB2003-102142; No Copyright; Avail: CASI; A03, Hardcopy

The stability program of two oscillators moving uniformly along a Euler-Bernoulli beam on a visco-elastic foundation is studied. It is assumed that the masses and the beam are in continuous contact and that the velocity of the oscillators exceeds the minimum phase velocity of waves in the supported beam. Stability regions are found. It is shown that a range of velocities exists for which unstable vibrations of the two oscillators will occur for all elastic-inertial properties.
NTIS
Euler-Bernoulli Beams; Viscoelasticity; Elastic Properties; Electron Beams; Oscillators

20030038876 Adelaide Univ. (Australia), Jefferson Lab., Newport News, VA
FLIC Fermions and Hadron Phenomenology
Leinweber, D. B.; Hedditch, J. N.; Melnichouk, W.; Thomas, A. W.; Williams, A. G.; Sep. 27, 2002; 10 pp.; In English
Report No.(s): DE2002-802909; No Copyright; Avail: Department of Energy Information Bridge

A pedagogical overview of the formulation of the Fat Link Irrelevant Clover (FLIC) fermion action and its associated phenomenology is described. The scaling analysis indicates FLIC fermions provide a new form of nonperturbative order (a) improvement where near-continuum results are obtained at finite lattice spacing. Spin-1/2 and spin-3/2, even and odd parity baryon resonances are investigated in quenched QCD, where the nature of the Roper resonance and Lambda (1405) are of particular interest. FLIC fermions allow efficient access to the light quark-mass regime, where evidence of chiral nonanalytic behavior in the Delta mass is observed.
NTIS
Fermions; Hadrons; Quantum Chromodynamics

20030039175 Lawrence Livermore National Lab., Livermore, CA
Edge-Spread Functions Expected for Several Changes in a Commercial Flat-Panel System
Schach von Wittenau, A. E.; Feb. 25, 2002; 12 pp.; In English
Report No.(s): DE2002-15002230; UCRL-ID-147751; No Copyright; Avail: Department of Energy Information Bridge

The Bldg. 239 radiography facility uses a 9 MeV bremsstrahlung linac and a commercially available fiat-panel detector system. Ref. (1) discusses the facility in detail. Ref. (1) furthermore discusses the imaging quality of the flat-panel system, and identifies several sources of image blur for the system in question. The main contributors to the imaging blur are radiation scattered from the front cover of the detector housing, radiation scattered from the back cover of the detector housing, and radiation scattered from the aluminum plate that supports the amorphous-Si detector within the detector housing. The manufacturer of one such flat-panel system seems willing to modify one of their products as requested, if such modifications may be made easily. Easy modifications would include making the detector housing thinner, decreasing the sizes of air gaps inside tile detector system, etc. Removing the aluminum support plate is considered to be a difficult modification. This memo reports the results of a set of Monte Carlo simulations that were performed to predict the changes in imaging quality, compared to that of the current system, if the detector is modified as suggested above. In particular, the edge-spread function (ESF) was calculated for each modification. ESFs were calculated for three photon energies: 100 keV, 450 keV, and 3 MeV.
NTIS
Linear Accelerators; Monte Carlo Method

20030039176 Lawrence Livermore National Lab., Livermore, CA
High Order Numerical Methods for the Investigation of the Two Dimensional Richtyer-Meschkov Instability
Don, W. S.; Gottlieb, D.; Shu, C. W.; Jameson, L.; Nov. 26, 2001; 28 pp.; In English
Report No.(s): DE2002-15002232; UCRL-ID-147252; No Copyright; Avail: Department of Energy Information Bridge

The primary goal of this study is to examine several numerical methodologies with high order of accuracy for the investigation of two dimensional and eventually three dimensional Richtmycr-Mcshkov instability. A detailed description of the evolution of a shock accelerated gaseous interface with diflhrent densities under perturbation can be found in paper by Zaytscv et al (1) and references therein. The numerical schemes developed here will served as a basis for the validation of the results obtained from both experiments and other numerical methods. In this preliminary stage, we employ two numerical schemes, namely, high order Pseudospectral methods (Spectral) and Weighted Essentially Non-Oscillatory finite difference scheme (WENO). Detailed discussion of the above mentioned numerical methods can be found in the vast existing literatures.
NTIS
Numerical Analysis; Accuracy

20030039181 Lawrence Livermore National Lab., Livermore, CA
Average Nuclear Level Densities and Radiative Strength Functions in (57)Fe from Primary (gamma)-Ray Spectra
Tavukcu, E.; Becker, J. A.; Bernstein, L. A.; Garrett, P. E.; Guttormsen, M.; Sep. 26, 2002; 12 pp.; In English
Report No.(s): DE2002-15002244; UCRL-JC-150505; No Copyright; Avail: Department of Energy Information Bridge
An experimental primary gamma-ray spectrum vs. excitation-energy bin (P(E(sub x),E(sub gamma)) matrix) in a light-ion reaction is obtained for 56,57Fe isotopes using a subtraction method. By factorizing the P(E (sub x),E(sub gamma)) matrix according to the Axel-Brink hypothesis the nuclear level density and the radiative strength function (RSF) in 56,57Fe are extracted simultaneously. A step structure is observed in the level density for both isotopes, and is interpreted as the breaking of Cooper pairs. The RSFs for 5s157Fe reveal an anomalous enhancement at low gamma-ray energies.
NTIS
Nuclear Structure; Ion Extraction

20030039184 Lawrence Livermore National Lab., Livermore, CA
Photon Colliders
Gronberg, J.; Oct. 07, 2002; 10 pp.; In English
Report No.(s): DE2002-15002246; UCRL-JC-149436; No Copyright; Avail: Department of Energy Information Bridge
A photon collider interaction region has the possibility of expanding the physics reach of a future TeV scale electron-positron collider. A survey of ongoing efforts to design the required lasers and optics to create a photon collider is presented in this paper.
NTIS
Elementary Particle Interactions; Lasers; Photon-Electron Interaction

20030045714 Lawrence Livermore National Lab., Livermore, CA
Estimating Reaction Cross Sections from Measured (gamma)-ray Yields: The (238)U(n,2n) and (239)Pu(n,2n) Cross Sections
Younes, W.; Nov. 18, 2002; 26 pp.; In English
Report No.(s): DE2002-15002344; UCRL-ID-151070; No Copyright; Avail: Department of Energy Information Bridge
A procedure is presented to deduce the reaction-channel cross section from measured partial gamma-ray cross sections. In its simplest form, the procedure consists in adding complementary measured and calculated contributions to produce the channel cross section. A matrix formalism is introduced to provide a rigorous framework for this approach. The formalism is illustrated using a fictitious product nucleus with a simple level scheme, and a general algorithm is presented to process any level scheme. In order to circumvent the cumbersome algebra that can arise in the matrix formalism, a more intuitive graphical procedure is introduced to obtain the same reaction cross-section estimate. The features and limitations of the method are discussed, and the technique is applied to extract the (235)U(n,2n) and (239)Pu(n,2n) cross sections from experimental partial gamma-ray cross sections, coupled with (enhanced) Hauser-Feshbach calculations.
NTIS
Gamma Rays; Nuclear Reactions; Formalism; Matrices (Mathematics)

20030045715 Lawrence Livermore National Lab., Livermore, CA
Spectral Partitioning in Diffraction Tomography
Lehman, S. K.; Chambers, D. H.; Candy, J. V.; Jun. 14, 1999; 18 pp.
Report No.(s): DE2002-15002346; UCRL-JC-134560; No Copyright; Avail: Department of Energy Information Bridge
The scattering mechanism of diffraction tomography is described by the integral form of the Helmholtz equation. The goal

of diffraction tomography is to invert this equation in order to reconstruct the object function from the measured scattered fields. During the forward propagation process, the spatial spectrum of the object under investigation is smeared, by a convolution in the spectral domain, across the propagating and evanescent regions of the received field. Hence, care must be taken in performing the reconstruction, as the objects spectral information has been moved into regions where it may be considered to be noise rather than useful information. This will reduce the quality and resolution of the reconstruction. We show how the objects spectrum can be partitioned into resolvable and non-resolvable parts based upon the cutoff between the propagating and evanescent fields. Operating under the Born approximation, we develop a beam-forming on transmit approach to direct the energy into either the propagating or evanescent parts of the spectrum. In this manner, we may individually interrogate the propagating and evanescent regions of the object spectrum.
NTIS
Diffraction; Tomography

20030045724 Lawrence Livermore National Lab., Livermore, CA
High Intensity Beam and X-Ray Converter Target Interactions and Mitigation
Chen, Y. J.; McCarrick, J. F.; Guethlein, G.; Chambers, F.; Falabella, S.; Jul. 31, 2002; 20 pp.; In English
Report No.(s): DE2002-15002360; UCRL-JC-148789; No Copyright; Avail: Department of Energy Information Bridge
Ions extracted from a solid surface or plasma by impact of an high intensity and high current electron beam can partially neutralize the beam space charge and change the focusing system. We have investigated ion emission computationally and experimentally. By matching PIC simulation results with available experimental data, our finding suggests that if a mix of ion species is available at the emitting surface, protons dominate the backstreaming ion effects, and that, unless there is surface flashover, ion emission is source limited. We have also investigated mitigation, such as e-beam cleaning, laser cleaning and ion trapping with a foil barrier. The temporal behavior of beam spot size with a foil barrier and a focusing scheme to improve foil barrier performance are discussed.
NTIS
Electron Beams; Hydrodynamics; Plasmas (Physics)

20030045727 Lawrence Livermore National Lab., Livermore, CA
Electrical Isolation of ZnO by Ion Irradiation
Kucheyev, S. O.; Jagadish, C.; Williams, J. S.; Deenapanray, P. N. K.; Yano, M.; Jul. 03, 2002; 10 pp.; In English
Report No.(s): DE2002-15002365; UCRL-JC-149080; No Copyright; Avail: Department of Energy Information Bridge
We demonstrate the formation of highly resistive single-crystal ZnO epilayers as a result of irradiation with MeV Li, 0, and Si ions. Results show that the ion doses necessary for electrical isolation close-to-inversely depend on the number of ion-beam-generated atomic displacements. However, in all the cases studied, defect-induced electrical isolation of ZnO is unstable to rapid thermal annealing at temperatures above about 300 degrees C . No significant improvement of thermal stability is found by varying ion mass, dose, and irradiation temperature (up to 350 degrees C). Finally, a comparison of implant isolation in ZnO with that in GaN is presented.
NTIS
Zinc Oxides; Ion Irradiation

20030045741 Lawrence Livermore National Lab., Livermore, CA
Electrostatic Field Between Non-Concentric Cylinders
Garcia, M.; Jan. 10, 2000; 26 pp.
Report No.(s): DE2002-15002373; UCRL-ID-137122; No Copyright; Avail: Department of Energy Information Bridge
This report describes a closed-form solution to the electrostatic potential, and the electric field, between non-concentric cylinders, with the inner cylinder charged and the outer cylinder grounded. This problem is an abstraction of the situation of an electron beam within a drift tube. Capacitive and surface current probes on the inner wall of the outer cylinder are used to detect the asymmetry of the field when the beam is off center. The solution of this problem allows for a quantitative relationship between probe-array signals and beam deflection. Probe-arrays of this type are called 'beam bugs' at LLNL.
NTIS
Electrostatics; Potential Fields; Concentric Cylinders; Electron Beams

20030045746 Lawrence Livermore National Lab., Livermore, CA
Radiative Strength Functions in (172)Yb Below 8 MeV
Schiller, A.; Becker, J. A.; Bernstein, L. A.; Garrett, P. E.; Hill, T. S.; Feb. 06, 2002; 8 pp.; In English
Report No.(s): DE2002-15002354; UCRL-ID-147425; No Copyright; Avail: Department of Energy Information Bridge

We have measured prompt gamma rays after thermal and resonant neutron capture in (171)Yb. The gamma rays were measured with three high resolution (approx. 3 keV) and high efficiency (two approx. 80\% Ge(HF) and one approx. 200\% segmented Clover) detectors. We have obtained singles and two-fold coincidence spectra as function of neutron energy using the time-of-flight technique. Two-fold coincidences where the summed energy adds up to the neutron binding energy B(sub n) or to B(sub n) minus the energy of the first excited stated (approx. 79 keV) will be used to determine the multipolarity of the pygmy resonance in (172)Yb. This pygmy resonance is a resonant structure in the radiative strength function around approx. 3 MeV in deformed rare earth nuclei.
NTIS
Ytterbium Isotopes; Rare Earth Elements; Nuclei (Nuclear Physics); Nuclear Binding Energy; Polarity; Gamma Rays

20030045775 Lawrence Livermore National Lab., Livermore, CA
Proton Reaction Cross Sections Measured in the BNL/AGS E943 Experiments
Dietrich, F. S.; Hartouni, E. P.; Johnson, S. C.; Schmid, G. J.; Soltz, R.; Nov. 01, 2001; 10 pp.
Report No.(s): DE2002-802919; No Copyright; Avail: Department of Energy Information Bridge
We have measured proton reaction cross sections over a wide mass and energy range at the Brookhaven AGS accelerator. The samples were elemental Be, C, Al, Cu, W, and Pb; the measurements were carried out at ten incident proton kinetic energies in the range 0.54 to 7. 8 GeV. The experiment was similar to an earlier experiment in the 200- 550 MeV range by Renberg et al. The new results are in good agreement with those of Renberg et al. at the overlap point near 550 MeV. The combined results of the two experiments show an energy dependence expected from the behavior of the nucleon-nucleon cross sections. The results are reproduced by calculations based on variants of the impulse approximation and Glauber theory.
NTIS
Glauber Theory; Protons; Cross Sections; Particle Accelerators; Reaction Kinetics

20030045781 Lawrence Livermore National Lab., Livermore, CA
Partial(gamma)-Ray Cross Sections for the reaction (239)Pu(n,2n(gamma)i) and the (239)Pu(,2n) Cross Section
Becker, J. A.; Berstein, L. A.; Younes, W.; McNabb, D. P.; Garrett, P. E.; Sep. 14, 2001; 12 pp.; In English
Report No.(s): DE2002-803160; UCRL-JC-145742; No Copyright; Avail: Department of Energy Information Bridge
Absolute partial gamma-ray cross sections for production of discrete gamma rays in the (239)Pu(n, 2n(gamma)i)238Pu reaction have been measured. The experiments were performed at LANSCE/WNR on the 60R flight line. Reaction gamma-rays were measured using the large-scale Compton-suppressed array of Ge detectors, GEANIE. The motivation for this experiment, an overview of the partial gamma-ray cross-section measurement, and an introduction to the main experimental issues will be presented. The energy resolution of the Ge detectors allowed identification of reaction gamma rays above the background of am sample radioactivity and fission gamma rays. The use of planar Ge detectors with their reduced sensitivity to neutron interactions and improved line shape was also important to the success of this experiment.
NTIS
Gamma Rays; Plutonium; Line Shape

20030045797 Helsinki Univ. of Technology, Espoo
Wave Equations for Bi-Anisotropic Media in Differential Forms
Lindell, I. V.; Wallen, K. H.; Jul. 2002; 26 pp.
Report No.(s): PB2003-101689; REPT-395; Copyright; Avail: National Technical Information Service (NTIS)
Differential-form formalism appears to be an ideal tool for electromagnetic analysis because it allows one to express the basic electromagnetic laws in a most compact and elegant form. In fact, the Maxwell equations for the two electromagnetic two-forms are represented by two differential equations of first-order in the simplest possible form. Connection between the two-forms in a homogeneous and time-invariant linear medium is given by a simple algebraic equation. However, constructing the wave equation for a single electromagnetic two-form through elimination appears to be cumbersome and such an equation corresponding to the general bi-anisotropic medium could not be found in the literature. The present paper gives one possibility for its derivation based on operations in multivector and dyadic algebra. Two special media are considered in more detailed leading to wave equations with scalar second-order and factorized fourth-order operators.
NTIS
Wave Equations; Differential Equations; Formalism; Anisotropic Media

20030051405 Lawrence Livermore National Lab., Livermore, CA

MCAPM-C Generator and Collision Routine (gen2000/bang2000) Documentation

Brantely, P. S.; Hagmann, C. A.; Rathkopf, J. A.; Nov. 22, 2000; 60 pp.

Report No.(s): DE2002-15001988; No Copyright; Avail: Department of Energy Information Bridge

This report documents the C version of the MCAPM (Monte Carlo All Particle Method) generator and collision physics library of subroutines. The Monte Carlo data generator (gen2000) reads cross sections and distributions that describe in-flight reactions from a binary library and creates an internal data library. The collision routines (bang2000) use this internal library to perform the physics of interaction of particles with the background material. Particles modeled with MCAPM-C are neutrons, charged particles (p, d, t, 3He, and alpha), and gammas. MCAPM-C is written in (nearly) standard C, and versions exist for Sun Solaris, Compaq Unix, IBM AIX, SGI Irix, and Linux. The library and its data files are installed on LC's Compass, TC, Forest, Blue, and Sky machines. This report describes the contents and format of the library, physics assumptions made, and the interface to the library's subroutines.

NTIS

Particle Collisions; Monte Carlo Method; Data Collection Platforms

20030051407 Lawrence Livermore National Lab., Livermore, CA

Fast Gated Detectors for Ballistic Imaging with Hard X-Rays

Perry, M. D.; Sefcik, J.; Moran, M.; Snavely, R.; Jul. 03, 1998; 16 pp.

Report No.(s): DE2002-15001989; No Copyright; Avail: Department of Energy Information Bridge

Intense laser (greater than 10(sup 21) W/cm(sup 2)) driven hard x-ray sources offer a new alternative to conventional electron accelerator Bremstrahlung sources. These laser driven sources offer considerable simplicity in design for multiple axis views and have the potential for very high spatial (less than 0.1 mm) and temporal resolution (less than 10 psec). The temporal resolution can be converted into increased image contrast by gating out the scattered background radiation and detecting only the ballistic photons transmitted by the object of interest. Currently available hard x-ray (less than 0.1 MeV) imaging systems are limited to a time resolution greater than = 60 nsec. Here, we propose the investigation of new types of imaging x-ray detectors which offer the potential for gate times less than 100 psec at photons energies in the 0.1 - 8 MeV range. Such detectors would find use in a variety of advanced radiographic applications in DOE'S stockpile Stewardship Program.

NTIS

Imaging Techniques; X Ray Sources; Ballistics; Detectors; Laser Beams

20030051417 Tufts Univ., Medford, MA

Top Quark Physics at the Tevatron Results and Prospects

Sliwa, K.; Jul. 13, 2002; 10 pp.

Report No.(s): DE2002-803093; CDF/PUB/TOP/PUBLIC/6020; No Copyright; Avail: Department of Energy Information Bridge

The techniques used in CDF and DO are variations of simple event counting. Both experiments allow identical steps: (1) identify events with the expected top signature; (2) calculate the expected Standard Model backgrounds; (3) count excess events above the expected backgrounds; and (4) apply corrections for the acceptance, reconstruction inefficiencies and other biases.

NTIS

Quarks; Particle Accelerators

20030051427 Brookhaven National Lab., Upton, NY

Hadron Structure from Lattice QCD

Mar. 2002; 208 pp.; In English

Report No.(s): DE2002-803412; BNL-52674; No Copyright; Avail: Department of Energy Information Bridge

The RIKEN BNL Research Center workshop on 'Hadron Structure from Lattice QCD' was held at BNL during March 11-15, 2002. Hadron structure has been the subject of many theoretical and experimental investigations, with significant success in understanding the building blocks of matter. The nonperturbative nature of QCD, however, has always been an obstacle to deepening our understanding of hadronic physics. Lattice QCD provides the tool to overcome these difficulties and hence a link can be established between the fundamental theory of QCD and hadron phenomenology. Due to the steady progress in improving lattice calculations over the years, comparison with experimentally measured hadronic quantities has become important. In this respect the workshop was especially timely. By providing an opportunity for experts from the lattice

and hadron structure communities to present their latest results, the workshop enhanced the exchange of knowledge and ideas.
NTIS
Quantum Chromodynamics; Hadrons

20030051428 Brookhaven National Lab., Upton, NY
Status of the MINOS Experiment
Diwan, M. V.; 2002; 12 pp.; In English
Report No.(s): DE2002-805811; BNL-69454; No Copyright; Avail: Department of Energy Information Bridge
The status of the long baseline neutrino oscillation experiment MINOS at Fermi National Accelerator Laboratory (Fermilab) is presented. The status of the detector and beam construction and the expected event rates and sensitivity to physics is also presented. Possible future plans to improve the performance of the experiment is discussed.
NTIS
Particle Accelerators; Neutrinos; Oscillations

20030051434 California Univ., Davis. Dept. of Physics, Lawrence Berkeley National Lab., CA
Photon and Pi(0) Production in (197) Au+(197) Au Collisions at root (s over NN)= 130 GeV
Johnson, I. J.; Sep. 2002; In English
Report No.(s): DE2002-806124; No Copyright; Avail: National Technical Information Service (NTIS)
Inclusive transverse momentum spectra of photons and (pi)(sup 0)s at mid-rapidity are studied as a function of collision centrality for (sup 197)Au + (sup 197)Au collisions at (radical)s(sub NN)= 130 GeV. Photon pair conversions have been reconstructed from charged tracks measured by the main Time Project Chamber of the STAR experiment at the RHIC heavy ion facility. The transverse momentum resolution of photons with this method is estimated to be (Delta)p(sub t)/p(sub t)= 2\% at 0.125 GeV/c and 5\% at 2.5 GeV/c. Photon spectra were measured up to a transverse momentum of 2.4 GeV/c between (+-) 0.5 units of rapidity. The dominant photon production mechanism, the (pi)(sup 0)(yields)(gamma)(gamma) decay, was measured between 0. 25-2.5 GeV/c and (+-) 1 units of rapidity. Spectra are reported for the top 11\%, 11-34\% and 34-85\% centrality classes. It was observed that in mid-central and central collisions the relative contribution of the (pi)(sup 0)(yields)(gamma)(gamma) decay to the inclusive photon spectrum decreases above a transverse momentum of 1.65 GeV/c. In central collisions the magnitude of the decrease from p(sub t)= 1.65 GeV/c to 2.4 GeV/c is 20\%. It is unlikely that contributions from other (pi)(sup 0) decay channels and other particle decays fully explain this decrease. The centrality dependence on the shapes of the (pi)(sup 0) spectra was analyzed with Boltmann and Bose-Einstein functions. In the transverse momentum windows of the spectra, the extracted temperatures are near 0.295 GeV. These temperatures are substantially higher than those extracted from (pi)(sup(+-)) spectra in a lower range of transverse momentum. This is an indication that the shapes of the pion spectra deviate from purely exponential shapes.
NTIS
Photons; Particle Collisions; Pions

20030051468 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Questioning the Equivalence Principle
Damour, T.; Sep. 2001; 22 pp.
Report No.(s): PB2003-102077; IHES/P/01/44; No Copyright; Avail: CASI; A03, Hardcopy
The Equivalence Principle (EP) is not one of the 'universal' principles of physics (like the Action Principle). It is a heuristic hypothesis which was introduced by Einstein in 1907, and used by him to construct his theory of General Relativity. In modern language, the (Einsteinian) EP consists in assuming that the only long-range field with gravitational-strength couplings to matter is a massless spin-2 field. Modern unification theories, and notably String Theory, suggest the existence of new fields (in particular, scalar fields: 'dilation' and 'moduli') with gravitational-strength couplings.
NTIS
Relativity; Big Bang Cosmology; Heuristic Methods

20030051482 Fermi National Accelerator Lab., Batavia, IL, California Univ., San Diego, La Jolla, Carnegie-Mellon Inst. of Research, Pittsburgh, PA
QCD String Spectrum and Conformal Field Theory
Juge, K. J.; Kuti, J.; Morningstar, C.; Dec. 2002; In English
Report No.(s): DE2002-806080; FERMILAB-CONF-01/316-T; No Copyright; Avail: National Technical Information Service (NTIS)

The low energy excitation spectrum of the critical Wilson surface is discussed between the roughening transition and the continuum limit of lattice QCD. The fine structure of the spectrum is interpreted within the framework of two-dimensional conformal field theory.
NTIS
Energy Spectra; Quantum Chromodynamics; String Theory; Field Mode Theory

20030051486 Jefferson Lab., Newport News, VA
Spin Response of the Nucleon in the Resonance Region
Burkert, V. D.; 2002; 14 pp.; In English
Report No.(s): DE2003-804424; No Copyright; Avail: Department of Energy Information Bridge
This document discusses recent results from CLAS and Hall A at Jefferson Lab on the measurement of inclusive spin structure functions in the nucleon resonance region using polarized electron beams and polarized targets. Results on the first moment of the spin structure function for protons and neutrons will be discussed, as well as the Brorken integral. It also discusses that the helicity structure of individual resonances plays a vital role in understanding the nucleon's spin response in the domain of strong interaction QCD, and must be considered in any analysis of the nucleon spin structure at low and intermediate photon virtuality.
NTIS
Spin Dynamics; Nucleons; Resonance

20030051560 Brookhaven National Lab., Upton, NY, Akademiya Nauk SSSR, Moscow. Inst. of Theoretical and Experimental Physics, Russian Academy of Sciences, Tomsk. Inst. of High Current Electronics, California Univ., Irvine
Underline Physics of E-Mevva Operation
Hershcovitch, A.; Batalin, V. A.; Bugaev, A. S.; DeBolt, N.; Gushenets, V. I.; 2002; 12 pp.; In English
Report No.(s): DE2003-804608; BNL-69383; No Copyright; Avail: Department of Energy Information Bridge
Recently substantial enhancement of high ion charge states was clearly observed in both the HCEI and ITEP E-MEVVA ion sources. These experimental set-ups have two different methods of measuring the ion charge state distributions. The results can be considered as a proof of the E-MEVVA principle. These results sparked discussions regarding, which physics effects are dominant. Basic physics seems straightforward, an ion charge state in E-MEVVA is determined by the number of collisions with fast electrons versus the number of encounters with neutrals and lower charge state ions during an ion dwell time in the drift channel. However, the fluxes of fast electrons, lower charge state ions, and neutrals encountered by an ion may be a consequence of numerous effects. Factors determining neutral fluxes might be poor vacuum conditions, desorption of adsorbed gas by the electron beam directly or indirectly due to stacking (E-beam reflection) and/or instabilities that cause heating and desorption. Flux and energy of the fast electrons is primarily determined by the electron gun output. But significant contributions from electron beam stacking, instabilities, as well as plasma electron heating, are possible. The various contributions are evaluated to account for past results and to guide future progress.
NTIS
Ion Charge; Charged Particles; Electron Plasma; Collisions

20030051587 Y-12 National Security Complex, Oak Ridge, TN, Fisk Univ., Nashville, TN
Superconducting Gamma/Neutron Spectrometer Task 1 Completion Report Evaluation of Candidate Neutron Sensitive Materials
Bell, Z. W.; Lamberti, V. E.; Burger, A.; Jun. 20, 2002; In English
Report No.(s): DE2003-804539; Y/DX-2490-R1; No Copyright; Avail: National Technical Information Service (NTIS)
A review of the scientific literature regarding boron- and lithium-containing compounds was completed. Information such as Debye temperature, heat capacity, superconductivity properties, physical and chemical characteristics, commercial availability, and recipes for synthesis was accumulated and evaluated to develop a list of neutron-sensitive materials likely to perform properly in the spectrometer. The best candidate borides appear to be MgB2 (a superconductor with T(sub c)= 39 K), B6Si, B4C, and elemental boron; all are commercially available. Among the lithium compounds are LiH, LiAl, Li12Si7, and Li7Sn2. These materials have or are expected to have high Debye temperatures and sufficiently low heat capacities at 100 mK to produce a useful signal. The responses of(sup 10)B and(sup 6)Li to a fission neutron spectrum were also estimated. These demonstrated that the contribution of scattering events is no more than 3\% in a boron-based system and 1.5\% in a lithium-based system. This project is concerned with the development of materials for use in a cryogenic neutron spectrometer and is complementary to work in progress by Labov at LLNL to develop a cryogenic gamma ray spectrometer. Refrigeration

to 100 mK lowers the heat capacity of these materials to the point that the energy of absorbed gamma and x rays, nuclei scattered by fast neutrons, and ions from (n, (alpha)) reactions produce a measurable heat pulse, from which the energy of the incident radiation may be deduced. The objective of this project is the discovery, fabrication, and testing of candidate materials with which a cryogenic neutron spectrometer may be realized.
NTIS
Superconductivity; Gamma Rays; Neutron Spectrometers; Physical Properties; Chemical Properties; Boron; Lithium Compounds

20030051597 Fermi National Accelerator Lab., Batavia, IL, Indiana Univ. at Bloomington. Dept. of Physics
Comments on Optical Stochastic Cooling
Ng, K. Y.; Lee, S. Y.; Zhang, Y. K.; Oct. 04, 2002; In English
Report No.(s): DE2002-802150; No Copyright; Avail: National Technical Information Service (NTIS)
An important necessary condition for transverse phase space damping in the optical stochastic cooling with transit-time method is derived. The longitudinal and transverse damping dynamics for the optical stochastic cooling is studied. We also obtain an optimal laser focusing condition for laser-beam interaction in the correction undulator. The amplification factor and the output peak power of the laser amplifier are found to differ substantially from earlier publications. The required power is large for hadron colliders at very high energy.
NTIS
Stochastic Processes; Laser Beams; Damping; Power Amplifiers

20030052004 Lawrence Livermore National Lab., Livermore, CA
Analysis of Raster Scanning Damage and Conditioning Experiments
Feit, M. D.; Rubenchik, A. M.; Oct. 11, 2002; In English
Report No.(s): DE2002-15002002; UCRL-JC-148555; No Copyright; Avail: National Technical Information Service (NTIS)
The raster scan technique is used for large optics damage tests and laser conditioning. We show that the 'effective area' concept enables the possibility to compare various scanning schemes and to use raster scan experiments for NIF optics damage prediction. It is shown that the hexagonal lattice of laser beam imprints yields optimal use of each shot for most of the typically used parameters. The effects of beam fluence fluctuations and pointing inaccuracies on experiments are evaluated. To analyze raster scan conditioning experiments, we introduce the concept of 'effective dose', i.e. total dose averaged over a unit cell of the scan lattice. This allows various scanning schemes to be compared quantitatively.
NTIS
Raster Scanning; Damage

20030052021 Lawrence Livermore National Lab., Livermore, CA
Centrality Dependent Strange Baryon Production in p-A and its Implications for Heavy Ion Collisions
Soltz, R.; Sep. 22, 2000; 14 pp.; In English
Report No.(s): DE2002-791072; UCRL-JC-140530; No Copyright; Avail: Department of Energy Information Bridge
BNL E910 has measured strange baryon production as a function of collision centrality for 17.5 GeV/c p-Au collisions. Collision centrality is defined by v(sub 1) the mean number projectile-nucleon interactions estimated from the 'grey' track multiplicity. The measured (Lambda) yield increases faster than the participant scaling expectation for v(le) 3 and then saturates. A simple parameterization of this dependence applied to nucleus-nucleus collisions reproduces the measured E866 km. and WA97(Lambda) centrality dependent yields. The increase in(Lambda) production to v(le) 3 is also evident for(Lambda)s which are leading baryons, in disagreement with predictions from RQMD.
NTIS
Baryons; Ionic Collisions; Nuclear Interactions

20030052069 Lawrence Livermore National Lab., Livermore, CA
Transmissive Optics Approach for Time-Slicing the LCLS X-Ray Pulse
Bionta, R. M.; May 17, 2000; 26 pp.; In English
Report No.(s): DE2002-793866; UCRL-ID-139011; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
X Rays; Optical Measuring Instruments

20030052094 Lawrence Livermore National Lab., Livermore, CA

Reducing Collisional Breakup of a System of Charged Particles to Practical Computation: Electron-Impact Ionization of Hydrogen

McCurdy, C. W.; Baertschy, M.; Isaacs, W. A.; Rescigno, T. N.; Aug. 24, 2001; 18 pp.; In English

Report No.(s): DE2002-803561; UCRL-JC-145338; No Copyright; Avail: Department of Energy Information Bridge

It has been a goal of researchers in the area of atomic collisions for nearly half a century to reduce to practical computation the simplest problem in collisional ionization: the electron-impact ionization of atomic hydrogen. The principal barrier to solving this problem has been the difficult boundary conditions that apply to the complete breakup of a system charged particles. We describe how this goal has been accomplished in the last five years by the application of the mathematical transformation of exterior complex scaling together with an appropriate formalism for computing the breakup amplitudes from a numerical representation of the complete solution of the Schrodinger equation. Some successes of other recent approaches to this problem are also described.

NTIS

Charged Particles; Hydrogen; Atomic Collisions; Gas Ionization

20030052110 Brookhaven National Lab., Upton, NY, Fribourg Univ. (Switzerland), Zurich Univ. (Switzerland), Basel Univ. (Switzerland)

Characterization of the New NSLS Infrared Microspectroscopy Beamline U10B

Carr, G. L.; Merlo, O.; Munsli, M.; Springer, S.; Ho, S. C.; Jul. 1999; 14 pp.; In English

Report No.(s): DE2002-750776; BNL-66996; No Copyright; Avail: Department of Energy Information Bridge

The first of several new infrared beamlines, built on a modified bending magnet port of the NSLS VUV ring, is now operational for mid-infrared microspectroscopy. The port simultaneously delivers 40 mrad by 40 mrad to two separate beamlines and spectrometer end-stations designated U10A and U10B. The latter is equipped with a scanning infrared microspectrometer. The combination of this instrument and high brightness synchrotron radiation makes diffraction-limited microspectroscopy practical. This paper describes the beamline's performance and presents quantitative information on the diffraction-limited resolution.

NTIS

Infrared Radiation; Beams (Radiation); Spectroscopy; Microanalysis

20030052118 Helsinki Univ. of Technology, Espoo (Finland)

Physical Dispersion

Sengor, T.; May 2001; 16 pp.

Report No.(s): PB2003-101740; REPT-373; Copyright; Avail: National Technical Information Service (NTIS)

The constitutive parameters, which are defined according to the approach presented in the recent report series to the TDFV case, are different for both of definitions and used functions. The authors call the physical dispersion this case. The conversion of dielectric permittivity in classical approaches to physical dispersion is given. The conversion of Debye's dispersion characteristic to the physical dispersion is explained in this report.

NTIS

Dispersions; Dielectrics

20030052157 Fermi National Accelerator Lab., Batavia, IL, Wisconsin Univ., Madison, Wayne State Univ., Detroit, MI, Argonne National Lab., IL

Summary of the Particle Physics and Technology Working Group

Lamme, S.; Smith, W. H.; Magill, S.; Procario, M.; Ruchti, R.; Dec. 2002; 24 pp.; In English

Report No.(s): DE2002-805682; FERMILAB-CONF-01/426; No Copyright; Avail: Department of Energy Information Bridge

Progress in particle physics has been tightly related to technological advances during the past half century. Progress in technologies has been driven in many cases by the needs of particle physics. Often, these advances have benefited fields beyond particle physics: other scientific fields, medicine, industrial development, and even found commercial applications. The particle physics and technology working group of Snowmass 2001 reviewed leading-edge technologies recently developed or in the need of development for particle physics. The group has identified key areas where technological advances are vital for progress in the field, areas of opportunities where particle physics may play a principle role in fostering progress, and areas where advances in other fields may directly benefit particle physics. The group has also surveyed the technologies

specifically developed or enhanced by research in particle physics that benefit other fields and/or society at large.
NTIS
Technology Utilization; Standard Model (Particle Physics)

20030052160 Lawrence Livermore National Lab., Livermore, CA
NIF Spot Summary
Young, P. E.; Apr. 13, 2000; In English
Report No.(s): DE2002-793864; UCRL-ID-138931; No Copyright; Avail: National Technical Information Service (NTIS)

We are compiling a list of anticipated target spot sizes that are specified by the NIF users groups. This data will be used to anticipate demands for phase plates. The spot size also has an impact on the laser operation. Presently the phase plates are designed to sit in the leo section of the FOA (before the conversion crystals). Intensity modulations produced by the phase plates are nonlinearly proportional to the laser spot size. For spot sizes above 3 mm diameter, the intensity modulations are large enough that the damage threshold for the remainder of the FOA is exceeded. For experiments requiring spot diameters larger than 3 ram, it is suggested that the phase plates sit in the 3(omega) section of the FOA. For planning purposes, the cost of the 3(omega) phase plates is presently projected to be more than that of a l(omega) phase plate due to the use of inclusion-free fused silica as the substrate material. This report is a summary of a meeting that we had on February 16, 2000 in order to catalogue the possible range of requested NIF spot sizes. Copies of the viewgraphs which were presented are also included.
NTIS
Crystals; Lasers; Silica Glass; Substrates

20030052181 Lawrence Livermore National Lab., Livermore, CA
Angular Distribution of Particles Emerging from a Diffusive Region and its Implications for the Fleck-Canfield Random Walk Algorithm for Implicit Monte Carlo Radiation Transport
Cooper, M. A.; Jul. 03, 2000; 16 pp.; In English
Report No.(s): DE2002-793970; UCRL-ID-139692; No Copyright; Avail: Department of Energy Information Bridge

We present various approximations for the angular distribution of particles emerging from an optically thick, purely isotropically scattering region into a vacuum. Our motivation is to use such a distribution for the Fleck-Canfield random walk method for implicit Monte Carlo (IMC) radiation transport problems. We demonstrate that the cosine distribution recommended in the original random walk paper is a poor approximation to the angular distribution predicted by transport theory. Then we examine other approximations that more closely match the transport angular distribution.
NTIS
Angular Distribution; Transport Theory; Radiation Transport; Monte Carlo Method

20030052183 Brookhaven National Lab., Upton, NY, Florida Univ., Gainesville. Dept. of Physics
Evidence for Millimeter-Wave Coherent Emission from the NSLS VUV Ring
Carr, G. L.; Kramer, S. L.; Murphy, J. B.; Jul. 1999; 14 pp.; In English
Report No.(s): DE2002-750777; BNL-66993; No Copyright; Avail: Department of Energy Information Bridge

Coherent synchrotron radiation from the NSLS VUV ring has been detected and partially characterized. The observations have been performed at the new far infrared beamline U12IR. The coherent radiation is peaked near a wavelength of 7mm and occurs in short duration bursts. The bursts occur only when the electron beam current (I) exceeds a threshold value (I(sub th)), which itself varies with ring operating conditions. Beyond threshold, the average intensity of the emission is found to increase as (I-I(sub th)). The coherent emission implies micro-bunching of the electron beam due to a longitudinal instability.
NTIS
Coherent Radiation; Millimeter Waves; Synchrotron Radiation; Electron Beams; Ring Currents

20030052190 Fermi National Accelerator Lab., Batavia, IL
Start of Run II at CDF
Rescigno, M.; Oct. 2002; In English
Report No.(s): DE2002-803559; FERMILAB-CONF-02126-E; No Copyright; Avail: National Technical Information Service (NTIS)

After a hiatus of almost 6 years and an extensive upgrade, Tevatron, the world largest proton-antiproton collider, has resumed the operation for the so called RUN II. In this paper we give a brief overview of the many new features of the

Tevatron complex and of the upgraded CDF experiment, and show the presently achieved detector performances as well as highlights of the RUN II physics program in the beauty and electroweak sector.
NTIS
Proton-Antiproton Interactions; Particle Accelerators

20030052218 Syracuse Univ., NY, Universidad Autonoma de Madrid (Spain), State Univ. of New York at Stony Brook, Colorado Univ., Boulder, CO
Flavor Physics
Artuso, M.; Gavela, B.; Kayser, B.; McGrew, C.; Rankin, P.; Dec. 2002; 18 pp.; In English
Report No.(s): DE2002-805754; FERMILAB-CONF-01/428; No Copyright; Avail: Department of Energy Information Bridge
Flavor physics has recently made striking advances. The Snowmass Flavor Physics Working Group has attempted to identify the important open questions in this field, and to describe the diverse future program that would address them.
NTIS
Flavor (Particle Physics); Particle Accelerators

20030052228 Fermi National Accelerator Lab., Batavia, IL, Bologna Univ. (Italy)
Supersymmetry Searches at the Tevatron
Castro, A.; Dec. 2002; In English
Report No.(s): DE2002-805753; FERMILAB-CONF-02/213-E; No Copyright; Avail: National Technical Information Service (NTIS)
We review some of the latest results on Supersymmetry searches at the Fermilab tevatron Collider. The final states for supersymmetric processes are preferably described in terms of the physical signatures produced by the particles involved. Accordingly we look at: missing transverse energy, E(sub T), related to the presence of neutral and stable supersymmetric particles; jets, from the decay of squarks or gluinos; leptons, coming for instance from gaugino decays; photons, predicted in gauge-mediated models. We discuss here some of the most recent results on SUSY searches performed at the Fermilab Tevatron by the CDF and D0 collaborations. The CDF and D0 detectors collected, during the 1992-96 period (Run I), about 100 pb(sup -1) of p(bar p) collisions. The most relevant up-grades for the current run (Run II, started in March 2001) refer mainly to the tracking and trigger system, with minor improvements to the calorimetry and muon systems.
NTIS
Particle Accelerators; Supersymmetry; Elementary Particles

20030052230 Fermi National Accelerator Lab., Batavia, IL, Michigan Univ., Ann Arbor
W Boson Cross Section and Decay Properties at the Tevatron
Bloom, K.; Oct. 2002; In English
Report No.(s): DE2002-803104; FERMILAB-CONF-02/256-E; No Copyright; Avail: National Technical Information Service (NTIS)
The authors present the first measurements of(sigma)(p(bar p)(yields) W(yields)(ell)(nu)) and(sigma)(p(bar p)(yields) Z(yields)(ell)(ell)) at(radical)s= 1.96 TeV, along with new measurements of W angular-decay distributions in p(bar p) collisions at(radical)s= 1.8 TeV.
NTIS
Bosons; Particle Decay; Cross Sections; Particle Theory

20030052234 Fermi National Accelerator Lab., Batavia, IL, State Univ. of New York at Stony Brook
D0 Detector for Run II
Babukhadia, L.; Oct. 2002; In English
Report No.(s): DE2002-803204; FERMILAB-CONF-02/239-E; No Copyright; Avail: National Technical Information Service (NTIS)
The general purpose D0 collider detector at the Fermilab Tevatron has undergone major upgrades for Run II. We describe the current status and performance of the D0 detector.
NTIS
Particle Accelerators; Nuclear Particles

20030052236 Fermi National Accelerator Lab., Batavia, IL, Argonne National Lab., IL

Parameters of an e(+)e(-) Collider in the VLHC Tunnels

Sen, T.; Norem, J.; Sharma, S.; Teng, L.; Dec. 2002; 8 pp.; In English

Report No.(s): DE2002-805416; No Copyright; Avail: Department of Energy Information Bridge

The authors have discussed the option of building an e(up+)(up -)collider in the tunnels of the VLHC in a number of notes. Continued study of this option has shown that the operating range of the machine can be extended somewhat from previous papers and this note presents the most recent progress on the luminosity and high energy operation of this machine. They have assumed that this machine would be used to justify the construction of a tunnel which would eventually house the VLHC collider, and perhaps ultimately an ep collider.

NTIS

Particle Accelerators; Construction

20030052237 Fermi National Accelerator Lab., Batavia, IL

Overview of the BTeV Pixel Detector

Appel, J. A.; Dec. 2002; 14 pp.; In English

Report No.(s): DE2002-805714; FERMILAB-CONF-02-273-E; No Copyright; Avail: Department of Energy Information Bridge

BTeV is a new Fermilab beauty and charm experiment designed to operate in the CZero region of the Tevatron collider. Critical to the success of BTeV is its pixel detector. The unique features of this pixel detector include its proximity to the beam, its operation with a beam crossing time of 132 ns, and the need for the detector information to be read out quickly enough to be used for the lowest level trigger. This talk presents an overview of the pixel detector design, giving the motivations for the technical choices made. The status of the current R&D on detector components is also reviewed.

NTIS

Particle Accelerators; Mesons

20030052238 Fermi National Accelerator Lab., Batavia, IL

B Physics, BTeV, and all That

Butler, J. N.; Dec. 2002; In English

Report No.(s): DE2002-806073; FERMILAB-CONF-02/336-E; No Copyright; Avail: National Technical Information Service (NTIS)

The status of 'flavor physics' in our pursuit of knowledge in elementary particle physics is discussed. Then, the BTeV experiment, planned for the Fermilab Tevatron collider, is described briefly and its physics reach is discussed. Comparisons are made to the current B physics experiments at e(sup+)e(sup -) facilities and to the LHCb experiment, planned for the Large Hadron Collider at CERN.

NTIS

Particle Accelerators; Hadrons

20030052239 Fermi National Accelerator Lab., Batavia, IL

Development of a Single-Layer Nb(3)Sn Common Coil Dipole Model

Novitski, I.; Ambrosio, G.; Andreev, N.; Kashikhin, V. V.; Litvinenko, L.; Dec. 2002; 8 pp.; In English

Report No.(s): DE2002-805822; FERMILAB-CONF-02/182; No Copyright; Avail: Department of Energy Information Bridge

A high-field dipole magnet based on the common coil design was developed at Fermilab for a future Very Large Hadron Collider. A short model of this magnet with a design field of 11 T in two 40-mm apertures is being fabricated using the react-and-wind technique. In order to study and optimize the magnet design two 165-mm long mechanical models were assembled and tested. A technological model consisting of magnet straight section and ends was also fabricated in order to check the tooling and the winding and assembly procedures. This paper describes the design and technology of the common coil dipole magnet and summarizes the status of short model fabrication. The results of the mechanical model tests and comparison with FE mechanical analysis are also presented.

NTIS

Magnetic Dipoles; Hadrons; Magnets

20030052240 Lawrence Berkeley National Lab., CA
First CDF Heavy Flavor Physics Results with the Silicon Vertex Trigger
Cerri, A.; Dec. 2002; In English
Report No.(s): DE2002-806074; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
NTIS
Particle Accelerators; High Energy Electrons

20030052242 Fermi National Accelerator Lab., Batavia, IL
Electrical Characterization of Irradiated Portotype Silicon Pixel Sensors for BTeV
Coluccia, M. R.; Appel, J. A.; Chiodini, G.; Christian, D. C.; Cihangir, S.; Nov. 2002; 12 pp.; In English
Report No.(s): DE2003-804444; FERMILAB-CONF-02/281-E; No Copyright; Avail: Department of Energy Information Bridge
The pixel detector in the BteV experiment at the Tevatron (Fermi Laboratory) is an important detector component for high-resolution tracking and vertex identification. For this task the hybrid pixel detector has to work in a very harsh radiation environment with up to 10(sup 14) minimum ionizing particles/cm(sup 2)/year. Radiation hardness of prototype n+/n/p+ silicon pixel sensors has been investigated. We present Electrical characterization curves for irradiated prototype n+/n/p+ sensors, intended for use in the BTeV experiment. We tested pixel sensors from various vendors and with two pixel isolation techniques: p-stop and p-spray. Results are based on irradiation with 200 MeV protons up to 6 x 10(sup 14) protons/cm(sup 2). because they provide very accurate space point information, intrinsically low noise, low occupancy due to large number of channel, better patter recognition capability (compared to strip detectors), high response speed, and high radiation hardness. We report here on the tolerance of hybrid silicon pixel components intended for use in the BTeV vertex detector.
NTIS
Silicon; Irradiation

20030052244 Fermi National Accelerator Lab., Batavia, IL
2001 Snowmass Accelerator R and D Report
Chao, A.; Davidson, R.; Dragt, A.; Dugan, G.; Holtkamp, N.; Sep. 17, 2001; 100 pp.; In English
Report No.(s): DE2003-804448; No Copyright; Avail: Department of Energy Information Bridge
The purpose of this report is to provide a perspective on future accelerator projects, and to identify the R&D activities necessary to prepare for these projects. The report summarizes the conclusions of accelerator studies made during the 2001 Snowmass Summer Study on the Future of Particle Physics. In doing so, it serves as a summary of the opinions on accelerator R&D expressed by the scientific community as it looks towards the next few decades. The main technical content is provided by the Executive Summaries of each of the fifteen accelerator Working Groups. These Working Group Executive Summaries form an integral part of this report.
NTIS
Research And Development; Particle Accelerators; Particle Theory

20030052245 Helsinki Univ. of Technology, Espoo (Finland)
Polarizability of a Tri-Isotropic Sphere
Sihvola, A.; May 2001; 20 pp.
Report No.(s): PB2003-101739; REPT-372; Copyright; Avail: National Technical Information Service (NTIS)
The report presents the polarizability matrix of a tri-isotopic sphere. A tri-isotropic material exhibits coupling between electric, magnetic, and in addition, a third kind of material response. Each of these three fields creates three different kinds of polarizations. The paper derives the polarizability components of such a sphere in vacuum and makes physical interpretations of the results for the co- and cross-polarizabilities.
NTIS
Polarization Characteristics; Spheres; Isotropy

20030052252 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
High Energy QCD: Stringy Picture from Hidden Integrability
Gorsky, A.; Kogan, I. I.; Korchemsky, G.; Apr. 2002; 44 pp.
Report No.(s): PB2003-102081; IHES/P/02/21; No Copyright; Avail: CASI; A03, Hardcopy

The authors discuss the stringy properties of high-energy QCD using its hidden integrability in the Regge limit and on the light-cone. It is shown that multi-color QCD in the Regge limit belongs to the same universality class as superconformal N=2 SUSY YM with (sub f)=(sub c) at the strong coupling orbifold point. The analogy with integrable structure governing the low energy sector of N=2 SUSY gauge theories is used to develop the brane picture for the Regge limit. In this picture the scattering process is described by a single M2 brane wrapped around the spectral curve of the integrable spin chain and unifying hadrons and reggeized gluons involved in the process. New quasiclassical quantization conditions for the complex higher integrals of motion are suggested which are consistent with the S-duality of the multi-reggeon spectrum. The derivation of the anomalous dimensions of the lowest twist operators is formulated in terms of the Riemann surfaces.
NTIS
Quantum Chromodynamics; Gauge Theory; Hadrons; Light-Cone Expansion

20030052255 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Violations of the Equivalence Principle in a Dilation-Runaway Scenario
Damour, T.; Piazza, F.; Veneziano, G.; May 2002; 40 pp.
Report No.(s): PB2003-102086; IHES/P/02/09; No Copyright; Avail: CASI; A03, Hardcopy

The authors explore a version of the cosmological dilation-fixing and decoupling mechanism in which the dilation-dependence of the low-energy effective action is extremized for infinitely large values of the bare string coupling g(sup 2)(sub s) = e(sup phi). The authors study the efficiency with which the dilation phi runs away towards its 'fixed point' at infinity during a primordial inflationary stage, and thereby approximately decouples from matter. The residual dilation couplings are found to be related to the amplitude of the density fluctuations generated during inflation.
NTIS
Equivalence; Decoupling; Couplings

20030052256 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Non-Linear Bigravity and Cosmic Acceleration
Damour, T.; Kogan, I. I.; Papazoglou, A.; Jun. 2002; 60 pp.
Report No.(s): PB2003-102083; IHES/P/02/34; No Copyright; Avail: CASI; A04, Hardcopy

The authors explore the cosmological solutions of classes of non-linear bigravity theories. These theories are defined by effective four-dimensional Lagrangians describing the coupled dynamics of two metric tensors, and containing, in the linearized limit, both a massless graviton and an ultralight one. The authors focus on two paradigmatic cases: the case where the coupling between the two metrics is given by a Pauli-Fierz-type mass potential, and the case where this coupling derives from five-dimensional brane constructions. The authors find that cosmological evolutions in bigravity theories can be described in terms of the dynamics of two 'relativistic particles', moving in a curved Lorenzian space, and connected by some type of nonlinear 'spring'.
NTIS
Cosmology; Nonlinearity; Gravitons; Acceleration (Physics)

20030052262 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Runaway Dilation and Equivalence Principle Violations
Damour, T.; Piazza, F.; Veneziano, G.; May 2002; 12 pp.
Report No.(s): PB2003-102090; IHES/P/02/27; No Copyright; Avail: CASI; A03, Hardcopy

In a recently proposed scenario, where the dilation decouples while cosmologically attracted towards infinite bare string coupling, its residual interactions can be related to the amplitude of density fluctuations generated during inflation, and are large enough to be detectable through a modest improvement on present tests of free-fall universality. Provided it has significant couplings to either dark matter or dark energy, a runaway dilation can also induce time-variations of the natural 'constants' within the reach of near-future experiments.
NTIS
Equivalence; Couplings

20030052313 Rutgers - The State Univ., Piscataway, NJ, Fermi National Accelerator Lab., Batavia, IL, Wisconsin Univ., Madison. Dept. of Physics
Precision of Higgs Boson Measurements and Their Implications
Conway, J.; Desch, K.; Gunion, J. F.; Mrenna, S.; Zeppenfeld, D.; Dec. 2002; In English
Report No.(s): DE2002-805418; No Copyright; Avail: National Technical Information Service (NTIS)

The prospects for a precise exploration of the properties of a single or many observed Higgs bosons at future accelerators are summarized, with particular emphasis on the abilities of a Linear Collider (LC). Some implications of these measurements for discerning new physics beyond the Standard Model (SM) are also discussed.
NTIS
Higgs Bosons; Precision; Standard Model (Particle Physics); Theoretical 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 and Power*.

20030038810 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft, Netherlands
Design Study of an Acoustic Array for Measuring Surface Ship Flow Noise in the MARIN Depressurized Towing Tank
Mast, A.; Thean, A.; deJong, C. A. F.; December 2002; 32 pp.; In English; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A02/KM/168; TNO Proj. 008.03459
Report No.(s): TD-0234; DGT-RPT-020145; Copyright; Avail: Other Sources

As a preparation for an US/NL collaborative research program into the contribution of flow noise to the underwater acoustic signature of surface ships, it is investigated whether acoustic scale model tests can be carried out in the MARIN Depressurized Towing Tank. Due to the many reflections at water surface, bottom and sidewalls, the environment is difficult for acoustic measurements. With the array techniques that are proposed in this report, it seems possible to identify noise sources at the ship hull with a spatial resolution of 1 m at frequencies above 10 kHz (at model scale) against other sources that are at maximum 15 dB stronger. Due to the influence of reflections, the error in the source strength estimation varies between -6 and +6 dB.
Author
Underwater Acoustics; Acoustic Measurement; Ships; Flow Noise; Arrays

20030039187 NASA Langley Research Center, Hampton, VA, USA, Army Aviation and Missile Command, Hampton, VA, USA
XV-15 Tiltrotor Aircraft: 1999 Acoustic Testing - Test Report
Edwards, Bryan D.; Conner, David A.; April 2003; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WU 576-03-15-10; WU 727-03-15-10
Report No.(s): NASA/TM-2003-212152; L-18264; NAS 1.15:212152; AMCOM/AFDD/TR-03-A-002; Copyright; Avail: CASI; A04, Hardcopy

An XV-15 acoustic test is discussed, and measured results are presented. The test was conducted by NASA Langley and Bell Helicopter Textron, Inc., during October 1999, at the BHTI test site near Waxahachie, Texas. As part of the NASA-sponsored Short Haul Civil Tiltrotor noise reduction initiative, this was the third in a series of three major XV-15 acoustic tests. Their purpose was to document the acoustic signature of the XV-15 tiltrotor aircraft for a variety of flight conditions and to minimize the noise signature during approach. Tradeoffs between flight procedures and the measured noise are presented to illustrate the noise abatement flight procedures. The test objectives were to support operation of future tiltrotors by further developing and demonstrating low-noise flight profiles, while maintaining acceptable handling and ride qualities, and refine approach profiles, selected from previous (1995 & 1997) tiltrotor testing, to incorporate Instrument Flight Rules (IFR), handling qualities constraints, operations and tradeoffs with sound. Primary emphasis was given to the approach flight conditions where blade-vortex interaction (BVI) noise dominates, because this condition influences community noise impact more than any other. An understanding of this part of the noise generating process could guide the development of low noise flight operations and increase the tiltrotor's acceptance in the community.
Author
Xv-15 Aircraft; Acoustic Properties; Noise Reduction; Blade-Vortex Interaction; Acoustic Measurement; Approach; Flight Tests

20030045791 Missouri Dept. of Conservation, Jefferson City
Surveys and Investigations Projects as Required by Federal Aid in Wildlife Restoration Act, Missouri. Study No. 54: Bat Call Detection Distance and 'Myotis' Species Discrimination Using Anabat. Job No. 1
Clawson, R. L.; Jul. 31, 2002; 54 pp.
Report No.(s): PB2003-101628; No Copyright; Avail: CASI; A04, Hardcopy

Acoustic surveys using Anabat II technology are an efficient and cost effective addition to bat survey methodology. As Anabat's use has increased, the desire for more advanced data analysis has grown. To perform these tasks, the zone of reception must be predicted for each sampling event so that the volume of space sampled can be compared. The zone of reception can be described mathematically for any sampling event using values for the environmental conditions, a calibrated detector unit, and the bat call characteristics (frequency and intensity). Bat call intensity is a difficult parameter to measure and a good field methodology for measuring intensity does not exit. In this study, a new technique, zip-lining, is used to measure call intensities. The authors found that the technique allows the collection of intensity information, but the call structure produced by bats flying on the zip-line is not equivalent to that of free-flying bats.
NTIS
Detection; Surveys; Acoustics; Bats; Wildlife; Missouri

20030051599 Lawrence Livermore National Lab., Livermore, CA
Undecimated Wavelet Transforms for Image De-noising
Gyaourova, A.; Kamath, C.; Fodor, I. K.; Nov. 19, 2002; 18 pp.; In English
Report No.(s): DE2002-15002085; UCRL-ID-150931; No Copyright; Avail: Department of Energy Information Bridge
A few dierent approaches exist for computing undecimated wavelet transform. In this work we construct three undecimated schemes and evaluate their performance for image noise reduction. We use standard wavelet based de-noising techniques and compare the performance of our algorithms with the original undecimated wavelet transform, as well as with the decimated wavelet transform. The experiments we have made show that our algorithms have better noise removal/blurring ratio.
NTIS
Algorithms; Noise Reduction; Wavelet Analysis; Image Processing

20030052020 Lawrence Livermore National Lab., Livermore, CA
Speech Articulator and User Gesture Measurements Using Micropower, Interferometric EM-Sensors
Holzrichter, J. F.; Sep. 15, 2000; 14 pp.; In English
Report No.(s): DE2002-791054; UCRL-JC-140496; No Copyright; Avail: Department of Energy Information Bridge
Very low power, GH z frequency, 'radar-like' sensors can measure a variety of motions produced by a human user of machine interface devices. These data can be obtained 'at a distance' and can measure 'hidden' structures. Measurements range from acoustic induced 10-micron amplitude vibrations of vocal tract tissues, to few centimeter human speech articulator motions, to meter-class motions of the head, hands, or entire body. These EM sensors measure fringe motions as reflected EM waves are mixed with a local (homodyne) reference wave. These data, when processed using models of the system being measured, provide real time states of interface positions vs. time. An example is speech articulator positions vs. time in the user's body. This information appears to be useful for a surprisingly wide range of applications ranging from speech coding and recognition, speaker or object identification, noise cancellation, hand or head motions for cursor direction, and other applications.
NTIS
Voice Data Processing; Low Frequencies; Homodyne Reception

20030052076 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft, Netherlands
Research on Hybrid Isolation of Structure Borne Sound at TNO TPD
Basten, T. G. H.; December 31, 2002; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A02/KM/167; TNO Proj. 008.03457/01.01
Report No.(s): DGT-RPT-030003; TD-0238; Copyright; Avail: Other Sources
This report describes a new technology called hybrid isolation of structure borne sound. This technology combines passive and active isolation techniques for reduction of structure borne sound of noisy shipboard machinery. Furthermore, the report gives the status of the research on this subject at TNO TPD. It describes some new analysis tools to analyse the performance of hybrid systems and it describes the laboratory setup used to demonstrate the technology. Some numerical and experimental results of some different control strategies and their effectiveness for the reduction of sound in accommodations on board of ships is shown. More research is required to investigate the effectiveness of this technique for underwater sound reduction and other Navy purposes.
Author
Ships; Noise Reduction

20030052274 Swedish Defence Research Agency, Stockholm. Div. of Systems Technology
Preliminary Investigation of Active Echo-Damping-Results of Two Small Scale Measurements
Slunga, R.; Brage, A.; Stahlsten, T.; Karlsson, P.-A.; Dec. 2001; 26 pp.; In Swedish
Report No.(s): PB2003-102120; FOI-R-0327-SE; No Copyright; Avail: CASI; A03, Hardcopy

The report presents positive results of small scale measurements with active echo-damping by use of a single transmitter. The measurements are found to be in agreement with theoretical considerations. It the model results are scaled up a factor 100 they mean that at least 10 dB damping can be achieved in a direction range of 10-20 degrees for an object with 3 m radius and at a frequency of 1000 Hz.
NTIS
Underwater Acoustics; Weapon Systems

73
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*.

20030037091 Lawrence Livermore National Lab., Livermore, CA
LLNL Accelerator Mass Spectrometry System for Biochemical (14)C-Measurements
Ognibene, T. J.; Bench, G.; Brown, T. A.; Vogel, J. S.; Oct. 31, 2002; 20 pp.
Report No.(s): DE2002-15001999; No Copyright; Avail: Department of Energy Information Bridge

We report on recent improvements made to our 1 MV accelerator mass spectrometry system that is dedicated to (14)C quantification of biochemical samples. Increased vacuum pumping capacity near the high voltage terminal has resulted in a 2-fold reduction of system backgrounds to 0.04 amol (14)C/mg carbon. Carbon ion transmission through the accelerator has also improved a few percent. We have also developed tritium measurement capability on this spectrometer.
NTIS
Particle Accelerators; Biochemistry; Mass Spectroscopy

20030037105 Lawrence Livermore National Lab., Livermore, CA
High Intensity Laser Interactions with Atomic Clusters
Ditmire, T.; Aug. 07, 2000; 10 pp.
Report No.(s): DE2002-15001992; No Copyright; Avail: Department of Energy Information Bridge

The development of ultrashort pulse table top lasers with peak pulse powers in excess of 1 TW has permitted an access to studies of matter subject to unprecedented light intensities. Such interactions have accessed exotic regimes of multiphoton atomic and high energy-density plasma physics. Very recently, the nature of the interactions between these very high intensity laser pulses and atomic clusters of a few hundred to a few thousand atoms has come under study. Such studies have found some rather unexpected results, including the striking finding that these interactions appear to be more energetic than interactions with either single atoms or solid density plasmas. Recent experiments have shown that the explosion of such clusters upon intense irradiation can expel ions from the cluster with energies from a few keV to nearly 1 MeV. This phenomenon has recently been exploited to produce DD fusion neutrons in a gas of exploding deuterium clusters. Under this project, we have undertaken a general study of the intense femtosecond laser cluster interaction. Our goal is to understand the macroscopic and microscopic coupling between the laser and the clusters with the aim of optimizing high flux fusion neutron production from the exploding deuterium clusters or the x-ray yield in the hot plasmas that are produced in this interaction. In particular, we are studying the physics governing the cluster explosions. The interplay between a traditional Coulomb explosion description of the cluster disassembly and a plasma-like hydrodynamic explosion is not entirely understood, particularly for small to medium sized clusters (approx. 1000 atoms) and clusters composed of low-Z atoms. We are focusing on experimental studies of the ion and electron energies resulting from such explosions through various experimental techniques. We are also examining how an intense laser pulse propagates through a dense medium containing these clusters.
NTIS
High Power Lasers; Atomic Clusters; Pulsed Lasers

20030037127 Lawrence Livermore National Lab., Livermore, CA

National Ignition Facility: Status and Plans for the Experimental Program

Moses, E. I.; Nov. 12, 2002; 14 pp.

Report No.(s): DE2002-15002000; No Copyright; Avail: Department of Energy Information Bridge

The National Ignition Facility (NIF), currently under construction at the University of California's Lawrence Livermore National Laboratory, is a stadium-sized facility containing a 192-beam, 1.8-Megajoule, 500-Terawatt, 351-nm laser system and a 10-meter diameter target chamber with room for nearly 100 experimental diagnostics. NIF is being built by the National Nuclear Security Administration and when completed will be the world's largest laser experimental system, providing a national center to study inertial confinement fusion and the physics of matter at extreme energy densities and pressures. NIF's 192 energetic laser beams will compress fusion targets to conditions where they will ignite and burn, liberating more energy than required to initiate the fusion reactions. NIF experiments will allow the study of physical processes at temperatures approaching 100 million K and 100 billion times atmospheric pressure. These conditions exist naturally only in the interior of stars and in nuclear weapons explosions. In the course of designing the world's most energetic laser system, a number of significant technology breakthroughs have been achieved. NIF is now entering the first phases of its laser commissioning program. Low-energy preamplifier rod laser shots have been successfully propagated through the entire laser chain. Higher energy shots are planned through the end of 2002. NIF's target experimental systems are also being installed in preparation for laser performance and experimental capability commissioning starting in 2003.

NTIS

Ignition; Laser Beams; Research Facilities; Nuclear Research And Test Reactors

20030038811 Lawrence Livermore National Lab., Livermore, CA

Building a LLNL Capability in Radioactive Ion Beam Experiments

Bernstein, L. A.; Becker, J. A.; Garrett, P. E.; Younes, W.; Schiller, A.; Jan. 31, 2002; 22 pp.

Report No.(s): DE2002-15002231; UCRL-ID-147178; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this LDRD was to establish a program at LLNL in radioactive ion beam (RIB) experiments that would use these experiments to address a wide range physics issues in both stellar nucleosynthesis and stockpile stewardship radiochemistry. The LDRD was funded for a total of two years (fiscal years 2000 and 2001) and transferred to the Physical Data Research Program in fiscal year 2002. Reactions on unstable nuclei and isomeric states play a central role in the formation of elements in both stars and nuclear devices. However, the abilities of reaction models to predict cross sections on radioactive nuclei are uncertain at best. This can be attributed to the lack of experimental data to guide reaction-modeling efforts. Only the 10\% of all bound nuclei that can be formed with stable targets and beams have been accessed and studied. The proposed Rare Isotope Accelerator (RIA) and existing RIB facilities offer an unprecedented opportunity to address many of the outstanding questions in nuclear structure, reactions and astrophysics by enabling the observation of nuclear reactions with radioactive targets and/or beams.

NTIS

Ion Beams; Nuclear Structure; Radiochemistry; Particle Accelerators

20030038892 Fluor Hanford, Richland, WA

Analysis in Response to CSER Review Team Report of June 28, 1999

Jan. 26, 2001; 84 pp.; In English

Report No.(s): DE2002-805927; No Copyright; Avail: Department of Energy Information Bridge

In early 1999, Fluor Daniel Hanford, Inc. contracted with the Pacific Northwest National Laboratory (PNNL) to conduct an assessment of the 300 Area Fuel Supply Shutdown (FSS) Facility and their technical basis for criticality safety. Their final report contained a number of issues that have now been addressed. This calculation note contains the results of analyses performed to respond to these issues. The issues addressed in this calculation note are: (1) The effect of interspersed moderation on finite fuel box arrays of different sizes. The PNNL Review Team wanted to see the effect of optimum moderator density shifting to larger values for smaller fuel box arrays. This effect has, in fact, been shown in this calculation note. (2) The hemispherical safe masses were to be recalculated using the more detailed Monte Carlo method. The previous values were obtained from deterministic codes (lattice transport theory for the generation of few-group constants, followed by diffusion theory for the calculation of finite geometry radii).

NTIS

Nuclear Fuels; Critical Mass

20030039171 Technische Univ. Delft (Netherlands)
Fuga Burnup Measurement Facility. Safety Aspects
Adams, B. T.; Damen, P. M. G.; Westerduin, K. T.; Aug. 13, 1997; 68 pp.
Report No.(s): PB2003-102892; IRI-131-97-006-REV-1; No Copyright; Avail: CASI; A04, Hardcopy

The FUel GAmma (FUGA) project is being conducted by the Department of Reactor Physics at the Interfaculty Reactor Institute (IRI) to determine the burnup of spent fuel assemblies removed from the Hoger Onderwijs Reactor (higher education reactor, or HOR) using measurements of the emitted gamma radiation. It has been previously shown that the fuel assembly burnup is linearly related to the concentration of certain nuclides (e.g., Cs(sup 137)) and, thus, can be determined directly by measuring the characteristic gamma rays emitted by these 'burnup monitors(sup 1, 2, 3).' The project is currently in the design phase. The FUGA assembly is semi-permanent and will be installed in the south-east corner of the large HOR basin adjacent to the reactor pool. A safety review of the design, installation, operation, and final decommissioning of FUGA has been performed. The installation of FUGA creates a new gamma radiation beam port in the reactor hall. Ample shielding is provided for the port to ensure that personnel radiation exposure meets ALARA principals and does not exceed regulatory limits for the spent fuel assemblies to be measured.
NTIS
Spent Fuels; Radiation Measurement; Gamma Rays

20030045770 Fermi National Accelerator Lab., Batavia, IL, Stanford Linear Accelerator Center, CA
Report of the Snowmass T4 Working Group on Particle Sources: Positron Sources, Antiproton Sources, and Secondary Beams
Mokhov, N.; Werkema, S.; Sheppard, J.; Sep. 2002; 24 pp.; In English
Report No.(s): DE2002-805430; No Copyright; Avail: Department of Energy Information Bridge

This report documents the activities of the Snowmass 2001 T4 Particle Sources Working Group. T4 was charged with examining the most challenging aspects of positron sources for linear colliders and antiproton sources for proton-antiproton colliders, and the secondary beams of interest to the physics community that will be available from the next generation of high-energy particle accelerators. The leading issues, limiting technologies, and most important R and D efforts of positron production, antiproton production, and secondary beams are discussed in this paper. A listing of T4 Presentations is included.
NTIS
Antiprotons; Positrons; Particle Beams; Linear Accelerators

20030045806 National Inst. of Standards and Technology, Gaithersburg, Technology Administration
NCNR 2002: NIST Center for Neutron Research Accomplishments and Opportunities
Cappelletti, R. L.; Dec. 2002; In English
Report No.(s): PB2003-102174; NIST/SP-993; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes research for the programs that use the facilities at NIST (National Institute for Standards and Technology) Center for Neutron Research (NCNR) for the period from October 2001 through September 2002. The programs range from the use of the thermal and cold neutron beams for studies of the structure and dynamics of materials to nuclear physics and neutron standards to sample irradiations for activation analysis. The NCNR is a national user facility, which served more than 1700 participants during the year.
NTIS
Nuclear Reactors; Neutron Activation Analysis

20030051595 Thomas Jefferson National Accelerator Facility, Newport News, VA
Prospect for Measuring G(sup N)(sub E) at High Momentum Transfers
Wojtsekhowski, B.; 2002; 14 pp.; In English
Report No.(s): DE2002-802908; No Copyright; Avail: Department of Energy Information Bridge

Experiment E02-013, approved by PAC21, will measure the neutron electric form factor at Q(sup 2) up to 3.4 (GeV/c)(sup 2), which is twice that achieved to date. The main features of the new experiment will be the use of the electron spectrometer BigBite, a large array of neutron detectors, and a polarized(sup 3)(vec)He target. We present the parameters and optimization of the experimental setup. A concept of an experiment for G(sup n)(sub E) where precision G(sup p)(sub E) data is used for calibration of the systematics of a Rosenbluth type measurement is also discussed.
NTIS
Electron Spectroscopy; Form Factors; Neutron Counters; Momentum Transfer

20030052005 California Univ., Berkeley, CA, USA
Molecular Carbon in the Galaxy: Laboratory and Observational Studies
Saykally, Richard James; [2003]; 12 pp.; In English
Contract(s)/Grant(s): NAG5-9384; No Copyright; Avail: CASI; A03, Hardcopy

In a collaboration with the Mats Larsson group from Stockholm, we carried out a new measurement of the rate of dissociative recombination of H(sup *, sub j), using a new pulsed supersonic beam source of rotationally cold H(sup *, sub j). This source was first designed and characterized in our lab by IR cavity ringdown spectroscopy, determining a rotationaYtranslationa1 temperature of 20-60K, depending on conditions. This new source was then taken to Stockholm for the recombination rate studies at the CRYRING storage ring. The recombination rate constant measured against temperature yields values consistent with the most recent calculations, whereas previous experimental measurements varied over a range of 10(exp 4) and were poor agreement with theory. This is a crucial achievement for understanding the ion chemistry of diffuse clouds. Moreover, this result in combination with recent observations implies a greatly enhanced (factor of 40) cosmic ray ionization rate in a diffuse cloud (zeta Persei) relative to previous studies. The implications of this are discussed in our recent Nature paper. An enhanced cosmic-ray flux towards zeta Persei inferred from a laboratory study of the H(sup *, sub j)-e(sup -) recombination rate.
Author
Carbon; Molecular Gases; Galaxies; Electromagnetic Measurement; Ionic Reactions

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20030037068 Argonne National Lab., IL
Spontaneous and Amplified Radiation at the Initial of a SASE FEL
Huang, Z.; Kim, K. J.; 2002; 8 pp.
Report No.(s): DE2002-805259; No Copyright; Avail: Department of Energy Information Bridge

At the initial stage of a self-amplified spontaneous emission (SASE) free-electron laser (FEL), spontaneous undulator radiation in certain experimental configurations can dominate the amplified signal over an extended undulator distance. In this paper we study both the spontaneous and the amplified radiation in the framework of the paraxial wave equation and determine the transition from the dominance of spontaneous emission to exponential amplification. We compare theoretical expectations with SASE simulation codes GINGER and GENESIS.
NTIS
Free Electron Lasers; Spontaneous Emission

20030037116 Lawrence Livermore National Lab., Livermore, CA
Reflectance, Optical Properties, and Stability of Molybdenum/Strontium and Molybenum/Yttrium Multilayer Mirrors
Kjornrattananwanich, B.; Sep. 01, 2002; In English
Report No.(s): DE2002-15002102; UCRL-LR-150541; No Copyright; Avail: National Technical Information Service (NTIS)

The motivation of this work is to develop high reflectance normal-incidence multilayer mirrors in the 8-12 nm wavelength region for applications in astronomy and extreme ultraviolet lithography. To achieve this goal, Mo/Sr and Mo/Y multilayers were studied. These multilayers were deposited with a UHV magnetron sputtering system and their reflectances were measured with synchrotron radiation. High normal-incidence reflectances of 23\% at 8.8 nm, 40.8\% at 9.4 nm, and 48. 3\% at 10.5 nm were achieved. However, the reflectance of Mo/Sr multilayers decreased rapidly after exposure to air. Attempts to use thin layers of carbon to passivate the surface of Mo/Sr multilayers were unsuccessful.
NTIS
Mirrors; Lithography; Thin Films; Molybdenum; Yttrium; Strontium

20030037177 Lawrence Livermore National Lab., Livermore, CA
Woelter Instrument Optical Design
Nederbragt, W. W.; Oct. 11, 2002; In English
Report No.(s): DE2002-15002122; UCRL-ID-150702; No Copyright; Avail: National Technical Information Service (NTIS)

Hundreds of target assemblies will be constructed annually for use on NIF or OMEGA in the near future. Currently, we

do not have the capability to tomographically characterize the target assemblies at the desired resolution. Hence, we cannot verify if an assembly has been assembled correctly. The Engineering Directorate, through the LDRD program, is currently funding an x-ray instruments that could solve this problem. This instrument is based on a Woelter Type-I design. We will refer to this design as the Woelter instrument in the remainder of the report.
NTIS
Optical Equipment; Design Analysis; Microscopes

20030037182 Lawrence Livermore National Lab., Livermore, CA
National NIF Diagnostic Program Fiscal Year 2002 Third Quarter Report
MacGowan, B.; Jul. 01, 2002; In English
Report No.(s): DE2002-15002131; UCRL-ID-148561-02-3; No Copyright; Avail: National Technical Information Service (NTIS)

Table of Contents: Overview and Summary; Schedule report; Budget; Report; Change Control Board Actions; Streaked X-Ray Detector; (SXD) Static X-Ray Imager (SXI); Full Aperture Backscatter Diagnostics (FABS); Diagnostic Instrument Manipulator (DIM); Gated X-Ray Detector (GXD); X-Ray Survey Spectrometer (HENEX); Visar; Neutron Yield Diagnostic (NYD); Target Diagnostic Alignment (TDA); Diagnostic Timing Fiducial; Target Diagnostic Integration; and Controls Integration.
NTIS
X Ray Detectors; Diagnosis

20030038855 Lawrence Livermore National Lab., Livermore, CA
Imaging of Plasmas Using Proton Beams Generated by Ultra-Intense Laser Pulses
Borghesi, M.; Campbell, D. H.; Clarke, R. J.; Galimberti, M.; Gizzi, L. A.; Jan. 15, 2002; 14 pp.
Report No.(s): DE2002-802851; UCRL-JC-146865; No Copyright; Avail: Department of Energy Information Bridge

During the interaction of ultraintense laser pulses with plasmas and solid targets, a considerable fraction of the laser energy is deposited into highly energetic charged particles. One of the most exciting results recently obtained in this area of research is the observation of very energetic beams of protons, generated during the interaction of ultraintense short pulses with solid targets. In a number of experiments, performed with different laser systems and in different interaction conditions, protons with energies up to several tens of MeV have been detected behind thin foils irradiated with high intensity pulses. In these experiments it was seen that the particle beams are directed along the normal to the back surface of the target, and have a small angular aperture at the highest energies. As proton beams are observed even using target which nominally do not contain hydrogen, protons are thought to originate from hydro-carbon impurities located on the target surfaces or from bulk contamination of the target. Proposed theoretical models indicate that the protons gain their energy from the enormous electric field (-MV/micron) set up laser accelerated fast electrons via space-charge at the back target surface. As protons are easier to accelerate than heavier ions, protons are the dominant component of the ion emission.
NTIS
Imaging Techniques; Mathematical Models; Proton Beams; Pulsed Lasers; Plasmas (Physics); Laser Target Interactions

20030038988 Lawrence Livermore National Lab., Livermore, CA
Progress at LLNL Toward DPSSL-Driven Inertial Fusion Energy
Orth, C. D.; Rothenberg, J. E.; Payne, S. A.; Powell, H. T.; Feb. 19, 2002; 12 pp.; In English
Report No.(s): DE2002-15002029; UCRL-JC-147441; No Copyright; Avail: Department of Energy Information Bridge

We describe research indicating that a diode-pumped solid-state laser (DPSSL) can serve as a viable driver for an inertial fusion energy (IFE) power plant. The ongoing construction of the National Ignition Facility (NIF) sets the stage for a new era to start in the next decade for target research aimed at achieving the high gains necessary for both defense and energy applications. In addition, advances in DPSSL research show that this type of laser can have adequate efficiency and reliability, and can achieve the effective beam smoothness required for direct-drive IFE.
NTIS
Solid State Lasers; Inertial Fusion (Reactor); Power Plants; Semiconductor Lasers

20030039001 Lawrence Livermore National Lab., Livermore, CA
Radiation Driven Capsules for Fast Ignition
Slutz, S. A.; Hermann, M.; Jun. 08, 2001; 12 pp.
Report No.(s): DE2002-15002107; UCRL-JC-142586; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Laser Targets; Implosions

20030039008 Lawrence Livermore National Lab., Livermore, CA
Modeling of Laser Induced Damage in NIF UV Optics
Feit, M. D.; Rubenchik, A. M.; Feb. 21, 2001; 34 pp.; In English
Report No.(s): DE2002-15002111; UCRL-ID-142596; No Copyright; Avail: Department of Energy Information Bridge
In this project, we successfully accounted for the pulselength dependence of damage threshold in bulk DKDP crystals with the hypothesis of small absorbers with a distribution of sizes. We theoretically investigated expected scaling of damage initiation craters both to baseline detailed numerical simulations presently underway and to aid identification of damage initiators. Ancillary experimental techniques intended to yield information on laser energy absorption and shockwave generation were investigated. Section 2 of this report describes accomplishments of the project. Work reported elsewhere is mentioned briefly and cited. Section 3 describes the twoproof of principle experiments carried out by UC collaborators. Section 4 has conclusions and recommendations for future work. Section 5 is a listing of reports and presentations arising from this project.
NTIS
Laser Damage; Optics; Laser Applications

20030039180 Lawrence Livermore National Lab., Livermore, CA
Toward Strehl-Optimizing Adaptive Optics Controllers
Gavel, D.; Wiberg, D.; Oct. 08, 2002; 18 pp.; In English
Report No.(s): DE2002-15002235; UCRL-JC-147283; No Copyright; Avail: Department of Energy Information Bridge
A main objective of adaptive optics is to maximize closed-loop Strehl, or, equivalently, minimize the statistical mean-square wavefront residual. Most currently implemented A 0 wavefront reconstructors and closed-loop control laws do not take into account either the correlation of the Kolmogorov wavefronts over time or the modified statistics of the residual wavefront in closed loop. There have been a number of attempts in the past to generate predictive controllers, which utilize wind speed and Cn2 profiles and incorporate one or two previous time steps. We present here a general framework for a dynamic controller/reconstructor design where the goal is to maximize mean closed-loop Strehl ratio over time using all previous data and exploiting the spatial-temporal statistics of the Kolmogorov turbulence and measurement noise.
NTIS
Adaptive Optics; Optimal Control

20030039183 Lawrence Livermore National Lab., Livermore, CA
Impulsive Stimulated Light Scattering at High Pressure: Precise Determination of Elastic Constants of Opaque Materials
Crowhurst, J. C.; Zaug, J. M.; Abramson, E. H.; Brown, J. M.; Ahre, D. W.; Aug. 22, 2002; 14 pp.; In English
Report No.(s): DE2002-15002245; UCRL-JC-147909; No Copyright; Avail: Department of Energy Information Bridge
Impulsive stimulated light scattering has been used to measure interfacial wave propagation speeds and elastic constants under conditions of high pressure. Data obtained from single-crystal Ge and Fe, and from polycrystalline Ta is presented. The method is complementary to other techniques for obtaining this type of information. There appears no fundamental reason why it cannot be extended to the I Mbar regime.
NTIS
Light Scattering; Elastic Properties; High Pressure

20030039185 Lawrence Livermore National Lab., Livermore, CA
Properties and Applications of Laser Generated X-Ray Sources
Smith, R. F.; Key, M. H.; Feb. 25, 2002; 18 pp.; In English
Report No.(s): DE2002-15002247; UCRL-JC-148019; No Copyright; Avail: Department of Energy Information Bridge

The rapid development of laser technology and related progress in research using lasers is shifting the boundaries where laser based sources are preferred over other light sources particularly in the XUV and x-ray spectral region. Laser based sources have exceptional capability for short pulse and high brightness and with improvements in high repetition rate pulsed operation, such sources are also becoming more interesting for their average power capability. This study presents an evaluation of the current capabilities and near term future potential of laser based light sources and summarises, for the purpose of comparison, the characteristics and near term prospects of sources based on synchrotron radiation and free electron lasers. Conclusions are drawn on areas where the development of laser based sources is most promising and competitive in terms of applications potential.
NTIS
X Ray Sources; Free Electron Lasers; Synchrotron Radiation

20030039186 Lawrence Livermore National Lab., Livermore, CA
Modeling of the Transient Ni-like Ag X-Ray Laser
Smith, R. F.; Benredjem, D.; Moller, C.; Kuba, J.; Klisnick, A.; Feb. 26, 2002; 16 pp.; In English
Report No.(s): DE2002-15002248; UCRL-JC-148017; No Copyright; Avail: Department of Energy Information Bridge
Recent high temporal resolution Ni-like x-ray laser experiments have yielded important insights into the output characteristics of picosecond pumped x-ray lasers. However, current experimental observations do not fully explain the plasma dynamics which are critical to the gain generation within the x-ray laser medium. A theoretical study of the Ni-like Silver x-ray laser has therefore been undertaken to compliment our experimental results, in an attempt to further our understanding of the processes at play in yielding the observed x-ray laser output. Preliminary findings are presented within this paper.
NTIS
X Ray Lasers; Laser Outputs

20030039190 Lawrence Livermore National Lab., Livermore, CA
Research and Development for X-Ray Optics and Diagnostics on the Linac Coherent Light Source (LCLS)
Bionta, R. M.; Arthur, J.; Chapman, H.; Craig, B.; Klingmann, J.; Sep. 24, 2002; 8 pp.; In English
Report No.(s): DE2002-15002250; UCRL-JC-145122-REV-1; No Copyright; Avail: Department of Energy Information Bridge
The Linac Coherent Light Source (LCLS) is a 1.5 to 15 wavelength Free-Electron Laser (PEL), under development at the Stanford Linear Accelerator Center (SLAC). The photon output consists of high brightness, transversely coherent pulses with duration (300 fs), together with a broad spontaneous spectrum. The output energy density per unit area, pulse duration, repetition rate, and small FEL spot size pose special challenges for optical components and diagnostics downstream of the undulator. Planning for the photon beam transport, manipulation and diagnostics downstream of the undulator has begun.
NTIS
X Ray Lasers; Optics; Free Electron Lasers; Light Sources

20030039192 Lawrence Livermore National Lab., Livermore, CA
Ultrafast Materials Probing with the LLNL Thomson X-Ray Source
Springer, P.; Anderson, S.; Brown, W.; Barty, C.; Cauble, R.; Sep. 03, 2002; 10 pp.; In English
Report No.(s): DE2002-15002251; UCRL-JC-150440; No Copyright; Avail: Department of Energy Information Bridge
The use of short laser pulses to generate very high brightness, ultra short (fs to ps) x-ray pulses is a topic of great interest. In principle, femtosecond-scale pump-probe experiments can be used to temporally resolve structural dynamics of materials on the time scale of atomic motion. The development of sub-ps x-ray pulses will make possible a wide range of materials and plasma physics studies with unprecedented time resolution. The Thomson scattering project at LLNL will provide such a novel x-ray source of high power using short laser pulses and a high brightness, relativistic electron bunch. The system is based on a 5 mm-mrad normalized emittance photoinjector, 100 MeV electron RF linac, and a 300 mJ, 35 fs solid-state laser system. The Thomson source will produce ultra fast pulses with x-ray energies (60 keV) capable of probing into high-Z metals. x-ray absorption fine structure
NTIS
Characterization; Materials Tests; Electromagnetic Pulses; Laser Applications

20030045695 Lawrence Livermore National Lab., Livermore, CA
Injector-Amplifier Design for Tabletop Ne-Like X-Ray Lasers
Dunn, J.; Osterheld, A. L.; Faenov, A. Y.; Pikuz, T. A.; Shlyaptsev, V. N.; Oct. 07, 2002; 12 pp.; In English
Report No.(s): DE2002-15002252; UCRL-JC-149105; No Copyright; Avail: Department of Energy Information Bridge

We report new results using the LLNL COMET laser to evaluate the effectiveness of different target architectures to improve the output and characteristics of the transient x-ray laser scheme. Surprising observations were found when the laser line focus irradiating a single slab Cr or Fe target was divided into two or three distinct plasma column sections with millimeter scale gaps between each plasma. The Ne-like 3p (sup 1)S(sub 0) -> 3s (sup 1)P(sub 1) 28.5 nm and 25. 5 nm x-ray laser lines, for Cr and Fe, respectively, were improved in beam divergence, by 2 - 3 times, and peak intensity, by up to one order of magnitude, when compared with a single plasma column of the same length or longer. This was contrary to expectations since these large-scale inhomogeneities introduced along the plasma, as well as attenuation from the cold plasma at the end of each section, would be detrimental to the x-ray propagation and amplification.
NTIS
Amplifier Design; Injectors; X Ray Lasers; Neon; Plasmas (Physics)

20030045697 Lawrence Livermore National Lab., Livermore, CA
Picosecond 14.7 nm X-Ray Laser for Probing Matter Undergoing Rapid Changes
Dunn, J.; Smith, R. F.; Nilsen, J.; Nelson, A. J.; Van Buuren, T. W.; Oct. 07, 2002; 14 pp.; In English
Report No.(s): DE2002-15002254; UCRL-JC-149104; No Copyright; Avail: Department of Energy Information Bridge
With laser-driven tabletop x-ray lasers now operating in the efficient saturation regime, the source characteristics of high photon flux, high monochromaticity, picosecond pulse duration, and coherence are well-matched to many applications involving the probing of matter undergoing rapid changes. We give an overview of recent experiments at the Lawrence Livermore National Laboratory (LLNL) Compact Multipulse Terawatt (COMET) laser using the picosecond 14.7 nm x-ray laser as a compact, ultrafast probe for surface analysis and for interferometry of laser-produced plasmas. The plasma density measurements for known laser conditions allow us to reliably and precisely benchmark hydrodynamics codes. In the former case, the x-ray laser ejects photo-electrons, from the valence band or shallow core-levels of the material, and are measured in a time-of-flight analyzer. Therefore, the electronic structure can be studied directly to determine the physical properties of materials undergoing rapid phase changes.
NTIS
Laser Plasmas; Picosecond Pulses; Pulse Duration; X Ray Lasers; Monochromatic Radiation

20030045699 Lawrence Livermore National Lab., Livermore, CA
Experimental Studies of the Stimulated Brillouin Scattering Instability in the Saturated Regime
Froula, D. H.; Oct. 29, 2002; In English
Report No.(s): DE2002-15002258; UCRL-LR-150860; No Copyright; Avail: National Technical Information Service (NTIS)
An experimental study of the stimulated Brillouin scattering (SBS) instability has investigated the effects of velocity gradients and kinetic effects on the saturation of ion-acoustic waves in a plasma. For intensities less than I less than 1:5 times 10 to the 15th power W cm to the minus 2 power, the SBS instability is moderated primarily by velocity gradients, and for intensities above this threshold, nonlinear trapping is invoked to saturate the instability. We report direct evidence of detuning of SBS by a velocity gradient which was achieved by directly measuring the frequency shift of the SBS driven acoustic wave relative to the local resonant acoustic frequency. Furthermore, a novel use of Thomson scattering has allowed us to gather direct evidence of kinetic effects associated with the SBS process. Specifically, a measured two-fold increase of the ion temperature has been linked with laser beam excitation of ion-acoustic waves to large amplitudes by the SBS instability.
NTIS
Plasmas (Physics); Brillouin Effect; Thomson Scattering; Frequency Shift

20030045707 Lawrence Livermore National Lab., Livermore, CA
Electron Optics Design and Performance of a New Large-format Two-frame Framing Tube
Lai, C. C.; Nov. 08, 2002; 12 pp.; In English
Report No.(s): DE2002-15002273; UCRL-JC-147893; No Copyright; Avail: Department of Energy Information Bridge
We have developed a framing tube with 80-mm photocathode for capturing two frames in less than 100-ns onto a 50-mm phosphor screen. A proven electron optics trajectory code was used to design the tube for imaging fidelity over wide dynamic range. This code's full accounting of space charge effects is essential for its ability to simulate accurately the distributed photoelectronic trajectories from the entire large photocathode area. Our approach and guideline for designing the electron optics are described. Results of trajectory simulation and test measurement are reported. Substantial correlations between the code expectation and the measured results are observed on relative resolution and distortion of the frame images. This tube

has been integrated into an active framing camera system for field application.
NTIS
Electron Optics; Imaging Techniques; Photocathodes; Framing Cameras

20030045739 Lawrence Livermore National Lab., Livermore, CA
Transient and Capillary Collisional X-Ray Lasers
Shlyaptsev, V. N.; Dunn, J.; Fournier, K. B.; Moon, S.; Osterheld, A. L.; Dec. 17, 2001; 16 pp.; In English
Report No.(s): DE2002-15002372; UCRL-JC-146605; No Copyright; Avail: Department of Energy Information Bridge

In this work we report our numerical modeling results of laser-generated transient inversion and capillary discharge X-ray lasers. In the search for more efficient X- ray lasers we look closely at other approaches in conjunction with experiments at LLNL. In the search for improved X-ray lasers we perform modeling and experimental investigations of low density targets including gas puff targets. We have found the importance of plasma kinetics in transient X-ray lasers by expanding the physical model beyond hydrodynamics approach with Particle In Cell (PIC) and Fokker-Planck codes. The evidence of the Langdon effect was inferred from the recent experimental data obtained with the Ni-like Pd X-ray laser. We continue modeling different kinds of capillary discharge plasma configurations directed toward shorter wavelength X-ray lasers, plasma diagnostics and other applications.
NTIS
X Ray Lasers; Hydrodynamics; Fokker-Planck Equation; Kinetics

20030045752 Lawrence Livermore National Lab., Livermore, CA
Institute for Laser Science and Applications
Baldis, H. A.; Aug. 27, 2001; 158 pp.; In English
Report No.(s): DE2002-15002383; UCRL-ID-145269; No Copyright; Avail: Department of Energy Information Bridge

When intense lasers are used to initiate fusion in inertial confinement fusion, plasmas typically form. Because the laser energy flux densities are high, there is a tendency for nonlinear interactions of the laser beam or beams with the plasma to occur. Such interactions can lead to backscatter, focusing, and/or filamentation of the laser beams, all of which may be quite deleterious to the fusion application. This project addresses the theoretical study of laser-plasma interactions and the modeling of laser-plasma interaction experiments. In particular, this project has addressed the modeling of multiple laser-beam experiments with CH target foils at the LULI facility near Paris that demonstrated a number of interesting and important nonlinear features regarding stimulated Brillouin and Raman backscatter (stimulated scattering of an electromagnetic wave by an ion sound wave and an electron plasma wave, respectively, in a plasma). We have applied similar analyses to SRS experiments in NOVA at LLNL and to a proposed cross-beam experiment in OMEGA at Rochester.
NTIS
Laser Plasma Interactions; Plasmas (Physics); Electron Plasma; Flux Density; Inertial Confinement Fusion; Laser Beams

20030045754 Lawrence Livermore National Lab., Livermore, CA
Petawatt Laser Data Analysis and Technology Development
Ley, M. H.; Perry, M. D.; Aug. 30, 2000; 16 pp.; In English
Report No.(s): DE2002-802584; UCRL-ID-140366; No Copyright; Avail: Department of Energy Information Bridge

The Petawatt (PW) laser beam line at the LLNL Nova laser facility was unique in the world in supplying an order of magnitude higher power (1PW in pulses of 500 fs duration) than lasers elsewhere. Focussed to intensities reaching 3x 10(sup 20) Wcm(sup -2), it opened up a new regime of experimental science where free electron energies in the light wave are strongly relativistic. After full operational capability of the PW beam-line was reached, close to 25\% of the operation of the Nova facility was dedicated to PW shots for two years, prior to the shut down of Nova in May 1999. A wealth of novel scientific data was obtained and it motivated the primary objective of this June 1 to Oct. 1,1999 LDRD, which was to complete systematic analysis of the PW laser data. This was done by the team, which had conducted the experiments working with associated experts in theoretical modeling of the complex physical phenomena. A second objective was to develop a key new technology of large area transmission gratings needed for the next step to higher energy PW laser development. This work was done by the team, which developed the reflective grating technology.
NTIS
Design Analysis; Laser Beams; Electron Energy; Laser Applications

20030045768 Lawrence Livermore National Lab., Livermore, CA
Hybrid Chirped Pulse Amplification
Jovanovic, I.; Barty, C. P. J.; Nov. 12, 2002; 12 pp.; In English
Report No.(s): DE2002-802881; UCRL-JC-146224; No Copyright; Avail: Department of Energy Information Bridge
A hybrid terawatt-amplification scheme combining optical-parametric-chirped-pulse amplification and amplification in active laser media is demonstrated for the first time. This simple technique uses a single pump pulse and eliminates gain narrowing, allows efficient energy conversion and does not require electro-optic devices.
NTIS
Laser Applications; Pulsed Lasers

20030045771 Lawrence Livermore National Lab., Livermore, CA
NIF Beam Shaping Masks
Bowers, M. W.; Henesian, M. A.; Nov. 15, 2001; 18 pp.
Report No.(s): DE2002-802916; No Copyright; Avail: Department of Energy Information Bridge
The report describes how spatial shapers work. They are binary masks that allow somewhere between 0 and 100\% transmission.
NTIS
Masks; Beamforming

20030045796 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology, Metrology Research Institute Annual Report, 2001
Kaerhae, P.; 2002; 62 pp.
Report No.(s): PB2003-101690; MRI-20/2002; Copyright; Avail: National Technical Information Service (NTIS)
Expansion of the research activities of the Metrology Research Institute continued in 2001. In the University's present financial situation, new activities can only be based on acquired funding which covers already almost two thirds of the total budget of the Institute. It should be noted that the fastest growing section of the budget is the direct funding from companies. The research fields of the Institute include optical radiation measurements, microtechnologies, applied quantum optics, and fiber optics where several significant developments were carried out in 2001. New equipment was constructed for characterization of filter radiometers with a wavelength tunable Ti:Sapphire laser. Such characterizations can be made only in a couple of other National Metrology Institutes. An all-optical 3-GHz frequency standard was developed using coherent population trapping in rubidium vapor. The measured linewidth of this system is one of the narrowest ever reported. Collaboration with Crystal Fiber A/S in Denmark was initiated to study novel optical properties of photonic crystal fibers and supercontinuum generation in these fibers.
NTIS
Metrology; Electrical Engineering

20030051419 Iowa State Univ. of Science and Technology, Ames, IA
Laser Micromachining and Information Discovery Using a Dual Beam Interferometry
Theppakuttaikomaraswamy, S. P.; 2001; 78 pp.; In English
Report No.(s): DE2002-803100; No Copyright; Avail: Department of Energy Information Bridge
Lasers have proven to be among the promising tool for micromachining because they can process features down to the size of the laser wavelength (smaller than 1 micrometer) and they provide a non-contact technology for machining. The demand for incorporating in-situ diagnostics technology into the mircromachining environment is driven by the increasing need for producing micro-parts of high quality and accuracy. Laser interferometry can be used as an on-line monitoring tool and it is the aim of this work to enhance the understanding and application of Michelson interferometry principle for the in-situ diagnostics of the machining depth on the sub-micron and micron scales.
NTIS
Laser Interferometry; Laser Machining; Micromachining

20030051534 Brookhaven National Lab., Upton, NY
Beam Dynamics Simulations in the Rapid Cycling Medical Synchrotron
Beebe-Wang, J.; D'Imperio, N.; Luccio, A. U.; Peggs, S.; Zhang, S. Y.; 2002; 8 pp.; In English
Report No.(s): DE2003-804611; BNL-68949; No Copyright; Avail: Department of Energy Information Bridge

The Rapid Cycling Medical Synchrotron (RCMS) accelerator is under conceptual design at BNL. We report the results of the beam dynamics studies in the current design RCMS ring lattice with simulation program ORBIT++. In this paper, the designed RCMS ring lattice, the important physical parameters and the simulation program employed in this study are overviewed. The major elements and the numerical parameters included in the simulations are listed and discussed. The evolution of longitudinal beam properties, such as bunch length, bunch height and particle distributions, under RF voltage ramping are studied. The simulation results of the 6D beam dynamics during acceleration including phase space and emittance evolution are presented. Finally, the space charge effects such as tune shift and emittance growth in the RCMS ring are investigated and discussed.
NTIS
Cycles; Medical Equipment; Synchrotrons; Beam Steering; Simulation

20030051586 Lawrence Livermore National Lab., Livermore, CA
Manufacturing Laser Glass by Continuous Melting
Campbell, J. H.; Krenitsky, S.; Takeuchi, K.; Jul. 01, 2001; 266 pp.; In English
Report No.(s): DE2002-15002236; UCRL-ID-142410; No Copyright; Avail: Department of Energy Information Bridge
A novel, continuous melting process is being used to manufacture meter-sized plates of laser glass at a rate 20-times faster, 5-times cheaper, and with 2-3 times better optical quality than with previous one-at-a-time, discontinuous technology processes. This new technology for manufacturing laser glass, which is arguably the most difficult continuously-melted optical material ever produced, comes as a result of a $60 million, six-year joint R&D program between government and industry. The glasses manufactured by the new continuous melting process are Nd-doped phosphate-based glasses and are marketed under the product names LG-770 (Schott Glass Technologies) and LHG-8 (Hoya Corporation USA). With this advance in glass manufacturing technology, it is now possible to construct high-energy, high-peak-power lasers for use in fusion energy development, national defense, and basic physics research that would have been impractical to build using the old melting technology. The development of continuously melted laser glass required technological advances that have lead to improvements in the manufacture of other optical glass products as well.
NTIS
Laser Materials; Phosphates; Glass; Melting

20030052008 Lawrence Livermore National Lab., Livermore, CA
Initiation Growth and Mitigation of UV Laser Induced Damage in Fused Silica
Rubenchik, A. M.; Felt, M.; Dec. 21, 2001; In English
Report No.(s): DE2002-15002011; UCRL-JC-144463; No Copyright; Avail: National Technical Information Service (NTIS)
Laser damage of large fused silica optics initiates at imperfections. Possible initiation mechanisms are considered. We demonstrate that a model based on nanoparticle explosions is consistent with the observed initiation craters. Possible mechanisms for growth upon subsequent laser irradiation, including material modification and laser intensification, are discussed. Large aperture experiments indicate an exponential increase in damage size with number of laser shots. Physical processes associated with this growth and a qualitative explanation of self-accelerated growth is presented. Rapid growth necessitates damage growth mitigation techniques. Several possible mitigation techniques are mentioned, with special emphasis on CO2 processing. Analysis of material evaporation, crack healing, and thermally induced stress are presented.
NTIS
Laser Damage; Ultraviolet Lasers; Laser Outputs

20030052016 Lawrence Livermore National Lab., Livermore, CA
Luminescence Investigation of SiO(2) Surfaces Damaged by 0.35 mm Laser Illumination
Kozlowski, M. R.; Battersby, C. L.; Demos, S. G.; Dec. 15, 1999; 12 pp.; In English
Report No.(s): DE2002-791046; UCRL-JC-136870; No Copyright; Avail: Department of Energy Information Bridge
Following initiation at absorbing surface flaws, UV laser-induced damage to polished fused-silica surfaces continues to grow upon subsequent illumination. In this study photoluminescence spectroscopy was used to detect the formation of a modified, absorbing layer of silica that could be responsible for the continued growth of the damage site. For damage sites created with pulsed 355 nm illumination, three characteristic photoluminescence peaks are detected within the damage sites when excited with a 35 1 nm CW beam. Two of the peaks are likely due to the well- known E and NBOHC defects associated with oxygen vacancies and broken Si-O bonds, respectively. The third, and dominant, peak at 560 nm has not been clearly identified, but is likely associated with a change in stoichiometry of the silica. The relative intensities of the peaks are

non-uniform across individual damage sites. The photoluminescence data is being combined with insights from various optical and electron microscopies to develop an understanding of laser-induced damage sites. The objective is to develop strategies to slow or stop the growth of the damage sites.
NTIS
Luminescence; Surface Defects; Continuous Radiation

20030052210 Lawrence Livermore National Lab., Livermore, CA
Development of Trivalent Ytterbium Doped Fluorapatites for Diode-Pumped Laser Applications
Bayramian, A. J.; Jun. 21, 2000; In English
Report No.(s): DE2002-791656; UCRL-LR-139215; No Copyright; Avail: National Technical Information Service (NTIS)
One of the major motivators of this work is the Mercury Project, which is a 1 kW scalable diode-pumped solid-state laser system under development at Lawrence Livermore National Laboratory (LLNL). Major goals include 100 J pulses, 10\% wallplug efficiency, 10 Hz repetition rate, and a 5 times diffraction limited beam. To achieve these goals the Mercury laser incorporates ytterbium doped Sr5(PO4)3F (S-FAP) as the amplifier gain medium. The primary focus of this thesis is a full understanding of the properties of this material which are necessary for proper design and modeling of the system.
NTIS
Doped Crystals; Mercury Project; Solid State Lasers; Ytterbium; Diodes

20030052231 Lawrence Livermore National Lab., Livermore, CA
Adaptive Optics and NICMOS Uniqueness Space
Max, C.; Mar. 22, 1999; 14 pp.; In English
Report No.(s): DE2002-793934; UCRL-ID-136492; No Copyright; Avail: Department of Energy Information Bridge
The present document outlines the conclusions to date, with emphasis on aspects relevant to the NICMOS cryocooler Independent Science Review. In general the near-infrared capabilities of the new ground-based adaptive optics systems will be complementary to the capabilities of NICMOS. For example NICMOS will have greater H-band sensitivity, broader wavelength coverage, and higher point-spread-function stability, whereas ground-based adaptive optics instruments will have higher spatial and spectral resolution. Section 2 of this report outlines the operational constraints faced by the first generation of adaptive optics (AO) systems on new 8-10 meter telescopes. Section 3 describes the areas of relative strength of near-infra-red observing from the ground via adaptive optics, compared with NICMOS. A Table gives an overview of the main strengths and weaknesses of these current-generation systems. Section 4 gives an indication of ground-based capabilities anticipated in the near future and in five to ten years. Section 5 contains a summary and conclusions.
NTIS
Adaptive Optics; Telescopes

20030052263 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Calculation of Free-Free Opacities
Bhatia, A. K.; Maiden, D.; Ritchie, A. B., Jr.; [2003]; 1 pp.; In English; DAMOP 2003, 2003; No Copyright; Avail: Other Sources; Abstract Only
Free-free absorption is an important contribution to the opacity for radiation transport through hot materials Temperatures can be as high as several keV, such that it becomes a computational challenge to solve the Schrodinger equation efficiently for rapidly oscillating continuum functions for high angular momenta. Several groups\footnots, including ours, have studied the phase amplitude solution (PAS) of the Schrodinger equation, in which one solves equations for the wave function amplitude and phase, which are: smooth functions of the electron energy. It is also important to have an accurate Schroudinger benchmark for the development of the PAS method. We present results for dipole matrix elements, Gaunt factors, and cross sections for the absorption of radiation at various energies for Cs XIX at temperature=100 eV and density=0.187 g/cc for our newly developed PAS and Schrodinger benchmark.
Author
Absorption; Opacity; Radiation Transport; Electron Energy; Radiation Absorption; Computation

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PLASMA PHYSICS

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

20030037172 Lawrence Livermore National Lab., Livermore, CA
Inertial Fusion Technology Spin-Offs History Provides a Glimpse of the Future
Powell, H.; Mar. 07, 2000; In English
Report No.(s): DE2002-15002097; UCRL-MI-137869; No Copyright; Avail: National Technical Information Service (NTIS)

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 drivers that perform with percent-level precision to fabricating targets with submicron specifications to measuring target performance at micron scale with picosecond 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 (EUV) lithography for microelectronics, compact and inexpensive radars, advanced laser materials processing, and medical technology.
NTIS
Inertial Confinement Fusion; Lasers

20030038801 Lawrence Livermore National Lab., Livermore, CA
Laser Plasma Interactions with Intensities from 10(12) W/cm(2) to 10(21) W/cm(2)
Kruer, W. L.; Nov. 05, 2002; 26 pp.
Report No.(s): DE2002-15002157; UCRL-JC-149143; No Copyright; Avail: Department of Energy Information Bridge

A tutorial introduction is given to some important physics and current challenges in laser plasma interactions. The topics are chosen to illustrate a few of John Dawsons many pioneering contributions to the physics and modeling of plasmas. In each case, a current frontier is also briefly discussed, including the .53pm option for laser fusion, kinetic inflation of instability levels, and new regimes accessed with ultra-high power lasers.
NTIS
Plasmas (Physics); Laser Beams

20030038815 Lawrence Livermore National Lab., Livermore, CA
National Ignition Facility Applications for Inertial Fusion Energy and High Energy Density Science
Campbell, E. M.; Hogan, W. J.; Aug. 12, 1999; In English
Report No.(s): DE2002-791695; UCRL-JC-135355; No Copyright; Avail: National Technical Information Service (NTIS)

Over the past several decades, significant and steady progress has been made in the development of fusion energy and its associated technology and in the understanding of the physics of high-temperature plasmas. While the demonstration of net fusion energy (fusion energy production exceeding that required to heat and confine the plasma) remains a task for the next millennia and while challenges remain, this progress has significantly increased confidence that the ultimate goal of societally acceptable (e.g. cost, safety, environmental considerations including waste disposal) central power production can be achieved. This progress has been shared by the two principal approaches to controlled thermonuclear fusion magnetic confinement (MFE) and inertial confinement (ICF). ICF, the focus of this article, is complementary and symbiotic to MFE. ICF invokes spherical implosion of the fuel to achieve high density, pressures, and temperatures, inertially confining the plasma for times sufficiently long (t approx. 10(sup -10) sec) that approx. 30\% of the fuel undergoes thermonuclear fusion.
NTIS
Controlled Fusion; High Temperature Plasmas; Thermonuclear Power Generation

20030038836 Lawrence Livermore National Lab., Livermore, CA
Hot Electron Diagnostic in a Solid Laser Target by Buried K-Shell Fluorer Technique from Ultra-Intense (3x10(20)W/cm(2), less than or equal to 500 J) Laser-Plasma Interactions on the Petawatt Laser at LLNL
Yasuike, K.; Key, M. H.; Hatchett, S. P.; Snavely, R. A.; Jun. 29, 2000; 56 pp.
Report No.(s): DE2002-802613; UCRL-ID-139612; No Copyright; Avail: Department of Energy Information Bridge

Characterization of hot electron production (a conversion efficiency from laser energy into electrons) in ultra intense laser-solid target interaction, using 1.06 micrometers laser light with an intensity of up to 3 times 10 to the 20th power W cm-2 and an on target laser energy of less than or equal to 500 J, has been done by observing K beta as well as Kalpha, emissions from a buried Mo layer in the targets, which are same structure as in the previous 100 TW experiments but done under less laser intensity and energy conditions (less than or equal to 4 X 10 to the 19th power Wcm-2 and less than or equal to 30 J). The conversion efficiency from the laser energy into the energy, carried by hot electrons, has been estimated to be approximately 50\%, which are little bit higher than the previous less laser energy (approximately 20 J) experiments, yet the x-ray emission spectra from the target has change drastically, i.e., gamma flash.
NTIS
Hot Electrons; Laser Plasma Interactions; Laser Target Interactions; Plasmas (Physics); Solid State

20030038839 Lawrence Livermore National Lab., Livermore, CA
E x B-Drift, Current, and Kinetic Effects of Divertor Plasma Profiles During ELMs
Rognlien, T. D.; Shimada, M.; May 23, 2002; 20 pp.
Report No.(s): DE2002-802834; UCRL-JC-148502; No Copyright; Avail: Department of Energy Information Bridge
The transient heat load on divertor surfaces from Edge-Localized Modes (ELMs) in tokamaks can be very large and thus of concern for a large device such as ITER. Models for kinetic modifications to fluid models are discussed that should allow them to reasonably describe the long mean-free path regime encountered owing to the high electron and ion temperatures in the SOL during large ELMs. A set of two-dimensional (2D) simulations of the dynamic response of the scrape-off layer (SOL) plasma to an ELM is presented. The role of plasma currents and ExB motion is emphasized, which cause large changes in the response compared to models neglecting them.
NTIS
Diverters; Tokamak Devices; Dynamic Response; Thermonuclear Reactions

20030038868 Lawrence Livermore National Lab., Livermore, CA
ICC 2002 Innovative Confinement Concepts
Hooper, E. B.; Jan. 15, 2002; 128 pp.; In English
Report No.(s): DE2002-15002238; UCRL-ID-147158-ABSTS; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Nuclear Fusion; Inertial Confinement Fusion; Plasmas (Physics)

20030038930 Lawrence Livermore National Lab., Livermore, CA
Kinetic Stabilizer: Further Calculations and Options
Post, R. F.; Jun. 19, 2002; 14 pp.; In English
Report No.(s): DE2002-803187; UCRL-JC-148763; No Copyright; Avail: Department of Energy Information Bridge
The Kinetic Stabilizer, employing injected and mirror-reflected ion beams, represents a method for stabilizing axisymmetric mirror and tandem mirror systems. Building on earlier work, this paper presents further calculations on the concept and explores some new options that promise to enhance its capabilities.
NTIS
Stabilizers; Kinetic Energy; Tandem Mirrors; Plasmas (Physics)

20030039004 Lawrence Livermore National Lab., Livermore, CA
Dynamics of Exploding Plasma within a Magnetized Plasma
Dimonte, G.; DiPeso, G.; Hewett, D.; Feb. 01, 2002; 10 pp.
Report No.(s): DE2002-15002108; UCRL-ID-147518; No Copyright; Avail: Department of Energy Information Bridge
This memo describes several possible laboratory experiments on the dynamics of an exploding plasma in a background magnetized plasma. These are interesting scientifically and the results are applicable to energetic explosions in the earth's ionosphere (DOE Campaign 7 at LLNL). These proposed experiments are difficult and can only be performed in the new

LAPD device at UCLA. The purpose of these experiments would be to test numerical simulations, theory and reduced models for systems performance codes.
NTIS
Plasmas (Physics); Diamagnetism; Magnetohydrodynamic Waves; Magnetization; Plasma Dynamics

20030039169 Lawrence Livermore National Lab., Livermore, CA
New Perspectives on Turbulent Mixing Induced by Raleigh-Taylor and Richtmyer-Meshkov Instabilitites
Zhous, Y.; Remington, B. A.; Glendinning, S. G.; Dimits, A.; Buckingham, A. C.; Oct. 30, 2002; 38 pp.; In English
Report No.(s): DE2002-15002118; UCRL-JC-149048; No Copyright; Avail: Department of Energy Information Bridge

Turbulent hydrodynamic mixing induced by the Rayleigh-Taylor (RT) and Richtmyer-Meshkov (RM) instabilities occurs in settings as varied as exploding stars (supernovae), inertial confinement fusion (ICF) capsule implosions, and macroscopic flows on fluid dynamics facilities such as shock tubes. We have developed a quantitative description of turbulence from the onset to the asymptotic end-state. Our treatment, based on a combined approach of theory, direct numerical simulation (DNS), and experimental data analysis, has broad generality. We will report two key areas in our progress. First, we have developed a robust, easy to apply criteria for the mixing transition in a time-dependent flow. This allows an assessment of whether flows, be they from supernova explosions or ICF experiments, should be turbulent or not. Second, we inspect the structure, scaling and spectra of the Rayleigh-Taylor (RT) and Richtmyer-Meshkov (RM) instabilities induced flows.
NTIS
Turbulent Mixing; Fluid Flow

20030039174 Lawrence Livermore National Lab., Livermore, CA
Final Report: Effect of Magnetic Configuration on Spheromak Performance FY2000-FY2001 Tracking No. 00-SI-008
Hill, D. N.; Hooper, E. B.; Mclean, H. S.; Stallard, B. W.; Woodruff, S.; Jan. 2002; 36 pp.; In English
Report No.(s): DE2002-15002229; UCRL-ID-147181; No Copyright; Avail: Department of Energy Information Bridge

This is the final report on LDRD SI-funded research to determine the Effect of Magnetic Field Configurations on Spheromak Performance for the years FY2000-FY2001, during which a new set of bias magnetic field coils was used to change the vacuum magnetic field configuration of the SSPX spheromak at LLNL. The USDOE Office of Fusion Energy Science funded the routine operation of the SSPX facility during FY00 and FY01. The main distinctive feature of the spheromak is that currents in the plasma itself produce the confining toroidal magnetic field, rather than a complex set of external coils.
NTIS
Spheromaks; Magnetic Fields

20030039188 Lawrence Livermore National Lab., Livermore, CA
Theoretical Investigation of Field-Line Quality in a Driven Spheromak
Cohen, R. H.; Berk, H. L.; Cohen, B. I.; Fowler, T. K.; Glasser, A. H.; Oct. 07, 2002; 12 pp.; In English
Report No.(s): DE2002-15002249; UCRL-JC-147254; No Copyright; Avail: Department of Energy Information Bridge

Theoretical studies aimed at predicting and diagnosing field-line quality in a spheromak are described. These include nonlinear 3-D MHD simulations, stability studies, analyses of confinement in spheromaks dominated by either open (stochastic) field lines or approximate flux surfaces, and a theory of fast electrons as a probe of field-line length.
NTIS
Spheromaks; Electrons; Computerized Simulation

20030045696 Lawrence Livermore National Lab., Livermore, CA
Aerial Image Microscopes for the Inspection of Defects in EUV Masks
Barty, A.; Taylor, J. S.; Hudyma, R.; Spiller, E.; Sweeney, D. W.; Oct. 22, 2002; 18 pp.; In English
Report No.(s): DE2002-15002253; UCRL-JC-148967; No Copyright; Avail: Department of Energy Information Bridge

The high volume inspection equipment currently available to support development of EUV blanks is non-actinic. The same is anticipated for patterned EUV mask inspection. Once potential defects are identified and located by such non-actinic inspection techniques, it is essential to have instrumentation to perform detailed characterization, and if repairs are performed, re-evaluation. The ultimate metric for the acceptance or rejection of a mask due to a defect, is the wafer level impact. Thus measuring the aerial image for the site under question is required. An EUV Aerial Image Microscope (AIM) similar to the current AIM tools for 248nm and 193nm exposure wavelength is the natural solution for this task. Due to the complicated

manufacturing process of EUV blanks, AIM measurements might also be beneficial to accurately assessing the severity of a blank defect. This is an additional application for an EUV AIM as compared to todays use In recognition of the critical role of an EUV AIM for the successful implementation of EUV blank and mask supply, International SEMATECH initiated this design study with the purpose to define the technical requirements for accurately simulating EUV scanner performance, demonstrating the feasibility to meet these requirements and to explore various technical approaches to building an EUV AIM tool.
NTIS
Defects; Extreme Ultraviolet Radiation; Masks; Microscopes; Aerial Photography

20030045698 Lawrence Livermore National Lab., Livermore, CA
Investigations on Soft X-Ray Lasers with a Picosecond-Laser-Irradiated Gas Puff Target
Fiedorowicz, H.; Bartnik, A.; Jarocki, R.; Rakowski, R.; Szczurek, M.; Oct. 09, 2002; 12 pp.; In English
Report No.(s): DE2002-15002255; UCRL-JC-149103; No Copyright; Avail: Department of Energy Information Bridge

We present results of experimental studies on transient gain soft x-ray lasers with a picosecond-laser-irradiated gas puff target. The target in a form of an elongated gas sheet is formed by pulsed injection of gas through a slit nozzle using a high-pressure electromagnetic valve developed and characterized at the Institute of Optoelectronics. The x-ray laser experiments were performed at the Lawrence Livermore National Laboratory using the tabletop Compact Multipulse Terawatt (COMET) laser to irradiate argon, krypton or xenon gas puff targets. Soft x-ray lasing in neon-like argon on the 3p-3s transition at 46. 9 nm and the 3d - 3p transition at 45.1 nm have been demonstrated, however, no amplification for nickel-like krypton or xenon was observed. Results of the experiments are presented and discussed.
NTIS
X Ray Lasers; Gas Injection; Targets

20030045700 Lawrence Livermore National Lab., Livermore, CA
Component Technology for Laser Plasma Simulation
Bosl, W. J.; Smith, S. G.; Dahlgren, T.; Epperley, T.; Kohn, S.; Jun. 17, 2002; 14 pp.; In English
Report No.(s): DE2002-15002257; UCRL-JC-150544; No Copyright; Avail: Department of Energy Information Bridge

This paper will discuss the application of high performance component software technology developed for a complex physics simulation development effort. The primary tool used to build software components is called Babel and is used to create language-independent libraries for high performance computers. Components were constructed from legacy code and wrapped with a thin Python layer to enable run-time scripting. Low-level components in Fortran, C++, and Python were composed directly as Babel components and invoked interactively from a parallel Python script.
NTIS
Technology Utilization; Computerized Simulation; Laser Plasmas; Applications Programs (Computers); Software Engineering

20030045701 Lawrence Livermore National Lab., Livermore, CA
Fast Ignition: Physics Progress in the US Fusion Energy Program and Prospects for Achieving Ignition
Key, M. H.; Andersen, C.; Cowan, T.; Fisch, N.; Freeman, R.; Oct. 16, 2002; 18 pp.; In English
Report No.(s): DE2002-15002262; UCRL-JC-147370; No Copyright; Avail: Department of Energy Information Bridge

Fast ignition (FI) has significant potentia1 advantages for inertial fusion energy and it is therefore being studied as an exploratory concept in the US fusion energy program. FI is based on short pulse isochoric heating of pre-compressed DT by intense beams of laser accelerated MeV electrons or protons. Recent experiment a1 progress in the study of these two heating processes is discussed. The goal is to benchmark new models in order to predict accurately the requirements for full-scale fast ignition. An overview is presented of the design and experimental testing of a cone target implosion concept for fast ignition. Future prospects and conceptual designs for larger scale FI experiments using planned high energy petawatt upgrades of major lasers in the US are outlined. A long-term roadmap for FI is defined.
NTIS
Ignition; Implosions; Targets

20030045705 Lawrence Livermore National Lab., Livermore, CA
Multi-keV X-ray Conversion Efficiency in Laser-Produced Plasmas
Back, C. A.; Davis, J.; Grun, J.; Suter, L. J.; Landen, O. L.; Oct. 31, 2002; 32 pp.; In English
Report No.(s): DE2002-15002267; UCRL-JC-149203; No Copyright; Avail: Department of Energy Information Bridge

In this paper, we discuss the source characteristics of underdense radiators and present more of the supporting experimental data. First we will give an overview of previous x-ray source research and then discuss the physics of the underdense target heating. Because the dominant factors are not the same as for disks, the source characteristics impacting the multi-keV production are different. Characteristics addressed in this work include dependencies on the atomic number Z and density. An important figure of merit for X-ray sources is the conversion efficiency.
NTIS
X Ray Sources; Laser Plasmas; Atomic Structure

20030045706 Lawrence Livermore National Lab., Livermore, CA
Effect of Shock Proximity on Richtmyer-Meshkov Growth
Glendinning, S. G.; Bolstad, J.; Braun, D. G.; Edwards, M. J.; Hsing, W. W.; Oct. 31, 2002; 34 pp.; In English
Report No.(s): DE2002-15002268; UCRL-JC-149199; No Copyright; Avail: Department of Energy Information Bridge

We report here experiments, conducted on the Omega laser (T.R.Boehly et al., Optics Commun. 133,495 (1997)), and simulations that show reduced Richtmyer- Meshkov growth rates in a strongly shocked system with linear initial amplitudes. The growth rate at early time is less than half the impulsive model prediction, rising at later time to near the impulsive prediction. An analytical model that accounts for shock proximity agrees with the results.
NTIS
Plasmas (Physics); Shock Waves

20030045710 Lawrence Livermore National Lab., Livermore, CA
Modification of the Coherence Properties of a Laser Beam Propagating through a Plasma and its Consequences for Stimulated Scattering Instabilities
Labaune, C.; Baldis, H. A.; Bandulet, H.; Depierreux, S.; Fuchs, J.; Nov. 19, 2002; 14 pp.; In English
Report No.(s): DE2002-15002276; No Copyright; Avail: Department of Energy Information Bridge

The control of coherence is a critical issue for the high-power lasers used in inertial confinement fusion (ICF). The level of coherence is an important parameter for the control of the light intensity distribution as well as the growth rate of parametric instabilities. Over the past few years, experimental and theoretical studies have evidenced the ability of an underdense plasma to reduce the spatial and temporal coherence of an intense laser beam propagating through it. As any process affecting laser propagation, plasma-induced incoherence appears fundamental for ICF for it can impact on wave-coupling conditions. We present results obtained with the six-beam LULI laser facility, in the nanosecond regime, showing direct evidences of the reduction of spatial and temporal coherence of an initially RPP-smoothed laser beam after propagation through a preformed plasma. Plasma induced incoherence (PII) proceeds from several mechanisms which include self-focusing and filament instabilities and non-linear coupling between self-focusing and forward stimulated Brillouin scattering (FSBS). Part of these experiments was dedicated to the understanding of the physical mechanisms involved in PII, as the break up of a single hot spot and the existence of ion acoustic waves having small wave vectors transverse to the interaction beam which are produced in the PII processes. The spatial and temporal characteristics of these waves give a unique access to the influence of PII on stimulated Brillouin and Raman scattering.
NTIS
Laser Beams; Inertial Confinement Fusion; Incoherence

20030045765 Lawrence Livermore National Lab., Livermore, CA
Spectroscopic Characterization of Post-Cluster Argon Plasmas During the Blast Wave Expansion
Chung, H. K.; Fournier, K. B.; Edwards, M. J.; Scott, H. A.; Cattolica, R.; May 30, 2002; 12 pp.
Report No.(s): DE2002-802837; UCRL-JC-148794; No Copyright; Avail: Department of Energy Information Bridge

In this work we present temperature diagnostics of an expanding laser-produced argon plasma. A short-pulse (35fs) laser with an intensity of I= 10(sup 17)W/cm(sup 2) deposits(approx) 100 mJ of energy into argon clusters. This generates a hot plasma filament that develops into a cylindrically expanding shock. We develop spectral diagnostics for the temperatures of the argon plasma in the shock region and the preionized region ahead of the shock. A collisional-radiative model is applied to explore line intensity ratios derived from Ar II - Ar IV spectra that are sensitive to temperatures in a few eV range. The results of hydrodynamic simulations are employed to derive a time dependent radiative transport calculation that generates the theoretical emission spectra from the expanding plasma.
NTIS
Argon Plasma; Shock Waves; Characterization

20030051600 Lawrence Livermore National Lab., Livermore, CA

Processes that Govern Helicity Injection in the SSPX Spheromak

Woodruff, S.; Stallard, B. W.; Holcomb, C. T.; Cothran, C.; Oct. 08, 2002; 12 pp.; In English

Report No.(s): DE2002-15002239; UCRL-JC-149718; No Copyright; Avail: Department of Energy Information Bridge

No abstract available

NTIS

Spheromaks; Tokamak Devices

20030052014 Lawrence Livermore National Lab., Livermore, CA

Ablation of NIF Targets and Diagnostic Components by High Power Lasers and X Rays from High Temperature Plasmas

Eder, D. C.; Anderson, A. T.; Braun, D. G.; Tobin, M. T.; Apr. 19, 2000; 18 pp.; In English

Report No.(s): DE2002-791041; UCRL-JC-136873; No Copyright; Avail: Department of Energy Information Bridge

The National Ignition Facility (NIF) will consist of 192 laser beams that have a total energy of up to 1.8 MJ in the 3rd harmonic with the amount of 2nd harmonic and fundamental light depending on the pulse shape. Material near best focus of the 3rd harmonic light will be vaporized/ablated very rapidly, with a significant fraction of the laser energy converted into plasma x rays. Additional plasma x rays can come from imploding/igniting capsule inside Inertial Confinement Fusion (ICF) hohlraums. Material from outer portions of the target, diagnostic components, first-wall material, and optical components, are ablated by the plasma x rays. Material out to a radius of order 3 cm from target center is also exposed to a significant flux of 2nd harmonic and fundamental laser light. Ablation can accelerate the remaining material to high velocities if it has been fragmented or melted. In addition, the high velocity debris wind of the initially vaporized material pushes on the fragments/droplets and increases their velocity. The high velocity shrapnel fragments/droplets can damage the fused silica shields protecting the final optics in NIF. We discuss modeling efforts to calculate vaporization/ablation, x-ray generation, shrapnel production, and ways to mitigate damage to the shields.

NTIS

Ablation; Laser Beams; Inertial Confinement Fusion; Plasmas (Physics)

20030052028 Lawrence Livermore National Lab., Livermore, CA

Comparison of Spectroscopic Measurements of an Inductive Plasma Source with the INDUCT Model

Huebschman, M. L.; Bakshi, V.; Bengston, R. D.; Ekerdt, J. G.; Vitello, P. A.; Oct. 03, 1999; 22 pp.; In English

Report No.(s): DE2002-791453; UCRL-JC-135554; No Copyright; Avail: Department of Energy Information Bridge

Noninvasive spectroscopic measurements of an inductively driven hydrogen plasma source with density and temperature characteristic of plasma processing tools have been made with an ultimate application of - cleaning of silicon substrates These measurements allow Ml radial and axial profiles of electron density and temperature to be measured from absolutely calibrated multichannel spectroscopic measurements of upper state number densities and a collisional radiative model. Profiles were obtained over a range of powers from 50 to 200 W and pressure from 5 to 50 mTorr in hydrogen in a small cylindrical source. The hydrogen working gas and simple cylindrical geometry was chosen to simplify detailed comparisons with a 2D computational model (lNDUCT95) which uses a fluid approximation for the plasma and neutral gas. The code calculates the inductive coupling of the 13.56 MHz RF source, the collisional, radiative, and wall losses as well as a chemistry model for electrons, H(sub 20), H, H(sup +)(sub 2), and H(sub +)(sub 3). Simulation results were sensitive to the value for the wall coefficient. The simulation and experimental temperature and density profile8 in r and z were in rough agreement, but some details were quite different. The simulated axial density profile was located under the coil while the measured density profile8 extended well beyond the edges of the coil. The scaling of conditions with pressure and power was in rough agreement between experiment and simulations.

NTIS

Spectroscopy; Plasmas (Physics); Electron Energy; Hydrogen Plasma

20030052045 Lawrence Livermore National Lab., Livermore, CA

Results on Plasma Focusing of High Energy Density Electron and Positron Beams

Ng, J. S. T.; Chen, P.; Craddock, W.; Decker, F. J.; Field, R. C.; Aug. 21, 2000; 10 pp.; In English

Report No.(s): DE2002-792817; UCRL-JC-140185; No Copyright; Avail: Department of Energy Information Bridge

We present results from the SLAC E-150 experiment on plasma focusing of high energy density electron and, for the first

time, positron beams. We also discuss measurements on plasma lens-induced synchrotron radiation, longitudinal dynamics of plasma focusing, and laser- and beam- plasma interactions.
NTIS
Plasma Focus; Electron Beams; Density (Mass/Volume); Laser Beams

20030052046 Lawrence Livermore National Lab., Livermore, CA
Spheromak Power and Helicity Balance
Thomassen, K. I.; May 18, 2000; 14 pp.; In English
Report No.(s): DE2002-793857; UCRL-ID-138934-R1; No Copyright; Avail: Department of Energy Information Bridge
This note addresses the division of gun power and helicity between the open line volume and the closed flux surface volume in a steady state flux core spheromak. Our assumptions are that fine scale turbulence maintains each region close to an axisymmetric Taylor state, micro(sub 0)j = LambdaB. The gun region that feeds these two volumes surrounded by a flux conserver is shown topologicaly below. (The actual geometry is toroidal). Flux and current from the magnetized gun flow on open lines around the entire closed surface containing the spheromak. The gun current flows down the potential gradient, the potential difference between the two ends of each line being the gun voltage. Here, the gun voltage excludes the sheath drops at each end. These volumes have different values of lambda in each region (open line volume V1 and closed spheromak volume V2) and we want to calculate the efficiency of transferring the gun power to the spheromak to sustain the ohmic loss in steady state.
NTIS
Spheromaks; Guns (Ordnance); Magnetization; Plasmas (Physics)

20030052067 Lawrence Livermore National Lab., Livermore, CA
Spheromak Power and Helicity Balance
Thomassen, K. I.; May 18, 2000; 12 pp.; In English
Report No.(s): DE2002-793865; UCRL-ID-138934; No Copyright; Avail: Department of Energy Information Bridge
This note addresses the division of gun power and helicity between the open line volume and the closed flux surface volume in a steady state flux core spheromak. Our assumptions are that fine scale turbulence maintains each region close to an axisymmetric Taylor state, micro(sub 0)j = LambdaB. The gun region that feeds these two volumes surrounded by a flux conserver is shown topologicaly below. (The actual geometry is toroidal). Flux and current from the magnetized gun flow on open lines around the entire closed surface containing the spheromak. The gun current flows down the potential gradient, the potential difference between the two ends of each line being the gun voltage. Here, the gun voltage excludes the sheath drops at each end.
NTIS
Spheromaks; Ohmic Dissipation

20030052072 Lawrence Livermore National Lab., Livermore, CA
Report of the National Ignition Facility Target Physics Program Review Committee
Moses, E.; Jun. 01, 2000; 28 pp.; In English
Report No.(s): DE2002-793958; UCRL-ID-139164; No Copyright; Avail: Department of Energy Information Bridge
The Department of Energy's (DOE) National Ignition Facility (NIF) has been under construction at the Lawrence Livermore National Laboratory (LLNL) since 1997. This multiple-beam facility is designed to be a source of powerful focused laser light pulses for experiments in support of the nuclear weapons Stockpile Stewardship Program (SSP), NIF will be operated by LLNL as national facility to elucidate high energy density science important to the weapons SSP and to achieving inertial confinement fusion (ICF) ignition. In addition, it will provide the nation with a valuable tool for exploring basic high energy density science. In September of 1999, projected cost overruns and schedule delays were identified in the NIF project, which have necessitated development of new construction and deployment plans and schedules. These affect science programs planned for NIF and DOE programs that the NIF is meant to support.
NTIS
Inertial Confinement Fusion; Test Facilities; Cost Analysis; Cost Effectiveness

20030052081 Lawrence Livermore National Lab., Livermore, CA
Simulation of Power and Particle Flows inthe NSTX Edge Plasma
Rensink, M. E.; Kugel, H.; Maingi, R.; Paoletti, F.; Porter, G. D.; May 18, 2000; 14 pp.; In English
Report No.(s): DE2002-794013; UCRL-JC-136705-R1; No Copyright; Avail: Department of Energy Information Bridge

We simulate edge plasmas in NSTX double-null divertor configurations with the UEDGE two-dimensional fluid code. The carbon impurity density in the core plasma and total radiated power increase with the core heating power and the magnitude of the physical and chemical sputtering in the divertor. Up/down plasma asymmetries are generated by classical cross-field particle drifts. With the standard toroidal magnetic field direction (ion Delta B drift toward the lower x-point) the highest density occurs at the lower inboard divertor plate and the highest heat flux at the upper outboard divertor plate. Simulations of 3-d edge plasma turbulence with the BOUT code show that anomalous radial transport at the outboard midplane should be similar in magnitude for NSTX and DIII-D.
NTIS
Diverters; Magnetic Field Configurations; Plasma Turbulence; Plasmas (Physics)

20030052105 Lawrence Livermore National Lab., Livermore, CA
Accuracy of X-ray Spectra Modeling of Inertial confinement Fusion Plasmas
Glenzer, S. H.; Fournier, K. B.; Hammel, B. A.; Lee, R. W.; MacGowan, B. J.; May 03, 2000; In English
Report No.(s): DE2002-792811; UCRL-JC-137557; No Copyright; Avail: National Technical Information Service (NTIS)
We have tested X-ray emission spectroscopic modeling of the helium-like and lithium-like argon emission in dense gas bag plasmas by comparing measured spectra with kinetics calculations using plasma parameters that have been independently and accurately measured with Thomson scattering. In particular, we have measured the line radiation in the wavelength region of the helium and argon transition. This spectrum is of interest to diagnose gas targets, laser ablation plasmas, and has previously been applied to diagnose electron densities and temperatures of inertial confinement fusion (ICF) capsule implosions.
NTIS
X Ray Spectra; Models; Plasmas (Physics); Emission; Spectroscopy; Inertial Confinement Fusion

20030052116 Lawrence Livermore National Lab., Livermore, CA
Calibration and Data Analysis for the KC1F Fast Magnetics System
Heeter, R. F.; Fasoli, A. F.; Ali-Arshad, S.; Moret, J. M.; Mar. 01, 2000; In English
Report No.(s): DE2002-792252; UCRL-ID-136952; No Copyright; Avail: National Technical Information Service (NTIS)
Alfven Eigenmodes (AEs) and other magnetohydrodynamic (MHD) phenomena have been studied at the Joint European Torus (JET) using a new 8-channel, 4 s, 1 MHz, 12-bit data acquisition system KC1F in conjunction with the JET fast Mirnov magnetic fluctuation pickup coils. The JET magnetic pickup coils were calibrated for the first time in the range 30-460 kHz using a new remote calibration technique which accounts for the presence of the first few LRC circuit resonances. A data-processing system has been developed within the MATLAB software environment to produce spectrograms of fluctuation amplitude and toroidal mode number versus frequency and time. The analysis software has been automated to allow routine overnight production of spectrogram web pages.
NTIS
Magnetohydrodynamics; Calibrating; Magnetic Coils; Data Processing; Rlc Circuits

20030052214 Lawrence Livermore National Lab., Livermore, CA
Laser Plasma Coupling for High Temperature Hohlraums
Kruer, W.; Nov. 04, 1999; 62 pp.; In English
Report No.(s): DE2002-793933; UCRL-ID-136320; No Copyright; Avail: Department of Energy Information Bridge
Simple scaling models indicate that quite high radiation temperatures can be achieved in hohlraums driven with the National Ignition Facility. A scaling estimate for the radiation temperature versus pulse duration for different size NIF hohlraums is shown in Figure 1. Note that a radiation temperature of about 650 ev is projected for a so-called scale 1 hohlraum (length 2.6mm, diameter 1.6mm). With such high temperature hohlraums, for example, opacity experiments could be carried out using more relevant high Z materials rather than low Z surrogates. These projections of high temperature hohlraums are uncertain, since the scaling model does not allow for the very strongly-driven laser plasma coupling physics. Lasnex calculations have been carried out to estimate the plasma and irradiation conditions in a scale 1 hohlraum driven by NIF. Linear instability gains as high as exp(100) have been found for stimulated Brillouin scattering, and other laser-driven instabilities are also far above their thresholds. More understanding of the very strongly-driven coupling physics is clearly needed in order to more realistically assess and improve the prospects for high temperature hohlraums. Not surprisingly, this

regime has been avoided for inertial fusion applications and so is relatively unexplored.
NTIS
Plasmas (Physics); Lasers; Brillouin Effect

20030052221 Brookhaven National Lab., Upton, NY
Quark-Gluon Structure of the Nucleon and QCD
En'yo, H.; Saito, N.; Shibata, T. A.; Yazaki, K.; 2002; 316 pp.; In English, March 29 - 31, 2002, Wako, Saitama, Japan
Report No.(s): DE2002-803615; BNL-52672; No Copyright; Avail: Department of Energy Information Bridge

An over view of the recent progress in Quantum Chromodynamics (QCD) at finite temperature and baryon density is given. The 1st lecture is devoted to general introduction to the phase transition in QCD. In the 2nd lecture, plasma properties at high temperature is discussed on the basis of the weak coupling perturbation theory. In the 3rd lecture, critical phenomena associated with the QCD phase transition are described. Applications to early universe, relativistic heavy ion collisions and the structure of neutron stars are also discussed.
NTIS
Nucleons; Quantum Chromodynamics; Quarks; Gluons; Ionic Collisions

20030052226 Lawrence Livermore National Lab., Livermore, CA
Particle Flows in Pumped DIII-D Discharges
Porter, G. D.; Rognlien, T. D.; Resink, M. E.; Wolf, N. S.; West, W. P.; May 17, 2000; In English
Report No.(s): DE2002-793991; UCRL-JC-136718; No Copyright; Avail: National Technical Information Service (NTIS)

The dynamics of particle flows in the DIII-D tokamak for two divertor configurations is considered. Fuel and intrinsic carbon impurity flows are analyzed using experimental data and 2D fluid plasma simulations. The flows in puff and pump experiments done in an open and a closed divertor geometry are described. It is shown that the flow of fuel particles is sensitive to divertor geometry. The pumping efficiency of the DIII-D cryopumps is a factor of 2 higher in a closed geometry than an open. The core refueling rate of an open divertor is a factor of 2 higher than that of a closed divertor. In contrast, the flow of impurity carbon particles is insensitive to divertor geometry. Both the core carbon content and the fraction of the carbon source which penetrates to the core is unchanged between an open and closed divertor. In addition, the core impurity content is found to be insensitive to the amplitude of gas puffing in the simulations.
NTIS
Plasmas (Physics); Cryopumping; Carbon; Chemical Composition

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20030037099 Fermi National Accelerator Lab., Batavia, IL, National High Magnetic Field Lab., Tallahassee, FL
Effect of Thermo-Mechanical Stress during Quench on Nb(3)Sn Cable Performance
Imbasciati, L.; Bauer, P.; Ambrosio, G.; Lamm, M. J.; Miller, J. R.; Dec. 2002; 8 pp.; In English
Report No.(s): DE2002-805584; No Copyright; Avail: Department of Energy Information Bridge

Several high field magnets using Nb(3)Sn superconductor are under development for future particle accelerators. The high levels of stored energy in these magnets can cause high peak temperatures during a quench. The thermo-mechanical stress generated in the winding during the fast temperature rise can result in a permanent damage of the brittle Nb(3)Sn. Although there are several studies of the critical current degradation of Nb(3)Sn strands due to strain, little is known about how to apply the strain limitations to define a maximum acceptable temperature in the coils during a quench. Therefore, an experimental program was launched, aimed at improving the understanding of the effect of thermo-mechanical stress in coils made from brittle Nb(3)Sn. A first experiment, reported here, was performed on cables. The experimental results were compared to analytical and finite element models. The next step in our experimental program will be to repeat similar measurements in small racetrack coils and later in full size magnets.
NTIS
High Field Magnets; Mathematical Models; Particle Accelerators; Thermodynamics; Superconductors (Materials); Niobium; Tin; Stress Distribution

20030037125 National Inst. of Standards and Technology (MSEL), Gaithersburg, MD

Determination of Texture from Individual Grain Orientation Measurements

Blendell, J. E.; Vaudin, M. D.; Fuller, E. R.; 2002; 14 pp.

Report No.(s): PB2003-102700; No Copyright; Avail: CASI; A03, Hardcopy

We present a technique for determining the texture of a polycrystalline material based on the measurement of the orientation of a number of individual grains. We assumed that the sample has fiber (i.e. axisymmetric) texture and that the texture can be characterized by a function (the March-Dollase function) with a single parameter. We simulated a large number, N, of orientation data sets, using the March-Dollase function for a total of five different texture parameters, r(init) Using the maximum likelihood method we solved for the texture parameter, r(prime) that best fits each simulated data set in order to determine the distribution of r(prime) evaluate the precision and accuracy with which r(prime) can be determined. The 90\% confidence limits of the ratio r(prime)/rinit varied as N-1/2 but were independent of r(init). Using the texture of slightly textured alumina as determined by x-ray diffraction we calculated the 90\% confidence limits for measurements of 131 grains. The orientations of 131 grains in textured alumina were measured by electron backscatter diffraction and the texture determined from those measurements lay within these 90\% confidence limits.

NTIS

X Ray Diffraction; Maximum Likelihood Estimates; Aluminum Oxides; Electron Diffraction; Polycrystals

20030037134 National Inst. of Standards and Technology (MSEL), Gaithersburg, MD, American Superconductor Corp., Westborough, MA, Los Alamos National Lab., NM

Method for Crystallographic Texture Investigations Using Standard X-Ray Equipment

Vaudin, M. D.; Rupich, M. W.; Jowett, M.; Riley, G. N.; Bingert, J. F.; 2002; In English

Report No.(s): PB2003-102698; No Copyright; Avail: National Technical Information Service (NTIS)

A fast and accurate method has been developed for measuring crystalline texture in homogeneous materials. The method uses a conventional powder x-ray diffractometer capable of q scans. Two scans are recorded from the sample: first, a high resolution q-2q scan is obtained of a Bragg peak whose diffracting planes are normal to the preferred orientation direction; second, a q scan is obtained using this peak. The q scan contains the required texture information but the intensities must be corrected for defocussing and absorption to obtain the texture profile. The q-2q scan of the Bragg peak is used to make the defocussing correction, and first principles calculations are used to correct for absorption. The theory behind these corrections is presented here. The validity of the technique has been verified by making measurements on untextured alumina. Data obtained from Bi2Sr2Ca2Cu3O10 superconducting tape specimens with this technique are compared with texture data obtained with a four-circle diffractometer.

NTIS

Crystallography; Textures; X Ray Diffraction; Superconductivity; Homogeneity

20030045732 Lawrence Livermore National Lab., Livermore, CA

LDA+DMFT Approach to Materials with Strong Electronic Correlations

Held, K.; Nekrasov, I. A.; Keller, G.; Eyert, V.; Bluemer, N.; Dec. 02, 2001; 42 pp.; In English

Report No.(s): DE2002-15002368; UCRL-JC-146470; No Copyright; Avail: Department of Energy Information Bridge

LDA + DMFT is a novel computational technique for ab initio investigations of real materials with strongly correlated electrons, such as transition metals and their oxides. It combines the strength of conventional band structure theory in the local density approximation (LDA) with a modern many-body approach, the dynamical mean-field theory (DMFT). In the last few years LDA+DMFT has proved to be a powerful tool for the realistic modeling of strongly correlated electronic systems. In this paper the basic ideas and the set-up of the LDA+DMFT(X) approach, where X is the method used to solve the DMFT equations, are discussed. Results obtained with X=QMC (quantum Monte Carlo) and X=NCA (non-crossing approximation) are presented and compared.

NTIS

Approximation; Solid State Physics

20030045804 Helsinki Univ. of Technology, Espoo (Finland)

First Principles Calculations for Point Defects in 2H-, 3C- and 4H-SiC Polytypes

Torpo, L.; Nov. 2001; 158 pp.

Report No.(s): PB2003-102064; TKK-DISS-114 (2001); No Copyright; Avail: CASI; A08, Hardcopy

The electronic and ionic structure of primary defects in silicon carbide (SiC) is studied using ab-initio plane-wave

pseudopotential methods. The studied effects include the carbon and silicon vacancy, the silicon and carbon antisite, the antistructure-pair and the nearest-neighbor divacancy. The defects are studied in all their stable charge states in a variety of SiC crystals (in 3C-, 4H- and 2H-polytypes). The aim of this work is to numerically calculate the electronic structure of the named defect centers, to evaluate the defect formation energy and the relaxed ionic structure around the defect accurately using density-functional theory and efficient computational tools. The physical, electrical, structural and optical properties can be derived from the results of the electronic structure calculation. In this work, such results are the ionization levels, negative-U transitions, the symmetry point group of the relaxed atoms around the defect, the total spin, the positron lifetime and corresponding high momentum part of Doppler broadening of the annihilation radiation of the defect center. All these quantities are compared and discussed in context with experimental observations.
NTIS
Point Defects; Silicon Carbides

20030051420 Brookhaven National Lab., Upton, NY
R&D for Accelerator Magnets with React and Wind High Temperature Superconductors
Grupta, R.; Anerella, M.; Cozzolino, J.; Escallier, J.; Ganetis, G.; 2002; 10 pp.; In English
Report No.(s): DE2002-803190; BNL-69345; No Copyright; Avail: Department of Energy Information Bridge

High Temperature Superconductors (HTS) have the potential to change the design and operation of future particle accelerators beginning with the design of high performance interaction regions. HTS offers two distinct advantages over conventional Low Temperature Superconductors (LTS) - they retain a large fraction of their current carrying capacity (1) at high fields and (2) at elevated temperatures. The Superconducting Magnet Division at Brookhaven National Laboratory (BNL) has embarked on a new R&D program for developing technology needed for building accelerator magnets with HTS. We have adopted a 'React & Wind' approach to deal with the challenges associated with the demanding requirements of the reaction process. We have developed several 'conductor friendly' designs to deal with the challenges associated with the brittle nature of HTS. We have instituted a rapid turn around program to understand and to develop this new technology in an experimental fashion. Several R&D coils and magnets with HTS tapes and 'Rutherford' cables have been built and tested. We have recently performed field quality measurements to investigate issues related to the persistent currents. In this paper, we report the results to date and plans and possibilities for the future.
NTIS
Research And Development; Particle Accelerators; High Temperature Superconductors

20030052054 Lawrence Livermore National Lab., Livermore, CA
Solid-State Modulator Testing
Cook, E. G.; Jan. 10, 2000; 12 pp.; In English
Report No.(s): DE2002-792255; UCRL-ID-136932; No Copyright; Avail: Department of Energy Information Bridge

In this note is reported the testing of the pre-production version of a solid-state adder type modulator. In this configuration, the adder consists of transformers that are driven by an array of MOSFET switches that are connected in parallel but not in series; i.e. the input voltage on the transformer is limited to the maximum voltage rating on the MOSFETs.
NTIS
Electric Potential; Metal Oxide Semiconductors; Field Effect Transistors

20030052088 Brookhaven National Lab., Upton, NY
Abort Gap Cleaning in RHIC
Drees, A.; Ahrens, L.; Fliller, R.; Gassner, D.; McIntyre, G. T.; 2002; 6 pp.; In English
Report No.(s): DE2003-804613; BNL-69042; No Copyright; Avail: Department of Energy Information Bridge

During the RHIC Au-run in 2001 the 200 MHz storage cavity system was used for the first time. The rebucketing procedure caused significant beam debunching in addition to amplifying debunching due to other mechanisms. At the end of a four hour store, debunched beam could account for approximately 30\%-40\% of the total beam intensity. Some of it will be in the abort gap. In order to minimize the risk of magnet quenching due to uncontrolled beam losses at the time of a beam dump, a combination of a fast transverse kicker and copper collimators were used to clean the abort gap. This report gives an overview of the gap cleaning procedure and the achieved performance.
NTIS
Electron Bunching; Quenching (Atomic Physics); Beams (Radiation); Solid State Physics; Magnetic Materials

20030052097 Brookhaven National Lab., Upton, NY, Tsukuba Univ., Ibaraki (Japan)

Space Charge Simulation Methods Incorporated in Some Multi-Particle Tracking Codes and Their Results Comparison

Beebe-Wang, J.; Machida, S.; 2002; 8 pp.; In English

Report No.(s): DE2003-804612; BNL-68948; No Copyright; Avail: Department of Energy Information Bridge

Space charge in high intensity beams is an important issue in accelerator physics. Due to the complicity of the problems, the most effective way of investigating its effect is by computer simulations. In the resent years, many space charge simulation methods have been developed and incorporated in various 2D or 3D multi- particle-tracking codes. It has becoming necessary to benchmark these methods against each other, and against experimental results. As a part of global effort, we present our initial comparison of the space charge methods incorporated in simulation codes ORBIT++ (1), ORBIT (2-5) and SIMPSONS (6,7). In this paper, the methods included in these codes are overviewed. The simulation results are presented and compared. Finally, from this study, the advantages and disadvantages of each method are discussed.

NTIS

Computerized Simulation; Space Charge

20030052101 Indiana Univ. at Bloomington, Oak Ridge National Lab., TN, Los Alamos National Lab., NM, Brookhaven National Lab., Upton, NY

Studies of the Coherent Half-Integer Resonance

Cousineau, S.; Holmes, J.; Galambos, J.; Macek, R.; Fedotov, A.; 2002; 6 pp.; In English

Report No.(s): DE2003-804614; BNL-69411; No Copyright; Avail: Department of Energy Information Bridge

We present studies of space-charge-induced beam pro- file broadening at high intensities in the Proton Storage Ring (PSR) at Los Alamos National Laboratory. Previous work has associated the observed broadening in the vertical direction with the coherent half integer resonance. Here, we study the effect of the space charge environment on this resonance; specifically, we investigate the strength of the resonance versus beam intensity, longitudinal bunching factor, transverse lattice tune, and two different beam injection scenarios. For each case, detailed particle-in-cell simulations are combined with experimental results to elucidate the behavior and sensitivity of the beam resonance response.

NTIS

Space Charge; Beam Injection

20030052106 Brookhaven National Lab., Upton, NY

Next Generation IR Magnets for Hadron Colliders

Gupta, R.; Anerella, M.; Cozzolino, J.; Escallier, J.; Ganetis, G.; Aug. 2002; 6 pp.; In English

Report No.(s): DE2003-804615; BNL-69413; No Copyright; Avail: Department of Energy Information Bridge

Brookhaven National Laboratory (BNL) is developing 'React and Wind' designs and technology for building long high field accelerator magnets. This paper presents the R&D program for interaction region (IR) magnets made with 'Rutherford' cable for the luminosity upgrade of the Large Hadron Collider (LHC). This paper will introduce a few new end design concepts that make the bend radius of the cable in the end independent of the coil aperture. These designs are suitable for building magnets with 'React and Wind' technology.

NTIS

Superconducting Magnets; High Field Magnets

20030052117 Fermi National Accelerator Lab., Batavia, IL, Lawrence Berkeley National Lab., CA, Brookhaven National Lab., Upton, NY

T2 Working Group Summary Report

Caspin, S.; Gourlay, S.; Green, M.; Sabbi, G.; Gupta, R.; Nov. 2002; 34 pp.; In English

Report No.(s): DE2003-804721; FERMILAB-CONF-01/431; No Copyright; Avail: Department of Energy Information Bridge

The T2 Working Group has reviewed and discussed the issues and challenges of a wide range of magnet technologies: superconducting magnets Using NbTi, Nb(sub 3) Sn and HTS conductor with fields ranging from 2-15 T and permanent magnets up to 4 T. The development time of these technologies varies significantly, but all are considered viable, providing an unprecedented variety of choice that can be determined by a balance of cost and application requirements.

NTIS

Superconducting Magnets; Magnetic Measurement

20030052193 Ames Lab., IA, Iowa State Univ., Ames. Dept. of Materials Science and Engineering
Magnetic Field Induced Phase Transitions in Gd(5)(Si(1. 95)Ge(2.05)) Single Crystal and the Anisotropic Magnetocaloric Effect
Tang, H.; Pecharsky, V. K.; Percharsky, A. O.; Schlage, D. L.; Logrsso, T. A.; 2002; 18 pp.; In English
Report No.(s): DE2002-803065; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Phase Transformations; Magnetic Fields

20030052225 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Curve Fitting Solar Cell Degradation Due to Hard Particle Radiation
Gaddy, Edward M.; Cikoski, Rebecca; Mekadenaumporn, Danchai; [2003]; 3 pp.; In English; 3rd World Conference on Photovoltaic Energy Conversion, 11-18 May 2003, Osaka, Japan; Copyright; Avail: CASI; A01, Hardcopy
This paper investigates the suitability of the equation for accurately defining solar cell parameter degradation as a function of hard particle radiation. The paper also provides methods for determining the constants in the equation and compares results from this equation to those obtained by the more traditionally used.
Author
Solar Cells; Numerical Analysis; Independent Variables

20030052250 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Effective Lagrangians and Universality Classes of Nonlinear Bigravity
Damour, T.; Kogan, I. I.; Jun. 2002; 48 pp.
Report No.(s): PB2003-102072; IHES/P/02/35; No Copyright; Avail: CASI; A03, Hardcopy
The authors discuss the fully non-linear formulation of multigravity. The concept of universality classes of effective Lagrangians describing bigravity, which is the simplest form of multigravity, is introduced. The authors show that non-linear multigravity theories can naturally arise in several different physical contexts: brane configurations, certain Kaluza-Klein reductions and some non-commutative geometry models. The formal and phenomenological aspects of multigravity (including the problems linked to the linearized theory of massive gravitons) are briefly discussed.
NTIS
Lagrangian Function; Gravitons

77
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*.

20030037062 Fermi National Accelerator Lab., Batavia, IL
BTeV Pixel Detector and Trigger System
Kwan, S.; Dec. 2002; 10 pp.
Report No.(s): DE2002-805271; No Copyright; Avail: Department of Energy Information Bridge
BTeV is an approved forward collider experiment at the Fermilab Tevatron dedicated to the precision studies of CP violation, mixing, and rare decays of beauty and charm hadrons. The BTeV detector has been designed to achieve these goals. One of the unique features of BTeV is a state-of-the-art pixel detector system, designed to provide accurate measurements of the decay vertices of heavy flavor hadrons that can be used in the first trigger level. The pixel vertex detector and the trigger design are described. Recent results on some of the achievements in our research and development effort are presented.
NTIS
Pixels; Radiation Detectors

20030037065 Jefferson Lab., Newport News, VA
Nucleon Form Factors
de Jager, K.; 2002; 14 pp.
Report No.(s): DE2002-805273; No Copyright; Avail: Department of Energy Information Bridge
A review of data on the nucleon electro-weak form factors in the space-like region is presented. Recent results from

experiments using polarized beams and either polarized targets or nucleon recoil polarimeters have yielded a significant improvement on the precision of the electromagnetic data obtained with the traditional Rosenbluth separation. An outlook is presented of planned experiments.
NTIS
Nucleons; Form Factors

20030037073 Fermi National Accelerator Lab., Batavia, IL
Accelerator Physics and Technology Limitations to Ultimate Energy and Luminosity in Very Large Hadron Colliders
Bauer, P.; Limon, P.; Peggs, S.; Syphers, M.; Solyak, N.; Dec. 2002; 8 pp.
Report No.(s): DE2002-805414; FERMILAB-CONF-01/421; No Copyright; Avail: Department of Energy Information Bridge

The following presents a study of the accelerator physics and technology limitations to ultimate energy and luminosity in very large hadron colliders (VLHCs). The main accelerator physics limitations to ultimate energy and luminosity in future energy frontier hadron colliders are synchrotron radiation (SR) power, proton-collision debris power in the interaction regions (IR), number of events-per-crossing, stored energy per beam and beam-stability. Quantitative estimates of these limits were made and translated into scaling laws that could be inscribed into the particle energy versus machine size plane to delimit the boundaries for possible VLHCs. Eventually, accelerator simulations were performed to obtain the maximum achievable luminosities within these boundaries.
NTIS
Hadrons; Particle Collisions; Particle Accelerators; High Energy Interactions

20030038768 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, Sussex Univ., Brighton (England), Oxford Univ. (England)
Conformal Orbifold Partition Functions from Topologically Massive Gauge Theory
Ferreira, P. C.; Kogan, I. I.; Szabo, R. J.; Dec. 2001; 52 pp.; In English
Report No.(s): PB2003-102092; IHES/P/01/53; SUSX-TH-01-040,OUTP-01-57P; No Copyright; Avail: CASI; A04, Hardcopy

The authors continue the development of the topological membrane approach to open and unoriented string theories. The authors study orbifolds of topologically massive gauge theory defined on the geometry of a generic compact Riemann surface. The orbifold operations are constructed by gauging the discrete symmetries of the bulk three-dimensional field theory. Multi-loop bosonic string vacuum amplitudes are thereby computed as bulk correlation functions of the gauge theory. It is shown that the three-dimensional correlators naturally reproduce twisted and untwisted sectors in the case of closed worldsheet orbifolds, and Neumann and Dirichlet boundary conditions in the case of open ones. The bulk wavefunctions are used to explicitly construct the characters of the underlying extended Kac-Moody group for arbitrary genus. The correlators for both the original theory and its orbifolds give the expected modular invariant statistical sums over the characters.
NTIS
String Theory; Field Theory (Physics)

20030038796 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Einstein Billiards and Overextensions of Finite-Dimensional Simple Lie Algebras
Damour, T.; De Buyl, S.; Henneaux, M.; Schomblond, C.; Jun. 2002; 42 pp.
Report No.(s): PB2003-102079; IHES/P/02/43; No Copyright; Avail: CASI; A03, Hardcopy

In recent papers, it has been shown that (1) dynamics of theories involving gravity can be described, in the vicinity of a space-like singularity, as a billiard motion in a region of hyperbolic space bounded by hyperplanes; and (2) that the relevant billiard has remarkable symmetry properties in the case of pure gravity in d+1 spacetime dimensions, or supergravity theories in 10 or 11 spacetime dimensions, for which it turns out to be the fundamental Weyl chamber of the Kac-Moody algebras AE(sub d), E(sub 10), BE(sub 10) or DE(sub 10) (depending on the model). The authors analyze in this paper the billiards associated to other theories containing gravity, whole toroidal reduction to three dimensions involves coset models G/H (with G maximally non compact). We show that in each case, the billiard is the fundamental Weyl chamber of the (indefinite) Kac-Moody 'overextension' (or 'canonical Lorentzian extension') of the finite-dimensional Lie algebra that appears in the toroidal compactification to 3 spacetime dimensions.
NTIS
Lie Groups; Algebra; Gravitation

20030051451 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, Imperial Coll. of Science and Technology, London (England)

Chern-Simons Vortices in Supergravity

Abou-Zeid, M.; Samtleben, H.; Dec. 2001; 34 pp.; In English

Report No.(s): PB2003-102093; IHES/P/O1/52; No Copyright; Avail: CASI; A03, Hardcopy

The authors study supersymmetric vortex solutions in three-dimensional abelian gauged supergravity. First, the authors construct the general U (1)-gauged D=3, N=2 supergravity whose scalar sector is an arbitrary Kahler manifold with U (1) isometry. This construction clarifies the connection between local supersymmetry and the specific forms of some scalar potentials previously found in the literature-in particular, it provides the locally supersymmetric embedding of the abelian Chern-Simons Higgs model. The authors show that the Killing spinor equations admit rotationally symmetric vortex solutions with asymptotically conical geometry which preserve half of the supersymmetry.

NTIS

Supergravity; Vortices

20030051464 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette

Dualitites in Quantum Hall System and Noncommutative Chern-Simons Theory

Gorsky, A.; Kogan, I. I.; Korthels-Altes, C.; Oct. 2001; 38 pp.

Report No.(s): PB2003-102095; IHES/P/01/47; No Copyright; Avail: CASI; A03, Hardcopy

The authors discuss different dualities of QHE in the framework of the non-commutative Chern-Simons theory. First, the authors consider the Morita or T-duality transformation on the torus which maps the abelian non-commutative description of QHE on the torus into the nonabelian commutative description on the dual torus. It is argued that the Ruijsenaars integrable many-body system provides the description of the QHE with finite amount of electrons on the torus. The new IIB brane picture for the QHE is suggested and applied to Jain and generalized hierarchies. This picture naturally links 2d alpha-model and 3d CS description of the QHE. All duality transformations are identified in the brane setup and can be related with the mirror symmetry and S duality. The authors suggest a brane interpretation of the plateu transition in IQHE in which a critical point is naturally described by SL(2, R) WZW model.

NTIS

Quantum Hall Effect; Duality Theorem

20030051473 Fermi National Accelerator Lab., Batavia, IL, INFN Grado, Itlay

First Run II Results with the CDF Detector

Bedeschi, F.; Oct. 2002; In English

Report No.(s): DE2002-803209; FERMILAB-CONF-02/259-E; No Copyright; Avail: National Technical Information Service (NTIS)

We report the first results obtained by the CDF (Collider Detector Facility) collaboration from the analysis of the Tevatron Run II data collected until June 2002. All components of the CDF detector are operating at or near the design specifications. Typical physics signals are observed and used both to characterize the CDF detector performance, and to make several physics measurements. In spite of the still limited accumulated luminosity some measurements are already competitive with the best currently available.

NTIS

Nuclear Research; Research Facilities; Particle Accelerators

20030051477 Fermi National Accelerator Lab., Batavia, IL

Tevatron Magnets and Orbit Vibrations

Shiltsev, V.; Johnson, T.; Zhang, X. L.; Oct. 2002; 10 pp.; In English

Report No.(s): DE2002-803422; FERMILAB-CONF-02/250; No Copyright; Avail: Department of Energy Information Bridge

We report results of recent measurements of vibrations of the Tevatron collider elements and orbit movements over large diapason of frequencies.

NTIS

Magnets; Vibration; Particle Accelerators

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20030052052 Institute for Human Factors TNO, Soesterberg, Netherlands
Information Operations: Effects of Missing and Unreliable Information on Decision Making
Kerstholt, J. H.; Jansen, E. J. M.; June 18, 2002; 26 pp.; In Dutch
Contract(s)/Grant(s): 013.40345; TNO Proj. 787.1
Report No.(s): TM-02-A030; TD-2002-0101; Copyright; Avail: Other Sources

We present research as part of a 4-year-long project that aims at identifying the circumstances under which military commanders are susceptible for deception, and how they might guard themselves against it. Two specific types of Info Ops are distinguished: denial and deception. In two experiments we investigated, as commissioned by the Program Leader of the Information Operations Program, how these two types of Info Ops affect decision making. For practical reasons we used a legal context for our research. In general, participants had to make a guilt assessment on the basis of witness statements. In the first experiment half of the participants were told that they did not have all information. The other half did not have this information. However, both groups actually received the same information. In the second experiment part of the participants was told that one witness (the victim) was unreliable, due to either memory failure (unintentional) or lying (intentional). However, also in this experiment all participants actually received the same information. The decision (guilty or not) depended on the scenario (the case) and completeness of infomation. If the available information was consistent with each other, participants declared the suspect guilty more often when information was missing (as compared to the participants who thought they had all information). If the available information was inconsistent with each other, on the other hand, they less often declared the suspect guilty. In all cases, participants were more uncertain about their decision when they thought information was missing. If the source of information could be unreliable, participants assessed probability of guilt lower. Additional information from this source received more weight when it concerned intentional rather than unintentional deception. Missing and unreliable information is not neglected, but the (possible) value is interpreted in the light of existing knowledge and information available. A danger for the quality of decisions, is that the available information gains too much weight. Decision support should therefore focus on the awareness of alternative explanations of available information.
Author

Decision Making; Deception; Military Operations; Decision Support Systems; Information Transfer

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030037045 CH2M Hill Hanford Group, Inc., Richland, WA
CDM on a Shoestring Indentifying and Utilizing an Existing Configuration and Data Management Infrastructure
Vann, J. M.; Aug. 24, 2000; 22 pp.; In English
Report No.(s): DE2002-804490; No Copyright; Avail: Department of Energy Information Bridge

The spreading need for and use of configuration and data management (CDM) standards has highlighted a number of challenges to the companies that need to Implement those standards. For companies and organizations that are new to CDM or have limited CDM capabilities, one of the major dilemmas faced is identifying how and where to start. In many cases there is a need to contend with a legacy of poody identified items and information and an immature or non-existent CDM infrastructure (processes, procedures, people, information systems). To the company management and CDM professional this poses a seemingly insurmountable task of putting in place a CDM infrastructure that provides the needed benefits while keeping within an acceptable cost and schedule. This paper deals with initially establishing the CDM infrastructure using the tools that a company already has available. The paper identifies features of common software applications that can be used to implement CDM principles.
NTIS

Configuration Management; Data Management; Applications Programs (Computers); Information Systems

20030037046 CH2M Hill Hanford Group, Inc., Richland, WA
Integration of Multiple Contractors with Performance Type of Contracts
2000; 14 pp.; In English
Report No.(s): DE2002-804742; No Copyright; Avail: Department of Energy Information Bridge
The management practices, procedures, and processes that are suited to managing Management and Operation (M&O) type of contracts at Department of Energy (DOE) sites, which were cost reimbursement with award fee, are not well suited to managing contracts where fee is determined by performance metrics. Thus a different style of management, requiring substantial revamping of the management process, is needed. This shift in philosophy also requires a dramatic shift in culture. This paper will describe how these changes are being managed at the River Protection Project (RPP), located at the DOE's Hanford Site in Washington State, one of DOE's largest and highest risk environmental clean-up project.
NTIS
Radioactive Wastes; Environment Management; Environmental Cleanup; Energy Technology; Waste Management

20030037048 CH2M Hill Hanford Group, Inc., Richland, WA
Office of River Protection: Simplifying Project Management Tools
2000; 14 pp.; In English
Report No.(s): DE2002-804743; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Project Management; Rivers

20030037051 Fluor Hanford, Richland, WA, Fluor Federal Services, Richland, WA
Fuel Supply Shutdown Facility Interim Operational Safety Requirements
Benecke, M. W.; Besser, R. L.; Brehm, J. R.; Remaize, J. A.; Sep. 06, 2000; 30 pp.; In English
Report No.(s): DE2002-804808; No Copyright; Avail: Department of Energy Information Bridge
The Interim Operational Safety Requirements for the Fuel Supply Shutdown (FSS) Facility define acceptable conditions, safe boundaries, bases thereof, and management of administrative controls to ensure safe operation of the facility.
NTIS
Fuel Systems; Safety Management

20030037090 Science Applications International Corp., Oak Ridge, TN
Report of Official Foreign Travel to Canada 2-10 August 2002
Mason, J. D.; Aug. 26, 2002; 20 pp.; In English
Report No.(s): DE2002-805442; No Copyright; Avail: Department of Energy Information Bridge
In support of DOEs use of SGML, XML, HTML, and related standards, I have served since 1985 as Chairman of the international committee responsible for SGML and related standards, ISO/IEC JTC1/SC34 (SC34) and its predecessor organizations. During my August 2002 trip, I attended the summer 2002 meeting of SC34/WG3 in Montreal, Canada. I also read a paper at Extreme Markup Languages 2002, a major conference on the use of SGML and XML sponsored by IDE Alliance.
NTIS
Energy Technology; Conferences; Canada; Transportation

20030037146 General Accounting Office, Washington, DC
Federal Student Aid: Timely Performance Plans and Reports Would Help Guide and Assess Achievement of Default Management Goals
Feb. 2003; 46 pp.
Report No.(s): PB2003-102741; GAO-03-348; No Copyright; Avail: CASI; A03, Hardcopy
The Department of Education's Office of Federal Student Aid (FSA) is responsible for managing and administering the nation's student financial assistance programs authorized under title IV of the Higher Education Act (HEA) of 1965, as amended. In 1998, the Congress amended HEA to establish FSA as a performance-based organization (PBO) in order to address longstanding management weaknesses. Among other requirements, HEA called for FSA to annually develop 5-year plans that establish measurable goals and to issue annual reports on the extent to which the goals were met. The intent of this law was to provide among other things, a greater level of accountability for FSA's administration of programs. Additionally,

HEA requires FSA to seek the opinions and suggestions of postsecondary institutions and other stakeholders, such as lenders and borrowers, regarding their delivery system.
NTIS
Education; Students; Management Planning

20030037148 General Accounting Office, Washington, DC
Transportation Security Administration: Actions and Plans to Build a Results-Oriented Culture
Jan. 2003; 52 pp.
Report No.(s): PB2003-102747; GAO-03-190; No Copyright; Avail: CASI; A04, Hardcopy

The objective of our review was to describe the Transportation Security Administration's (TSA) actions and plans for implementing the results-oriented practices required in the Aviation and Transportation Security Act (ATSA) and recommend next steps for TSA to build a results-oriented organizational culture and to establish a positive control environment. To identify results-oriented practices and recommend next steps, we reviewed our models, guides, reports, and other products on strategic planning and performance measurement, strategic human capital management, transformation efforts, and other related areas. We next analyzed ATSA in relation to our products to identify any results-oriented practices that were statutorily required in the legislation. In addition, we reviewed TSA and Department of Transportation missions, performance goals and measures, performance agreements, policies and procedures, and organizational charts and other relevant documentation. To describe TSA's status in implementing these results-oriented practices, we interviewed 25 officials from various TSA offices including strategic planning, human capital, training, budget, public affairs, and policy, among others. We also visited Baltimore-Washington International airport after it was transitioned to federal control to talk to front-line managers about their responsibilities and specifically their role in providing performance data to headquarters. We developed the recommended next steps by referring to our models, guides, reports, and other products on results-oriented practices and identifying additional practices that were associated with and would further complement or support current TSA efforts. We performed our work from May through September 2002 in accordance with generally accepted government auditing standards.
NTIS
Transportation; Security; Management Planning

20030037151 California Univ., Berkeley. Dept. of Economics, North Carolina Univ. at Greensboro. Dept. of Economics, Dartmouth Coll., Hanover, NH
Universities as Research Partners
Hall, B. H.; Link, A. N.; Scott, J. T.; Jun. 2002; 80 pp.; In English
Report No.(s): PB2003-102755; No Copyright; Avail: CASI; A05, Hardcopy

Universities are a key institution in the U.S. innovation system, and an important aspect of university involvement is the role universities play in private-public partnering activities. This study seeks to gain a better understanding of the performance of university-industry research partnerships by using a survey of a sample of pre-commercial research projects funded by the U.S. Advanced Technology Program (ATP). Although results must be interpreted cautiously because of the small sample size, the study finds that projects with university involvement tend to be in areas involving new science and therefore the projects may experience more difficulty and delay but also are more likely to end successfully. This finding implies that universities are contributing to basic research awareness and insight among the partners in ATP-funded projects.
NTIS
Universities; Research Management; Surveys

20030037161 Patent and Trademark Office, Washington, DC
USA Patent and Trademark Office 21st Century Strategic Plan
Jun. 03, 2002; 20 pp.
Report No.(s): PB2003-102786; No Copyright; Avail: CASI; A03, Hardcopy

Today, the USA Patent and Trademark Office (USPTO) is under siege. Patent application filings have increased dramatically throughout the world. There are an estimated seven million pending applications in the world's examination pipeline, and the annual workload growth rate is in the range of 20-30 percent. Technology has become increasingly complex, and demands from customers for higher quality products and services have escalated. Our applicants are concerned that the fees they pay to have their patent and trademark applications examined are being diverted for other purposes, thereby jeopardizing the benefits intellectual property rights bring to our national economy. In the USA, these demands have created substantial workload challenges in the processing of patents. The Congress, the owners of intellectual property, the patent bar,

and the public-at-large have all told us that we must address these challenges aggressively and promptly.
NTIS
Management Planning; Information Systems

20030038920 General Accounting Office, Washington, DC
VA Health Care: Improved Planning Needed for Management of Excess Real Property
Jan. 2003; 22 pp.
Report No.(s): PB2003-102590; GAO-03-326; No Copyright; Avail: CASI; A03, Hardcopy

The Department of Veterans Affairs (VA) operates one of our nation's largest health care delivery systems, comprising 21 health care delivery networks that operate and maintain over 4,700 buildings. Over the past decade, VA's system has undergone a dramatic transformation, shifting from predominantly hospital-based care to primary reliance on community-based VA and non-VA providers for a full continuum of health care delivered largely on an outpatient basis. As a result, vacant and underutilized buildings at VA's inpatient locations have become more common. Because the cost to operate and maintain these underutilized and vacant buildings consumes resources that could otherwise be used to provide health care services for veterans, VA initiated its Capital Asset Realignment for Enhanced Services (CARES) process. Under CARES, VA's Undersecretary for Health has directed networks to develop asset-restructuring plans to guide future capital investment decisions that would involve constructing new facilities or renovating or closing existing ones for the purpose of delivering health care more efficiently in existing locations or closer to where veterans live.
NTIS
Medical Services; Public Health; Facilities; Clinical Medicine

20030038921 General Accounting Office, Washington, DC
2000 Census: Coverage Measurement Programs' Results, Costs, and Lessons Learned
Jan. 2003; 32 pp.
Report No.(s): PB2003-102591; GAO-03-287; No Copyright; Avail: CASI; A03, Hardcopy

To assess the quality of population data for the 2000 Census and to possibly adjust for any errors, the U.S. Census Bureau (Bureau) conducted the Accuracy and Coverage Evaluation (A.C.E.) program. The A.C.E. program was first included in Bureau program documents in November 1998 and funded for fiscal years 2000 through 2002 with proposed funding through December 31, 2002. Its predecessor, Integrated Coverage Measurement (I.C.M.), began in May 1995 and was funded by the Bureau for fiscal years 1996 through 1999. The Bureau obligated about $207 million to both programs from fiscal years 1996 through 2001, which was about 3 percent of the $6.5 billion total estimated cost of the 2000 Census. However, neither program was used to adjust the 2000 Census population count. Concerned about the amount of money the Bureau spent on both programs as well as what was received in return for its investment, GAO examined (1) the Bureau's objectives for the I.C.M./A.C.E. programs and the extent to which those objectives were met (2) the cost of consultants and technical studies, and (3) ways to track the costs of coverage measurement activities in future censuses.
NTIS
Census; Populations; Operating Costs; Project Management; Data Acquisition

20030038954 Internal Revenue Service, Washington, DC
National Taxpayer Advocate FY2002 Annual Report to Congress
2002; In English
Report No.(s): PB2003-102796; No Copyright; Avail: National Technical Information Service (NTIS)

Table of Contents: Preface; The most serious problems encountered by taxpayers; The National taxpayer advocate's legislative recommendations; The most litigated tax issues; Taxpayer advocate service case advocacy and systemic advocacy and Appendices.
NTIS
Financial Management; Revenue

20030038962 General Accounting Office, Washington, DC
Tax Administration: IRS Should Continue to Expand Reporting on Its Enforcement Efforts
Jan. 2003; 66 pp.
Report No.(s): PB2003-102923; GAO-03-378; No Copyright; Avail: CASI; A04, Hardcopy

IRS annually reports extensive data on audits but only limited, or no, data on its other enforcement programs. This limited

reporting does not provide policymakers or taxpayers information on the full extent of IRS's enforcement efforts. To the extent that taxpayers do, as is widely believed, take the level of enforcement into account when self-reporting their tax obligations, the audit rate alone may mislead them. IRS officials believe that more reporting is desirable and intend to report readily available, but incomplete, information on nonaudit programs in future reports. The USA tax system is based on self-reporting and voluntary compliance by taxpayers. The Internal Revenue Service (IRS) uses various enforcement programs to check the accuracy of tax returns and contacts taxpayers if problems are found. IRS makes the contacts through four major enforcement programs that have existed for many years.
NTIS
Information Theory; Revenue

20030038967 General Accounting Office, Washington, DC
Contract Management: DLA Properly Implemented Best Value Contracting for Clothing and Textiles and Views and Supplier Base as Uncertain
Feb. 2003; 26 pp.
Report No.(s): PB2003-102924; GAO-03-440; No Copyright; Avail: CASI; A03, Hardcopy

The Defense Logistics Agency (DLA) supplies the nation's military services and certain civilian agencies with critical resources needed to accomplish their worldwide missions. During fiscal year 2001, DLA contracts totaled $14.8 billion--$1.2 billion of which was for clothing and textiles. In a report on the Bob Stump National Defense Authorization Act for Fiscal Year 2003, the House Committee on Armed Services directed us to determine whether DLA is properly implementing applicable statutory and regulatory guidance for best value purchases of clothing and textile items. Best value procurements are those that in the federal governments view provide the greatest overall benefits, not just the lowest price. In addition, in subsequent discussions with Committee staff, we were asked to obtain DLA's views on the domestic supplier base for key clothing and textile items.
NTIS
Textiles; Supplying; Logistics; Defense Program; Clothing

20030038972 General Accounting Office, Washington, DC
Contract Management: Commercial Use of Share-in-Savings Contracting
Jan. 2003; 22 pp.
Report No.(s): PB2003-102933; GAO-03-327; No Copyright; Avail: CASI; A03, Hardcopy

The Congress and federal agencies are increasingly turning to performance-based contracting methods as a way to enhance the delivery of government services. You requested that we determine how Share-in- Savings (SIS) contracting, one performance-based technique, is used in the commercial sector. This report responds to your request by examining four commercial SIS contracts and identifying common characteristics that made them successful. For the purposes of this report, we have defined SIS contracting as an agreement in which a client compensates a contractor from the financial benefits derived as a result of contract performance. Financial benefits can come from either contractor-generated savings or revenues.
NTIS
Contractors; Identifying; Revenue

20030038976 General Accounting Office, Washington, DC
Tobacco Settlement: States' Allocations of Fiscal Years 2002 and 2003 Master Settlement Agreement Payments
Feb. 2003; 126 pp.
Report No.(s): PB2003-102932; GAO-03-407; No Copyright; Avail: CASI; A07, Hardcopy

The Master Settlement Agreement (MSA) requires four of the nation's largest tobacco companies to make annual payments to states in perpetuity as reimbursement for past health care costs related to tobacco use. The Farm Security and Rural Investment Act of 2002 requires GAO to report annually on the amount of MSA payments states receive and how they allocate these payments for the years 2002 through 2006. This report provides information on the amount of MSA payments that the 46 states party to the MSA received for fiscal year 2002 and the amount these states expect to receive during fiscal year 2003; states' allocations of MSA funds to various program categories for fiscal years 2002 and 2003 and changes in these allocations from prior years; and changes in states' decision making frameworks for MSA funds since fiscal year 2001.
NTIS
Health; Tobacco; Medical Services; Costs

20030038977 General Accounting Office, Washington, DC

Financial Regulation: Review of Selected Operations of the Federal Housing Finance Board

Feb. 2003; 90 pp.

Report No.(s): PB2003-102922; GAO-03-364; No Copyright; Avail: CASI; A05, Hardcopy

This report reviews selected operations of the Federal Housing Finance Board (FHFB) and its ability to fulfill its critical mission to regulate the Federal Home Loan Bank System (FHLBank System). The FHLBank System consists of 12 Federal Home Loan Banks (FHLBanks), whose mission is to promote housing and community finance. To do so, the FHLBank System issues debt in the financial markets; and each of FHLBanks makes loans, also known as advances, to member financial institutions, such as thrift institutions and commercial banks, that are located in its district.1 As of September 30, 2002, total FHLBank System outstanding debt obligations stood at $668 billion. Although due to conservative underwriting standards the FHLBank System has never experienced a loss on an advance, it faces additional risks due to the recent rapid growth of direct mortgage acquisition programs. The direct acquisition of mortgages adds to the FHLBanks interest rate and credit risks, and the banks have developed increasingly sophisticated systems to manage these risks.

NTIS

Financial Management; Regulations; Residential Areas; Commerce

20030038985 CH2M Hill Hanford Group, Inc., Richland, WA

Business Systems Planning Project, Systems Requirements Specification

Nelson, R. L.; Oct. 2000; 48 pp.; In English

Report No.(s): DE2002-804765; No Copyright; Avail: Department of Energy Information Bridge

CH2M HILL Hanford Group, Inc. (CHG) is currently performing many core business functions including, but not limited to, work control, planning, scheduling, cost estimating, procurement, training, and human resources. Other core business functions are managed by or dependent on Project Hanford Management Contractors including, hut not limited to, payroll, benefits and pension administration, inventory control, accounts payable, and records management. The purpose of the Business Systems Planning Project System Requirements Specification (SRS) is to provide the outline and contents of the requirements for the CHG integrated business and technical information systems. This SRS defines and documents functional requirements for an integrated Project Control, Work Management and Business Management system. This document is limited to the basic functional requirements for the Business Systems Planning Project to perform software alternative analysis and develop a preliminary systems design. It does not address system solutions approval, or systems implementation.

NTIS

Project Management; Inventory Controls; Functional Design Specifications

20030038992 Virginia Transportation Research Council, Charlottesville, VA

Improved Decision Making in Construction Using Virtual Site Visits

Mills, T.; Beliveau, Y.; Jung, K.; Ilich, M.; Graziani, C.; Feb. 2003; 36 pp.; In English

Report No.(s): PB2003-102826; VTRC-03-CR8; Copyright; Avail: National Technical Information Service (NTIS)

The goal of this research was to provide an effective solution to the problem of critical and timely decision making by developing communication models that would enable a 'virtual site visit' by personnel from the Virginia Department of Transportation (VDOT). The concept of a virtual site visit is to allow personnel to view, evaluate, clarify, or modify what is occurring on the construction site by making the site, project personnel and project data available in real or near real time at multiple remote locations.

NTIS

Websites; Transportation; Planning; Construction; Management; Communication; Computers; Sites

20030045807 Mission Research Corp., Nashua, NH

Small Business Safety Officer

Fraser, M. E.; Jul. 02, 2001; 152 pp.; In English

Report No.(s): PB2003-102264; No Copyright; Avail: CASI; A08, Hardcopy

The vision of 'Small Business Safety Officer' is to provide a cost-savings portal for small businesses to integrate pollution prevention, cheaper and safer process alternatives and worker health and safety compliance into their business process. The specific goal of the Phase I program was to develop and evaluate a prototype containing a web-based expert-assisted system to generate an Intranet site to perform the following functions: determine applicable OSHA regulations; generate chemical hygiene and other safety plans; formulate policies such as chemical purchase, storage and disposal; perform medical

recordkeeping; develop an accident and event reporting archive; create and operate a safety committee and emergency response team; provide ergonomics advice; generate forms; and host several advisor capabilities to provider safer and cheaper process alternatives. The prototype was to also create a general access safety web page to provide all employees with important safety information.
NTIS
Safety Management; Industries; Industrial Management

20030051415 CH2M Hill Hanford Group, Inc., Richland, WA
Human Resource Staffing Plan for the Tank Farm Contractor
Bosley, J. W.; Dennis, D. P.; Apr. 22, 2000; 46 pp.; In English
Report No.(s): DE2002-803016; RPP-6114; No Copyright; Avail: Department of Energy Information Bridge
The Human Resources Staffing Plan quantified the equivalent staffing needs required for the Tank Farm Contractor (TFC) and its subcontractors to execute the readiness to proceed baseline between FY 2000-2008. The TFC staffing needs were assessed along with the staffings needs of Fluor Hanford and the privatization contractor. The plan then addressed the staffing needs and recruitment strategies required to execute the baseline.
NTIS
Contractors; Human Resources

20030051416 CH2M Hill Hanford Group, Inc., Richland, WA
Project Delivery Acquisition and Contracting Plan for the Tank Farm Contractor
Mercado, L. C.; Apr. 22, 2000; 46 pp.; In English
Report No.(s): DE2002-803015; RPP-6113; No Copyright; Avail: Department of Energy Information Bridge
This document is a plan presenting the process, strategies and approaches for vendor contracting by the Tank Farm Contractor. The plan focuses on contracting structures, practices, methods, and desired approaches in contracting.
NTIS
Storage Tanks; Project Planning; Contract Management; Contractors

20030051529 General Accounting Office, Washington, DC
Financial Audit: Independent Counsel Expenditures for the Six Months Ended September 30, 2002
Mar. 2003; 30 pp.
Report No.(s): PB2003-103689; GAO-03-445; No Copyright; Avail: CASI; A03, Hardcopy
The independent counsels are responsible for preparing statements of expenditures in conformity with the basis of accounting described in the accompanying notes. The counsels are also responsible for establishing, maintaining, and assessing internal control to provide reasonable assurance that the following internal control objectives are met and for complying with applicable laws and regulations. Financial reporting: Transactions are properly recorded, processed, and summarized to permit the preparation of the statements of expenditures in conformity with the basis of accounting described in the notes to the statements, and assets are safeguarded against loss from unauthorized acquisition, use, or disposition. Compliance with laws and regulations: Transactions are executed in accordance with laws and regulations that could have a direct and material effect on the counsels' statements of expenditures. We are responsible for (1) obtaining reasonable assurance about whether the counsels' statements of expenditures are presented fairly, in all material respects, in conformity with the basis of accounting described in the notes accompanying their statements of expenditures, (2) obtaining a sufficient understanding of internal control over financial reporting and compliance to plan the audits, and (3) testing compliance with selected provisions of laws and regulations that have a direct and material effect on the statements.
NTIS
Accounting; Losses; Financial Management

20030051536 General Accounting Office, Washington, DC
DOD Business Systems Modernization: Improvements to Enterprise Architecture Development and Implementation Efforts Needed
Feb. 2003; 72 pp.
Report No.(s): PB2003-102927; GAO-03-458; No Copyright; Avail: CASI; A04, Hardcopy
DOD has undertaken a challenging and ambitious task to, within 1 year, develop a departmentwide blueprint for modernizing its over 1,700 timeworn, inefficient, and nonintegrated business processes and supporting information technology

(IT) assets. Such a blueprint, commonly called an enterprise architecture, is an essential modernization management tool. We support the Secretary of Defense's decision to develop an architecture and the department's goal of acquiring systems that provide timely, reliable, and relevant information. Successfully doing so requires the application of effective enterprise architecture and IT investment management processes and controls. While DOD is following some of these enterprise architecture practices, it is not following others, in part because it is focused on meeting its ambitious schedule. More specifically, with respect to developing the architecture, DOD has yet to (1) establish the requisite architecture development governance structure and process controls needed to ensure that ownership of and accountability for the architecture are vested with senior leaders across the department, (2) clearly communicate to intended architecture stakeholders the purpose, scope, and approach to developing the initial and subsequent versions of the architecture, and their roles and responsibilities, and (3) define and implement an independent quality assurance process. Until it follows these practices, DOD increases the risk of developing an architecture that will be limited in scope, be resisted by those responsible for implementing it, and will not support effective systems modernization.
NTIS
Congressional Reports; Management Systems; Information Management; Industrial Management; Armed Forces (United States)

20030051538 General Accounting Office, Washington, DC
Electronic Procurement: Business Strategy Needed for GSA's Advantage System
Feb. 2003; 18 pp.
Report No.(s): PB2003-103678; GAO-03-328; No Copyright; Avail: CASI; A03, Hardcopy
Federal agencies ordered about $22 billion worth of products and services from commercial firms during fiscal year 2002 using the General Services Administration's (GSA) Multiple Award Schedules program. To help federal agencies use the program more efficiently, GSA developed a system called GSA Advantage, which is an Internet-based system for conducting market research and ordering schedule products and services on line. Because of concerns about the effectiveness of GSA Advantage, you asked that we review the performance of the system. In response to your request, we assessed how effective Advantage has been as an on-line system for federal agencies to shop for and order schedule products and services.
NTIS
On-Line Systems; Commerce; Schedules; Management

20030051539 General Accounting Office, Washington, DC
Title I: Although Definitions of Administrative Expenditures Vary, Almost All School Districts Studied Spent Less Than 10 Percent on Administration
Apr. 2003; 34 pp.
Report No.(s): PB2003-103677; GAO-03-386; No Copyright; Avail: CASI; A03, Hardcopy
We were directed in two separate mandates by the Congress to (1) examine how school districts defined and spent Title I funds on administrative activities and (2) review Title I expenditures in at least six school districts. In response to these mandates, we are reporting on (1) how five studies define Title I administrative expenditures and what they found about the percentage of funds spent on these activities and (2) what proportion of Title I funds was spent on administrative activities compared with instructional and other activities in six school districts.
NTIS
Schools; Costs; Management

20030051549 General Accounting Office, Washington, DC
Results-Oriented Cultures: Creating a Clear Linkage between Individual Performance and Organizational Success
Mar. 2003; 44 pp.
Report No.(s): PB2003-103672; GAO-03-488; No Copyright; Avail: CASI; A03, Hardcopy
The federal government is in a period of profound transition and faces an array of challenges and opportunities to enhance performance, ensure accountability, and position the nation for the future. High-performing organizations have found that to successfully transform themselves, they must often fundamentally change their cultures so that they are more results-oriented, customer-focused, and collaborative in nature. To foster such cultures, these organizations recognize that an effective performance management system can be a strategic tool to drive internal change and achieve desired results. Based on previously issued reports on public sector organizations' approaches to reinforce individual accountability for results, GAO

identified key practices that federal agencies can consider as they develop modern, effective, and credible performance management systems.
NTIS
Management Systems; Organizations; Procedures

20030051556 Office of National Drug Control Policy, Washington, DC
Design for a HIDTA/OCDETF Performance Monitoring and Management System
Jan. 2003; 172 pp.
Report No.(s): PB2003-103657; NDCP-197717; No Copyright; Avail: CASI; A08, Hardcopy

The HIDTA/OCDETF Performance Monitoring and Management System project represents the shared commitment of the White House Office of National Drug Control Policy (ONDCP) and the U.S. Department of Justice (DOJ) to develop a method to examine the accomplishments of two major drug enforcement programs: the High Intensity Drug Trafficking Area (HIDTA) and the Organized Crime Drug Enforcement Task Force (OCDETF) programs. The mission of the HIDTA program is to eliminate or reduce drug trafficking and its harmful consequences in critical regions of the USA. The mission of the OCDETF program is to disrupt and dismantle major drug trafficking organizations (DTOs) and related criminal enterprises. The OCDETF program provides a platform for Federal, state, and local LEAs to work together to target well-established and complex organizations that direct, finance, or engage in illegal narcotics trafficking and related crimes.
NTIS
Management Systems; Drugs; Policies; Organizations

20030051558 Environmental Protection Agency, Washington, DC
Status of the State Small Business Stationary Source Technical and Environmental Compliance Assistance Program (SBTCP), for the Reporting Period January - December 1999
Brown, K. V.; Jul. 2001; 320 pp.
Report No.(s): PB2003-103077; EPA/233/R-01/001; No Copyright; Avail: CASI; A14, Hardcopy

The U.S. Environmental Protection Agency's (EPA's) Small Business Ombudsman (SBO) is pleased to submit this fifth Report to Congress describing the activities and accomplishments of the state Small Business Stationary Source Technical and Environmental Compliance Assistance Programs (SBTCPs) during the reporting period, January 1 - December 31, 1999. This report is being submitted in accordance with Section 507(d), Monitoring, of the Clean Air Act, as amended in 1990 (CAA), which directs EPA to provide Congress with periodic reports on the status of the SBTCPs. This oversight responsibility has been delegated by the EPA Administrator to EPA's Small Business Ombudsman (SBO).
NTIS
Environment Protection; Air Quality; Pollution Monitoring; Congressional Reports

20030051564 Hudson Inst., Washington, DC
Hudson Trend Analysis: Final Report to the National Oceanic and Atmospheric Administration
Sep. 2002; In English
Report No.(s): PB2003-103091; No Copyright; Avail: National Technical Information Service (NTIS)

During the next 5-10 years NOAA (National Oceanic and Atmospheric Administration) will face many powerful trends with far-reaching impacts on its activities and decisions. In discussing these changes, trends are grouped into seven categories. Developments in each of these areas will be critical to NOAA's future and its impact. (1) Science, Technology and Communication (2) Globalization (3) Climate Change (4) Demands for Services and Cooperation (5) Economic and Business Trends (6) Environment and Resource Management Trends and Policies (7) Government Initiatives. Within these categories and often cutting across them are many transformational changes such as the Internet, global warming, the new economy, use of incentive and management approaches to resource management, government improvement, reliance on markets and the private sector, security imperatives and patterns of international competition and cooperation.
NTIS
Oceanography; Earth Atmosphere; Project Management

20030051572 Technische Univ. Twente, Enschede (Netherlands), IBM Research, Zruich, Switzerland, GMD-IPSI, Germany
CrossFlow: Cross-Organizational Workflow Management in Dynamic Virtual Enterprises
Grefen, P.; Aberer, K.; Hoffner, Y.; Ludwig, H.; 2002; 34 pp.; In English
Report No.(s): PB2003-103125; No Copyright; Avail: CASI; A03, Hardcopy

In this report, we present the approach to cross-organizational workflow management of the CrossFlow project. CrossFlow is a European research project aiming at the support of cross-organizational workflows in dynamic virtual enterprises. The cooperation in these virtual enterprises is based on dynamic service outsourcing specified in electronic contracts. Service enactment is performed by dynamically linking the workflow management infrastructures of the involved organizations. Extended service enactment support is provided in the form of cross-organizational transaction management and process control, advanced quality of service monitoring, and support for high-level flexibility in service enactment. CrossFlow technology is realized on top of a commercial workflow management platform and applied in two real-world scenarios in the contexts of a logistics and an insurance company.
NTIS
Research Projects; Workloads (Psychophysiology); Management Planning; Technology Utilization; Organizations

20030051583 General Accounting Office, Washington, DC
Financial Audit: Senate Restaurants Revolving Fund for Fiscal Years 2002 and 2001
Mar. 2003; 24 pp.
Report No.(s): PB2003-103404; GAO-03-410; No Copyright; Avail: CASI; A03, Hardcopy

Christopher J. Dodd Ranking Minority Member Committee on Rules and Administration USA Senate The Honorable Alan M. Hantman Architect of the Capitol As you requested, we provided for an audit of the financial statements of the U.S. Senate Restaurants Revolving Fund (the Fund) for the fiscal years ended September 30, 2002, and 2001, by contracting with the independent public accounting firm of Clifton Gunderson LLP. The contract required that the audit be done in accordance with U.S. generally accepted government auditing standards and the joint GAO/PCIE President's Council on Integrity and Efficiency (PCIE) Financial Audit Manual.
NTIS
Congressional Reports; Financial Management; Industrial Management

20030051592 National Inst. of Standards and Technology, Gaithersburg, MD
Annual Report (4th) on Federal Agency Use of Voluntary Consensus Standards: Implementation of Public Law 104-113 and OMB Circular A-119 for the Period of October 1, 1999, Through September 30, 2000
Jan. 2002; 146 pp.; In English
Report No.(s): PB2002-102132; NISTIR-6846; No Copyright; Avail: CASI; A07, Hardcopy

On September 11, 2000, NIST, as chair of the National Technology Transfer and Advancement Act (NTTAA), requested that each agency provide information on the status of its implementation activities: agency use of government-unique standards in lieu of voluntary consensus standards, the use of voluntary consensus standards, the number of voluntary standards substituted for government-unique standards, and the number of individual agency participants in voluntary standards bodies as well as an evaluation of the effectiveness of the policies promulgated in the Circular. The report covers fiscal year (FY) 2000 from October 1, 1999 through September 20, 2000. It also describes NIST's coordination activities, with special emphasis on implementing the National Technology Transfer and Advancement Act, as well as information in ICSP activities and individual agencies' reports on NTTAA implementation efforts, and suggestions for future courses of action.
NTIS
Standards; United States; Congressional Reports

20030052060 Lawrence Livermore National Lab., Livermore, CA
Challenges of Developing and Integrating a Quality Management System in a Research and Development Organization
Ryan, E.; Werne, R. W.; Aug. 01, 2000; 14 pp.; In English
Report No.(s): DE2002-792819; UCRL-JC-139905; No Copyright; Avail: Department of Energy Information Bridge

Tailoring a quality management system to the specific needs of an organization is difficult to say the least. The existence of quality system models and standards help facilitate this process immensely. However, what does an organization do when its work is so unique that quality system models and standards do not exist for it. This and other obstacles are what the Nonproliferation, Arms Control, and International Security (NAI) Directorate at Lawrence Livermore National Laboratory (LLNL) encountered during strategic initiatives to develop and integrate a new quality management system.
NTIS
Research And Development; Nuclear Weapons

20030052102 Lawrence Livermore National Lab., Livermore, CA
State of the Stockpile
Aug. 2001; In English
Report No.(s): DE2002-791652; No Copyright; Avail: National Technical Information Service (NTIS)

Lawrence Livermore National Laboratory is operated by the University of California for the Department of Energy. At Livermore, we focus science and technology on assuring our nation's security. We also apply that expertise to solve other important national problems in energy, bioscience, and the environment. Science and Technology Review is published 10 times a year to communicate, to a broad audience, the Laboratory's scientific and technological accomplishments in fulfilling its primary missions. The publication's goal is to help readers understand these accomplishments and appreciate their value to the individual citizen, the nation, and the world. Research Highlights Contents: National Security Is Our Unifying Theme; Annual Certification Takes a Snapshot of Stockpile's Health; Sensing for Danger; It's the Pits in the Weapons Stockpile; Looking into the Shadow World.

NTIS
Stockpiling; Security; Health; Hazards; Certification

20030052188 Lawrence Livermore National Lab., Livermore, CA
R&D in the Superblock
Mar. 2001; In English
Report No.(s): DE2002-791647; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Safety and Security Are Enhanced by Understanding Plutonium; Inside the Superblock; Exploring the Fundamental Limits of Simulations; Plutonium Up Close...Way Close, and Shocked and Stressed, Metals Get Stronger.

NTIS
Research And Development; Technology Utilization; Nuclear Power Plants; Radioactive Wastes

20030052194 Lawrence Livermore National Lab., Livermore, CA
Supercomputing Takes Another Giant Step
Jun. 2000; In English
Report No.(s): DE2002-791642; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Accelerating on the ASCI Challenge; New Day Dawns in Supercomputing; Uncovering the Secrets of Actinides; A Predictable Structure for Aerogels, and Tibet--Where Continents Collide.

NTIS
Supercomputers; Technology Assessment; Science

20030052201 Institute for Human Factors TNO, Soesterberg, Netherlands
Crew Reduction and Design of an Efficient Organisation for Dutch Mine Countermeasure Vessels
Willeboordse, E. J.; Punte, P. A. J.; October 15, 2002; 33 pp.; In Dutch
Contract(s)/Grant(s): 013.21415; TNO Proj. 791.1
Report No.(s): TM-02-A047; TD- 2002-0121; Copyright; Avail: Other Sources

At the request of the Royal Netherlands Navy (RNN), TNO Human Factors has participated in a project to investigate possibilities for a more efficient organisation and a reduction of crew for Dutch mine countermeasure vessels (the Alkmaarklasse Mijnenbestrijdingsvaartuigen, AMBV). The purpose of cooperation was to let TNO Human Factors supply the RNN with Human Factors knowledge on task allocation and job design. The work took place at the office for Platform Management, Department of Naval Architecture and Marine Engineering. During sessions with the RNN project team we composed, by means of table-top-analyses, proposals for crew reduction. Consequently we designed new jobs and composed new crew lists after which we assessed the crew list from the perspective of ergonomics. The investigation for crew reduction resulted in different crew lists for different scenarios. We composed a method for job design and job assessment, containing criteria for ergonomic job design. These criteria can be divided into efficaciousness, safety, and job satisfaction. Our participation in this team supplied us with systematics for the design of crew lists for Navy operational systems based on the actual practice. We presented our proposal for crew reduction to the Royal Netherlands Navy. In the future, we will use our experience in developing computer-based tools to support the design process.

Author
Human Factors Engineering; Armed Forces (Foreign); Navy; Ships; Crews; Personnel Management

20030052202 Lawrence Livermore National Lab., Livermore, CA
Getting the Big Computational Picture
Oct. 2000; In English
Report No.(s): DE2002-791644; No Copyright; Avail: National Technical Information Service (NTIS)
Contents includes: Visualization Tools Take on Supercomputing Challenges Commentary by David Cooper; and A New World of Seeing See and understand is the mantra of the scientists and engineers who are building new visualization tools to better interpret supercomputer data. Research highlights include: The Many Faces of Carbon Dioxide; Award-Winning System Assays Radioactive Waste with Radiation; and Nanoscale Chemistry Yields Better Explosives
NTIS
Research Management; Radioactive Wastes; Computer Programming

20030052203 Lawrence Livermore National Lab., Livermore, CA
Remembering Roger Batzel 1922-2000
Feb. 2000; In English
Report No.(s): DE2002-791646; No Copyright; Avail: National Technical Information Service (NTIS)
Lawrence Livermore National Laboratory is operated by the University of California for the Department of Energy. At Livermore, we focus science and technology on assuring our nation's security. We also apply that expertise to solve other important national problems in energy, bioscience, and the environment. Science & Technology Review is published 10 times a year to communicate, to a broad audience, the Laboratory's scientific and technological accomplishments in fulfilling its primary missions. The publication's goal is to help readers understand these accomplishments and appreciate their value to the individual citizen, the nation, and the world. Contents: Roger Batzel-A Leader and a Gentleman; A Career of Distinguished Achievement; From Dosimetry to Genomics; Swords into Plowshares and Beyond; Adapting to a Changing Weapons Program.
NTIS
Research And Development; Research Management; Technology Assessment

20030052205 Lawrence Livermore National Lab., Livermore, CA
Simulations Push the Boundaries of Bioscience
Apr. 2001; In English
Report No.(s): DE2002-791648; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Computer Modeling Advance Bioscience; A New Kind of Biological Research; The World's Most Accurate Lathe; Leading the Attack on Cancer, and Electronic Memory Goes High Rise.
NTIS
Research Management; Laboratories

20030052206 Lawrence Livermore National Lab., Livermore, CA
Carbon Conversion: A Source of Clean Electricity
Jun. 2001; In English
Report No.(s): DE2002-791650; No Copyright; Avail: National Technical Information Service (NTIS)
Lawrence Livermore National Laboratory is operated by the University of California for the Department of Energy. At Livermore, we focus science and technology on assuring our nation's security. We also apply that expertise to solve other important national problems in energy, bioscience, and the environment. Science & Technology Review is published 10 times a year to communicate, to a broad audience, the Laboratory's scientific and technological accomplishments in fulfilling its primary missions. The publication's goal is to help readers understand these accomplishments and appreciate their value to the individual citizen, the nation, and the world. Research Highlights Contents: Addressing the Energy-Environment Challenge; Turning Carbon Directly into Electricity; Environmental Research in California and Beyond; This Nitrogen Molecule Really Packs Heat; Peregrine Goes to Work.
NTIS
Technologies; Electricity; Carbon

20030052207 Lawrence Livermore National Lab., Livermore, CA
Award-Winning Science and Technology 2001 R & D 100 Awards
Sep. 2001; In English
Report No.(s): DE2002-791653; No Copyright; Avail: National Technical Information Service (NTIS)

Lawrence Livermore National Laboratory is operated by the University of California for the Department of Energy. At Livermore, we focus science and technology on assuring our nation's security. We also apply that expertise to solve other important national problems in energy, bioscience, and the environment. Science and Technology Review is published 10 times a year to communicate, to a broad audience, the Laboratory's scientific and technological accomplishments in fulfilling its primary missions. The publication's goal is to help readers understand these accomplishments and appreciate their value to the individual citizen, the nation, and the world. Research Highlights Contents: Technology Transfer Takes a Team; Zeroing In on Genes; Big Glass for a Big Laser; Lasershot Makes Its Mark; R&D 100 Award HighlightsFeature Tracking the Global Spread of Advanced Technologies.
NTIS
Technology Transfer; Glass Lasers; Technologies

20030052269 Swedish Defence Research Agency, Stockholm. Div. of Defence Analysis
Technology Innovative Systems for the FoRMA Project
Stenstrom, M.; Jan. 2002; 42 pp.; In Swedish
Report No.(s): PB2003-102115; FOI-R-0375-SE; No Copyright; Avail: CASI; A03, Hardcopy

One of the results from the FoRMA-study 2000 was an overview of technological trends. The present study is a continuation on that theme. The study had two main aims: to develop technology innovative concepts and to explore the need perspective. In the report the concept 'Pater Noster' is presented, an infrastructure for unmanned terrain domination. The concept is based upon miniaturized UAVs, which are used in swarms instead of soldiers. The need perspective has been investigated through interviews. An instrument for generating ideas around the need for innovative systems is proposed. The report includes also an overview of electricity sources for soldiers, sensors, UAVs and UGVs. A system for strategic air transport, Sky Cat, is presented.
NTIS
Technology Utilization; Air Transportation; General Overviews; Systems Engineering

20030052271 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Constellation X-Ray Mission and Support
Grady, Jean, Technical Monitor; Tananbaum, H.; November 2002; 12 pp.; In English
Contract(s)/Grant(s): NCC5-368; No Copyright; Avail: CASI; A03, Hardcopy

This Fourth Annual Report summarizes work performed by the Smithsonian Astrophysical Observatory (SAO) for NASA Goddard Space Flight Center (GSFC) under Cooperative Agreement NCC5-368. The Agreement is entitled Constellation X-ray Mission Study and SAO continues to perform work under the overall direction of Dr. Harvey Tananbaum, the SAO Principal Investigator for the program. Mr. Robert Rasche is the SAO Program Manager and is responsible for day-to-day program management at SAO and coordination with GSFC. The report summarizes the main areas of SAO activity. Most of the work has been done jointly with personnel from GSFC and Marshall Space Flight Center (MSFC). We describe SAO participation in these efforts. As is appropriate to a Cooperative Agreement, SAO continued to work with GSFC in an integrated team mode. SAO was involved in the overall mission management, technology development, scientific direction, and mission definition. While formal overall management responsibility resides with GSFC, scientific lead and subordinate responsibilities continue to be shared by GSFC and SAO. The work performed by SAO is consistent with the SAO proposal 'Constellation X-ray Mission Study and Optics Development' dated September 1997, which was the basis for establishing the Cooperative Agreement under which SAO is currently funded. Over time, the scope of the effort has expanded somewhat to accommodate the needs of the project. Work, except for meeting support and high priority program tasks, has been at a level of effort. Priorities and work progress have been closely coordinated with the Constellation-X Project Formulation Manager at GSFC. Funding limitations constrained the work accomplished during this period. Nonetheless, a significant amount of work was accomplished. Under the Agreement, SAO performed work in seven major areas of activity. These areas related to: Constellation X-ray Mission Facility Definition Team and Study Management; Science Support; Spectroscopy X-ray Telescope (SXT); Systems Engineering; Travel in Support of the Work Effort; In-house Management and Coordination.
Author
X Ray Telescopes; Project Management; Mission Planning

20030052300 Environmental Protection Agency, Washington, DC
Office of Water Quality Management Plan
Jul. 2002; 78 pp.
Report No.(s): PB2003-103626; EPA/821/X-02/001; No Copyright; Avail: CASI; A05, Hardcopy

This document is the quality management plan for the entire EPA Office of Water. It describes the quality system used by the Office of Water and applies to all environmental programs within the Office of Water and to any activity within those programs that involves the collection or use of environmental data. This quality management plan supersedes the one approved by the Office of Water in 1995. It incorporates many of the long-established procedures used to successfully manage quality in the Office of Water and provides a practical approach to meeting the expanded goals of the EPA agency-wide quality system in the 21st century. A major goal of this plan is to provide a description of the quality system that is of value to the users in the Office of Water.
NTIS
Management Planning; Water Quality

82
DOCUMENTATION AND INFORMATION SCIENCE

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

20030039000 Lawrence Livermore National Lab., Livermore, CA
FY02 CBNP Annual Report Input: Bioinformactics Support for CBNP Research and Deployments
Slezak, T.; Oct. 31, 2002; In English
Report No.(s): DE2002-15002105; UCRL-ID-150580; No Copyright; Avail: National Technical Information Service (NTIS)
The events of FY01 dynamically reprogrammed the objectives of the CBNP bioinformatics support team, to meet rapidly-changing Homeland Defense needs and requests from other agencies for assistance: Use computational techniques to determine potential unique DNA signature candidates for microbial and viral pathogens of interest to CBNP researcher and to our collaborating partner agencies such as the Centers for Disease Control and Prevention (CDC), U.S. Department of Agriculture (USDA), Department of Defense (DOD), and Food and Drug Administration (FDA); Develop effective electronic screening measures for DNA signatures to reduce the cost and time of wet-bench screening; Build a comprehensive system for tracking the development and testing of DNA signatures; Build a chain-of-custody sample tracking system for field deployment of the DNA signatures as part of the BASIS project and Provide computational tools for use by CBNP Biological Foundations researchers.
NTIS
Deoxyribonucleic Acid; Genetics; Pathogens; Detection; Computer Systems Programs

20030045809 National Inst. of Standards and Technology, Gaithersburg, MD
Concepts for Automating Systems Integration
Barkmeyer, E. J.; Freeney, A. B.; Denno, P.; Flater, D. W.; Libes, D. E.; Feb. 2003; 94 pp.
Report No.(s): PB2003-102296; NISTIR-6928; No Copyright; Avail: CASI; A05, Hardcopy
Over the last 25 years we have been able to automate the capture and delivery of product engineering decisions to an ever increasing extent, and in the last 15 years, we have begun to be able to automate some of the engineering activities themselves. In a similar way, we have been able to automate the capture and delivery of software engineering decisions for over 20 years, and we have automated the software engineering activities themselves. With this in mind, researchers at the National Institute of Standards and Technology (NIST) have undertaken a project-Automated Methods for Integrating Systems (AMIS)-to investigate whether we now have the technology to automate some of the manufacturing software integration processes. The objectives of the project are; to identify integration activities that may benefit from automation; to identify methods and technologies that may be brought to bear on automation of those activities; to characterize a set of common manufacturing integration problems that may be wholly or partly solved by automated means; to compare the cost of the automation with the cost of the point solutions, that is, to determine whether engineering for automated integration is easier, better, and/or more feasible than ad hoc engineering of the integrated system themselves.
NTIS
Systems Integration; Software Engineering; Computer Aided Manufacturing; Management Systems

20030051399 Pacific Northwest National Lab., Richland, WA
Federal Emergency Management Information System (FEMIS) Data Administration Guide for FEMIS V1.4.6
Jun. 25, 1999; 208 pp.; In English
Report No.(s): DE2002-15001484; No Copyright; Avail: Department of Energy Information Bridge

This FEMIS Data Management Guide provides the information needed to manage the data used to support the administrative, user-environment, database management, and operational capabilities of FEMIS.
NTIS
Data Base Management Systems; Emergencies; Chemical Warfare; Computer Networks

20030051400 Pacific Northwest National Lab., Richland, WA
Federal Emergency Management Information System (FERMIS) Bill of Materials (BOM) for FEMIS Version 1.4.7
Mar. 03, 2000; 30 pp.; In English
Report No.(s): DE2002-15001496; No Copyright; Avail: Department of Energy Information Bridge
This document describes the hardware and software required for the Federal Emergency Management Information System version 1.4.7 (FEMIS v1.4.7). FEMIS is designed for a single Chemical Stockpile Emergency Preparedness Program (CSEPP) site that has multiple Emergency Operations Centers (EOCs). Each EOC has personal computers (PCs) that emergency planners and operations personnel use to do their jobs. These PCs are connected via a local area network (LAN) to servers that provide EOC-wide services. Each EOC is interconnected to other EOCs via a wide area network (WAN). A UNIX server provides a platform to support the Oracle relational database management system (RDBMS), ARC/INFO geographic information system (GIS) capabilities (optional), basic file management services, the evacuation model (ESIM), the data exchange interface (DEI), and the notification service. FEMIS v1. 4.7 can also be operated on an isolated PC workstation and is then referred to as 'stand-alone' FEMIS.
NTIS
Emergencies; Management Information Systems; Geographic Information Systems; Relational Data Bases; Computer Programs

20030051476 National Inst. for Aviation Research, Wichita, KS
Survey of Aviation Maintenance Technical Manuals Phase 3 Report: Final Report and Recommendations
Chaparro, A.; Groff, L. S.; Dec. 2002; 24 pp.; In English
Report No.(s): PB2003-102191; No Copyright; Avail: CASI; A03, Hardcopy
This report contains the results from the final phase of a three-phase research effort. Phase 1 of this research effort surveyed the procedures used by five aircraft manufacturers to develop maintenance manuals. The issues included the reactive rather than proactive use of user evaluations, the limited use of user input and procedure validation, no systematic attempts to track errors, and the lack of standards for measuring document quality. In Phase 2, a written survey was used to solicit information about user perception of errors in current manuals, manual usage rates, and general manual quality. On-site interviews of technicians were also conducted to gather feedback about the types of problems encountered with manuals, the associated impact, and suggestions for improving manuals.
NTIS
Aircraft Maintenance; Documentation; Technical Writing; Manuals

20030051609 Connecticut Dept. of Transportation, Rocky Hill. Div. of Research
Development of a GIS-Based Rights of Way Outdoor Advertising Sign Information System
Overturf, B. J.; Dec. 2002; 22 pp.; In English
Report No.(s): PB2003-103318; RR-1136-F-02-8; No Copyright; Avail: CASI; A03, Hardcopy
Due to the increased workload and new requirements being legislated to manage and maintain data on billboard advertising, ConnDOT staff sought to develop an effective means to address these needs using a concept provided by ConnDOT's photolog group. Research was conducted to define data acquisition and management needs. Field photolog vans were outfitted with side-facing image and data acquisition systems, coupled with GPS data and complimentary digital images via hand-held cameras. A database was developed to collect, maintain and provide instantaneous access to billboard advertising data and information. The system has been implemented and shown to have a cost benefit ratio of 1. 94 over a ten-year period of use.
NTIS
Commercialization; Geographic Information Systems; Global Positioning System

20030052027 Lawrence Livermore National Lab., Livermore, CA
Future Vision of Nuclear Material Information Systems
Wimple, C.; Suski, N.; Kreek, S.; Buckley, W.; Romine, B.; Sep. 17, 1999; 12 pp.; In English
Report No.(s): DE2002-791446; UCRL-JC-134874-R1; No Copyright; Avail: Department of Energy Information Bridge

Modern nuclear materials accounting and safeguards measurement systems are becoming increasingly advanced as they embrace emerging technologies. However, many facilities still rely on human intervention to update materials accounting records. The demand for nuclear materials safeguards information continues to increase while general industry and government downsizing has resulted in less availability of quality staff. Under the auspices of the Department of Energy (DOE), LLNL is providing assistance in the development of standards for minimum raw data file contents, methodology for comparing shipper-receiver values and generation of total propagated measurement uncertainties, as well as the implementation of modern information technology to improve reliability of an accessibility to nuclear materials information.
NTIS
Information Systems; Test Facilities; Technology Utilization; Nuclear Research

20030052090 Physics and Electronics Lab. TNO, The Hague, Netherlands
Unmanned Aerial Vehicles (UAVs)
Visser, B. J.; Cambien, K. P. H.; vanderHorst, R. M.; January 2003; 40 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/679; TNO Proj. 015.31088
Report No.(s): FEL-02-A097; TD02-0206; Copyright; Avail: Other Sources

This report is one of a series of publications, which provide an overview of recent developments in the field of Unmanned Aerial Vehicles (UAVs). The information provided is based on open sources, such as periodicals and research reports. The time period covered by this report is August 2001 through December 2001.
Author
Pilotless Aircraft; Documents

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20030045815 Louisiana State Univ., Baton Rouge. National Ports and Waterways Inst
High Speed Ferries and Coastwise Vessels: Evaluation of Parameters and Markets for Application
Jun. 2000; 108 pp.
Report No.(s): PB2003-102695; No Copyright; Avail: CASI; A06, Hardcopy

This report presents the findings of Phase II of the study 'High Speed Ferries and Coastwise Vessels: Evaluation of Parameters and Markets for Application.' The goal of the study was to define a commercially viable coastal shipping system that could relieve congestion on land-based transport arteries and at the same time can be utilized for defense related mobilizations. This report addresses the following tasks: Assessment of cargo potentials, including cargo flows served by land-based and marine transport modes; Review of available and mature designs of vessels and port systems; Analysis of several operating systems, including performance and cost (required freight rates); Assessment of military application.
NTIS
Cargo Ships; Military Operations; Marine Transportation; Commerce

20030051550 Research Triangle Inst., Research Triangle Park, NC
Economic Analysis for Air Pollution Regulations: Asphalt Roofing and Processing
Heller, K. B.; Yang, J. C.; Depro, B. M.; Feb. 2003; 104 pp.; In English
Report No.(s): PB2003-103060; No Copyright; Avail: CASI; A06, Hardcopy

The Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS) is developing a National Emission Standard for Hazardous Air Pollutants (NESHAP) under Section 112 of the Clean Air Act (CAA) Amendments of 1990 to limit air emissions from the production and processing of asphalt roofing products. This document analyzes the economic impacts of the final rule on the asphalt industry and its customers. EPA has identified 123 facilities owned by 34 companies that may be subject to the standards because they produce asphalt roofing products. In addition, nine refineries owned by seven companies may be subject to the rule because they produce and sell blown asphalt. The identified facilities produce one or more of five asphalt roofing products: blown asphalt, fiberglass shingles, organic shingles, roll roofing (including asphalt felts), and modified bitumen roofing.
NTIS
Economic Analysis; Air Pollution; Regulations; Roofs; Emission

20030051582 General Accounting Office, Washington, DC

Tactical Aircraft: DOD Needs to Better Inform Congress about Implications of Continuing F/A-22 Cost Growth

Feb. 2003; 38 pp.

Report No.(s): PB2003-103405; GAO-03-280; No Copyright; Avail: CASI; A03, Hardcopy

In 1991, the Air Force began developing the F/A-22 aircraft with advanced features to make it less detectable to adversaries and capable of high speeds for long distances. After a history of program cost increases, Congress limited the cost of F/A-22 production to $37.5 billion in 1997. Congress has remained interested in the potential cost of production. As requested, we (1) identified the latest production cost estimate and assessed the planned offsets from cost reduction plans, (2) identified areas where additional cost growth is likely to occur, and (3) determined the extent that DOD has informed Congress about production costs.

NTIS

F-22 Aircraft; Cost Reduction; Production Costs

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20030038797 Lawrence Livermore National Lab., Livermore, CA

Whither Deterrence. A Brief Synopsis

Poppe, C.; Vergino, E.; Barker, B.; Brown, P.; Gilmartin, T. J.; May 29, 2002; 20 pp.

Report No.(s): DE2002-15002153; UCRL-ID-148557; No Copyright; Avail: Department of Energy Information Bridge

To most audiences, deterrence has been interconnected with nuclear weapons whose purpose had been to deter a Soviet attack. But, the Soviet Union has been gone for almost a decade. President George W. Bush has stated that Russia is not an enemy of the USA and the numbers of nuclear weapons can be dramatically reduced. It is important to note that deterrence has always transcended nuclear weapons. The USA first line of deterrence has been its formidable conventional warfare capability, designed to prevent conflict and win wars if necessary. The role of nuclear weapons has been to deter the use of nuclear weapons and other weapons of mass destruction against U.S. interests during the conduct of conventional warfare and to ensure our ability to inflict massive destruction on any who would use nuclear weapons, or other weapons of mass destruction, against us. With regard to the Soviet Union, the threat of the use of nuclear weapons was a critical component of our deterrent to prevent massive Soviet conventional attack against our allies in Europe.

NTIS

Nuclear Weapons; Military Operations; Strategy

20030038803 Lawrence Livermore National Lab., Livermore, CA

WSSX-A Joint U.S.-Russian Nuclear Counter-Terrorism Exchange

Crites, T. R.; Sep. 25, 2002; 12 pp.

Report No.(s): DE2002-15002158; UCRL-JC-149057; No Copyright; Avail: Department of Energy Information Bridge

In 1994, the U. S. and Russian Federation governments formally agreed to exchange information on the safety and security of nuclear weapons. This agreement included three major elements, called Technical Working Groups (TWGs). TWG C deals with counter-terrorism. Its four assigned actions and U.S./Russian experience are reviewed in this paper. Although active exchange programs were created under TWGs A and B, involving workshops and laboratory-to-laboratory development projects, little work was initiated in TWG C, due to the sensitive nature of this information. After 9/11, however, it became clear that much could be gained by having each country share information to help solve the problem of nuclear proliferation among terrorist groups. Government-to-government meetings have reaffirmed the initial agreement to exchange information on this topic, and a number of joint project proposals are now under discussion. The Joint Steering Committee that oversees this exchange has approved approximately 20 projects. They include such topics as terrorist threat scenario development, detection of nuclear material and explosives in transportation containers, analysis of material mass and configuration, and consequence mitigation. It is expected that the joint development of these capabilities will enhance our ability to respond to a nuclear threat and to facilitate mutual assistance, should either party experience a nuclear terrorist event.

NTIS

United States; Russian Federation; International Cooperation; Terrorism; Nuclear Weapons

20030051469 Air Force Academy, CO
USA Military Space Into the Twenty-First Century
Hays, P. L.; Sep. 2002; 204 pp.
Report No.(s): PB2003-102183; No Copyright; Avail: CASI; A10, Hardcopy

Partial Contents: What is Spacepower and Does it Constitute a Revolution in Military Affairs; Space-Related Arms Control and Regulation to 2015: Precedents and Prospects (The ABMT Regime and Space-Based Defenses; Recent Space-Related Arms Control Developments; Spectrum Crowding, Orbital Debris, and Space Traffic Control).
NTIS
Space Weapons; Military Operations; Military Spacecraft

20030051533 General Accounting Office, Washington, DC
Weapons of Mass Destruction: Additional Russian Cooperation Needed to Facilitate U.S. Efforts to Improve Security at Russian Sites
Mar. 2003; 106 pp.
Report No.(s): PB2003-103679; GAO-03-482; No Copyright; Avail: CASI; A06, Hardcopy

The Russian Federation has the world's largest stockpiles of weapons-usable nuclear material, nuclear warheads, dangerous biological pathogens, and chemical weapons. Poorly secured weapons and material at sites throughout Russia may provide terrorists and countries of concern with access to weapons of mass destruction. To address this threat to U.S. national security, the Departments of Defense (DOD) and Energy (DOE) have obligated $1.8 billion since 1992 to help improve security at sites where Russia stores weapons of mass destruction and weapons-usable nuclear material.
NTIS
Biological Weapons; Nuclear Warheads; Russian Federation

20030051542 General Accounting Office, Washington, DC
Overseas Presence: Rightsizing Framework Can Be Applied at U.S. Diplomatic Posts in Developing Countries
Apr. 2003; 40 pp.
Report No.(s): PB2003-103674; GAO-03-396; No Copyright; Avail: CASI; A03, Hardcopy

Since the mid-1990s, GAO has highlighted the need for the Department of State and other agencies to establish a systematic process for determining their overseas staffing levels. To support this long-standing need and in support of the President's Management Agenda, GAO developed a framework for assessing overseas workforce size and identified options for rightsizing. Because the framework was largely based on work at the U.S. embassy in Paris, GAO was asked to determine whether the rightsizing framework is applicable at U.S. embassies in developing countries. To accomplish this objective, we visited three U.S. embassies in West Africa-a medium-sized post in Dakar, Senegal; and two small embassies in Banjul, The Gambia; and Nouakchott, Mauritania-and applied the framework and its corresponding questions there.
NTIS
Developing Nations; Personnel

20030051547 General Accounting Office, Washington, DC
Embassy Construction: Process for Determining Staffing Requirements Needs Improvement
Apr. 2003; 46 pp.
Report No.(s): PB2003-103673; GAO-03-411; No Copyright; Avail: CASI; A03, Hardcopy

The 1998 terrorist attacks on two U.S. embassies in Africa highlighted security deficiencies in diplomatic facilities, leading the Department of State to embark on an estimated $16 billion embassy construction program. The program's key objective is to provide safe, secure, and cost effective buildings for employees overseas. Given that the size and cost of new facilities are directly related to agencies' anticipated staffing needs, it is imperative that future requirements be projected as accurately as possible. GAO was asked to (1) assess whether State and other federal agencies have adopted a disciplined process for determining future staffing requirements and (2) review cost-sharing proposals for agencies with overseas staff.
NTIS
Personnel; Cost Effectiveness; Construction

20030052030 Lawrence Livermore National Lab., Livermore, CA
Three Problems: Nuclear Energy, National Defense and International Cooperation
Teller, E.; Sep. 06, 1999; 14 pp.; In English
Report No.(s): DE2002-791456; UCRL-JC-135608; No Copyright; Avail: Department of Energy Information Bridge

A little more than half a century into the Nuclear Age, we cannot look back on a peaceful period, but we can say that the second (nuclear) half of the century has seen much less violent than the first half with its two violent wars. Also the second half of the century has seen the fortunate ending of the Cold War. But as to the future, we are left with three great questions. (1) How can the world be provided with ample energy. (2) How can we avoid the potentially devastating sudden applications of new destructive technologies. And finally, (3) How can we preserve the development of the world's new potentialities without producing a continuation of violent conflicts.
NTIS
International Cooperation; Nuclear Energy; Defense Program; Warfare

20030052062 Lawrence Livermore National Lab., Livermore, CA
Observations on the CTBT and Nonproliferation
Shotts, W. J.; Jul. 26, 2000; 10 pp.; In English
Report No.(s): DE2002-792820; UCRL-JC-139793; No Copyright; Avail: Department of Energy Information Bridge
The CTBT sits in a broad national security context. The stated purpose of the treaty is to ban nuclear testing and thereby slow nuclear proliferation. However, it also heightens issues of concern for U.S. national security related to stockpile stewardship, worldwide monitoring, and the status of other countries nuclear weapons programs. These issues were recognized during the negotiation of the CTBT and articulated, in August 1995, as the set of safeguards under which the U.S. would be willing to sign a CTBT. Safeguards A, B, C, and F address maintenance of the U.S. nuclear stockpile, Safeguard D addresses improved monitoring capabilities, and Safeguard E addresses the need to be knowledgeable about foreign nuclear programs.
NTIS
Security; Nuclear Weapons

20030052133 National Defence Research Establishment, Stockholm
Annual Report 2001 on International Security
Nylen, T.; Feb. 2002; 28 pp.; In Swedish
Report No.(s): PB2003-103194; FOI-R-0352-SE; No Copyright; Avail: CASI; A03, Hardcopy
This report presents a summary of studies, results and usefulness to the MFA within the FOA research area International Security. The activities have been directed towards support to disarmament negotiations, export controls and verification within the N, B and C areas. Nuclear weapons: FOA continues to prepare a national data center (NDC). This includes seismic detection, collection of xenon gas, and filtering of radionuclides. Support has been given to CTBT and the coming FMCT treaties and other disarmaments limitations. Support has also been given directly to CTBT. Biological weapons: support has been given to the negotiations on a verification protocol to the biological and toxin weapons convention, the Australia Group and export control issues. Chemical weapons: support has been given to the Australia Group and export control issues. In addition, the verification laboratory has continued under the convention on chemical weapons. Other support: FOI has carried out a review of the international development in missile technology.
NTIS
Security; International Cooperation

20030052184 Lawrence Livermore National Lab., Livermore, CA
Contingency Planning for Feedstock Splits Between the Immobilization and MOX Disposition Routes to Fissile Materials Disposition
Gray, L. W.; Edmunds, T. A.; Feb. 11, 2000; In English
Report No.(s): DE2002-791450; UCRL-JC-135536; No Copyright; Avail: National Technical Information Service (NTIS)
In 1997, DOE issued a ROD endorsing a dual-track approach for dispositioning excess Pu so that it achieved the spent-fuel standard. This assumed 35.6 tonnes of weapons-grade Pu, 7.4 tones of nonweapons- grade Pu plus 7 tonnes of weapons-grade Pu from future retirements would make up the feed stock. The Center for Strategic and International Studies Senior Policy Panel on the Safe, Timely, and Effective Disposition of Surplus U. S. and Russian Weapons-Grade Plutonium (CSIS) deemed this direction as well and soundly conceived. The DOEs Materials Disposition Program is presently on track to deploy both disposition routes. In this hybrid approach, MOX fuel irradiation route would be used for pure Pu. Immobilization would be used for mixtures that are less practicable to fabricate into fuel or could be used for the full 50 tonnes. Both routes must overcome their uncertainties and obstacles and come on-stream for the complete disposition of the U. S. excess weapons-useable plutonium. However, because these disposition plants are being designed primarily to accommodate the hybrid, not the dual option, they fall short of the glowing praise heaped upon the Disposition Program by the CSIS.

However, fairly minor changes to the disposition plants would bring them much closer to the glowing praise of the CSIS. A major problem for the program is the constantly changing status of the feed stock. DOE/EM is tossing much greater quantities of Pu to WIPP than had been anticipated and DOE/NE is reserving tonnes of Pu as national assets that had not been anticipated. Due to the loss of tonnes of Pu feed, original assumptions may no longer hold and the feed acceptance criteria may have to be revised. Many groups are now advancing unsolicited contingency plans to carry out the disposition of excess plutonium. Though these unsolicited plans may save money, they all appear to be in conflict with national policy.
NTIS
Spent Fuels; Waste Management; Fissionable Materials

20030052222 Lawrence Livermore National Lab., Livermore, CA
Extended Deterrence, Nuclear Proliferation, and START III
Speed, R. D.; Jun. 20, 2000; 34 pp.; In English
Report No.(s): DE2002-793964; UCRL-ID-139508; No Copyright; Avail: Department of Energy Information Bridge

Early in the Cold War, the USA adopted a policy of 'extended nuclear deterrence' to protect its allies by threatening a nuclear strike against any state that attacks these allies. This threat can (in principle) be used to try to deter an enemy attack using conventional weapons or one using nuclear, chemical, or biological weapons. The credibility of a nuclear threat has long been subject to debate and is dependent on many complex geopolitical factors, not the least of which is the military capabilities of the opposing sides. In the report, several potential regions of conflict where the USA has defense commitments will be examined. In each region, the issue of the credibility of extended deterrence and, in particular, whether the credibility depends on the force levels agreed to in START III is addressed. In addition, the general question of nuclear proliferation by U.S. allies is also briefly examined for each region. Particular emphasis is given to the Asia-Pacific region because of its potential instability and because U.S. allies there could relatively easily develop nuclear weapons.
NTIS
Biological Weapons; Nuclear Weapons

20030052267 National Defence Research Establishment, Stockholm
Annual Report 2001 on NBC-research
Nylen, T.; Andersson, G.; Jan. 2002; 52 pp.; In Swedish
Report No.(s): PB2003-103195; FOI-R-0350-SE; No Copyright; Avail: CASI; A04, Hardcopy

This report summarizes the results from the fiscal year 2001 within FOI research area of NBC-defense. The report gives a survey of the ongoing activities, the extent and directing of the area and the national and international development in the field of NBC-defense. During 2001 FOA has for example: arranged the seventh international symposium on protection against BC warfare agents; studied and analyzed the international development in the NBC-area; performed international research cooperation in the NBC-field; participated in the planning and arrangement of the 'Barents Rescue Live Exercise'; participated in three international interlaboratory calibration studies concerning analysis of biological and chemical warfare agents and two concerning radio analytical analysis of fissile materials and fission products; and participated in an international experiment and arranged a workshop on detection of nobel gases.
NTIS
Chemical Warfare; Biological Weapons; Nuclear Weapons; Military Technology

20030052291 Swedish Defence Research Agency, Stockholm
Annual Report 2001 on FOI's Research on Defence and Security Policy
Mittemaier, E.; Toernqvist, S.; Feb. 2002; 66 pp.; In Swedish
Report No.(s): PB2003-103197; FOI-R-0347-SE; No Copyright; Avail: CASI; A04, Hardcopy

The report presents the projects of the research area; their issues and targets, activities, results and conclusions, dissemination of knowledge, usefulness and effects for the customer, use of international agreements and any continuation of the respective project. The projects are described under the following headings: Security policy studies, Technology, Policy and industry, European crisis management and international operations, Studies of command and control of total defense, and Risk and crisis management in society. The main part of the content of this report is related to the Ministry of Defense appropriation to FOI, but also some separate commissioned projects are described, e.g. from the Ministry of Foreign Affairs.
NTIS
Policies; Security; Defense

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

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.

20030037097 Department of Energy, Washington, DC
Environmental Management Performance Report November 2000
Nov. 09, 2000; 254 pp.; In English
Report No.(s): DE2002-805449; No Copyright; Avail: Department of Energy Information Bridge

The purpose of the Environmental Management Performance Report (EMPR) is to provide the Department of Energy Richland Operations Office's (DOE-RL's) report of Hanford's Environmental Management (EM). This report is a monthly publication that summarizes EM Site performance under RL Operations Office.
NTIS
Waste Management; Spent Fuels; Radioactive Wastes

20030037120 Foersvarets Forskningsanstalt, Stockholm (Sweden)
Air Power - Future Capability in Russia
Loefstedt, H.; Mar. 2002; 112 pp.
Report No.(s): PB2003-101261; FOI-R-0439-SE; No Copyright; Avail: CASI; A06, Hardcopy

There is a rapid evolution in guided weapons. Russia has capability and knowledge to follow and implement that development. There might well be a considerable shift in Russian present capacity to conduct air-to-ground operations if Russia will acquire such weapons. That shift is possible even if Russia must restrict itself to the use of existing aircraft. A condition is that the Russian Air Force will develop normal status in maintenance of equipment and personnel training. Russian air capability will develop into a threat only after a political upheaval. To guard against that, it is necessary to give political and material support for continued democratic evolution. However an armed air defense will be needed as a last resort. The data and considerations behind the conclusions are presented in the second part of the report. The way is described how a great number of performance data are combined to aggregated capability figures. Data from Kosovo and Kuwait-war are used for air to ground weapons. A new method has been developed for air-to-air equipment. A number of sensitivity analyses are carried through because of the uncertainty in data and methods.
NTIS
Military Technology; Precision Guided Projectiles; Air To Surface Missiles; Armed Forces (Foreign); Russian Federation

20030037183 Westinghouse Savannah River Co., Aiken, SC
SME Acceptability Determination For DWPF Process Control (U)
Aug. 30, 2002; 74 pp.; In English
Report No.(s): DE2002-805889; WSRC-TR-95-000364-REV-4; No Copyright; Avail: Department of Energy Information Bridge

This document has supported the technical basis for the Defense Waste Processing Facility (DWPF) of the Savannah River Site (SRS) since the DWPF began radioactive operation in 1996. The facility blends High Level Waste (HLW) with glass frit and vitrifies the resulting mix into a stable, borosilicate wasteform. While doing so, it must satisfy, with appropriate confidence, several product and process constraints. These include constraints on: the process melt (i.e., melt viscosity and liquidus temperature) to assure that the material is processable and the quality of the resulting wasteform (i.e., durability of the glass product).
NTIS
Statistics; Process Control (Industry); Waste Treatment; Borosilicate Glass

20030038883 Fluor Hanford, Richland, WA
Accelerated Closure of the Hanford Site
2002; 12 pp.; In English
Report No.(s): DE2002-804757; No Copyright; Avail: Department of Energy Information Bridge

Cleanup of the Hanford Site is currently planned to take until 2046 and another approximately $50B. In the summer of 1999, Fluor Hanford initiated an 'Accelerated Closure Team' to evaluate opportunities to reduce this long schedule and high cost for the parts of the Hanford Site which they manage. To date, this breakthrough team has developed two approaches which

will move more than 50 million curies away from the Columbia River sooner than planned and at a significantly reduced cost. The approaches successfully applied so far are presently being applied to other opportunities at Hanford.
NTIS
Radioactive Wastes; Facilities; Removal; Cleaning

20030045817 Washington State Transportation Center, Seattle, Washington Univ., Seattle. ITS Research Program
Brief Report on 2001 Activities for ITS Backbone Infrastructure
Dailey, D. J.; Mar. 2002; 20 pp.; In English
Report No.(s): PB2003-102780; WA-RD-543.1; No Copyright; Avail: CASI; A03, Hardcopy

The ITS Backbone performs several important tasks for ongoing efforts at the Washington State Department of Transportation and University of Washington. The Backbone (1) supports existing traveler information applications for both traffic and transit information, (2) supports real-time access to WSDOT data for a variety of public and private groups, (3) off-loads the interaction and support of data users external to WSDOT, (4) provides a standard interface so that all roadway data are available equally to outside agencies/groups, (5) supports research activities within WSDOT, research funded by WSDOT at the UW, and research at universities and agencies nationwide, and (6) provides a standard interface to include new data sources into the existing traffic management system.
NTIS
Artificial Intelligence; Information Systems; Traffic; Transportation; Management Systems; Highways

20030051596 Lawrence Livermore National Lab., Livermore, CA
Polymeric Species of Pu in Low Ionic Strength Media
Romanovski, V. V.; Palmer, C. E.; Shaw, H. F.; Bourcier, W. L.; Jardine, L. J.; Jan. 27, 2000; 10 pp.; In English
Report No.(s): DE2002-15002376; UCRL-JC-137330; No Copyright; Avail: Department of Energy Information Bridge

No abstract available
NTIS
Radioactive Wastes; Colloids; Plutonium

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*.

20030052731 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
NASA Education Forum at SAO on the Structure and Evolution of the Universe
Rosendhal, Jeffrey, Technical Monitor; Gould, Roy R.; April 2003; 8 pp.; In English
Contract(s)/Grant(s): NCC5-261; No Copyright; Avail: CASI; A02, Hardcopy

NASA's Structure and Evolution of the Universe (SEU) science theme offers an unparalleled opportunity to capture the public's imagination and inspire the next generation of scientific explorers-the generation that will determine America's lead in science and technology in the 21st century. The missions and research programs of SEU science are transporting the public to some of the universe's most exotic destinations: the beginning of time, the edge of space at the entrance to a black hole, and the great cycles of matter and energy that have slowly brought life to the universe. NASA's Office of Space Science (OSS) has put in place an Education and Public Outreach (EPO) initiative designed to do just that. Spanning all of NASA's OSS science themes, the initiative is a far-reaching partnership with the education community. As a result, NASA space science now reaches every avenue of education-from the nation's schools, science museums and planetariums, to libraries, community groups and after-school programs. As a partner in this enterprise, the,SEU Forum has successfully brought SEU science to a large and diverse audience. But this is an ongoing process, and much still needs to be done. Working with our colleagues in the OSS Support Network, and with our partners in the space science and education communities, we look forward to ensuring that the public supports and participates in the great explorations of the SEU theme. Working with the SEU missions and members of the OSS Support Network, the Forum will harness the assets of the SEU science community to: Inform, inspire, and involve the public in the explorations of the SEU science theme. Use the unique resources of the SEU science theme to

enhance K-14 science, technology, and mathematics education. Identify and develop high-leverage opportunities for the SEU science community to contribute to education and outreach.
Derived from text
NASA Programs; Education; Large-Scale Structure Of The Universe; Cosmology

89
ASTRONOMY

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

20030038995 Lawrence Livermore National Lab., Livermore, CA
Improved Optical Design for the Large Synoptic Survey Telescope (LSST)
Seppala, L. G.; Sep. 24, 2002; 14 pp.; In English
Report No.(s): DE2002-15002241; UCRL-JC-149639; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Telescopes; Optical Materials

20030052084 Lawrence Livermore National Lab., Livermore, CA
Exposure History of Shergottites Dar Al Gani 476/489/670/735 and Sayh Al Uhaymir 005
Nishiizumi, K.; Caffee, M. W.; Jull, A. J. T.; Klandrud, S. E.; Apr. 01, 2001; 8 pp.; In English
Report No.(s): DE2002-803430; UCRL-JC-145404; No Copyright; Avail: Department of Energy Information Bridge
Four basaltic shergottites, Dar al Gani (DaG) 476, 489, 670, and 735 were found in the Libyan Sahara; two basaltic shergottites, Sayh al Uhaymir (SaU) 005 and 008 were found in Oman. Recently SaU 051 was also recognized as a possible pair of SaU 005/008. Although the collection sites were different, the texture, bulk chemical compositions, and noble gas compositions of these shergottites are similar. However, cosmic-ray-produced noble gases alone cannot unambiguously constrain the irradiation history for these objects. From a combination of cosmogenic stable- and radionuclides, exposure histories, and ejection conditions from the hypothesized Martian parent body, and genetic relationships between the Martian meteorites can be determined. In addition to those nuclides produced by galactic cosmic rays (GCR) are those produced by solar cosmic rays (SCR).
NTIS
Basalt; Shergottites; Snc Meteorites; Solar Cosmic Rays; Exposure

20030052122 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
String Cosmology and Chaos
Damour, T.; Apr. 2002; 30 pp.
Report No.(s): PB2003-102084; IHES/P/02/22; No Copyright; Avail: CASI; A03, Hardcopy
A striking prediction of string theory is that its 'gravitational sector' is richer than that of General Relativity: it contains several a priori massless fields in addition to the Einstein graviton. The authors consider that these fields represent an interesting prediction whose possible existence should be taken seriously, and whose observable consequences should be carefully studied. Of course, tests of General Relativity put severe constraints on such fields, and notably on the dilation.
NTIS
String Theory; Chaos; Cosmology; Relativity

20030052232 Fermi National Accelerator Lab., Batavia, IL, Chicago Univ., Chicago, IL
Sloan Digital Sky Survey Observing Time Tracking and Efficiency Measurement
Neilsen, E. H.; Kron, R. G.; Boroski, W. N.; Oct. 2002; 14 pp.; In English
Report No.(s): DE2002-803082; FERMILAB-CONF-02/168-A; No Copyright; Avail: Department of Energy Information Bridge
Accurate and consistent time tracking is essential for evaluating the efficiency of survey observing operations and identifying areas that need improvement. Off the shelf time tracking software, which requires users to enter activities by hand, proved tedious to use and insufficiently exible. In this paper, we present an alternate time tracking system developed specifically for Sloan Digital Sky Survey observing. This system uses an existing logging system, murmur, to log the

beginning and ending times of tracked circumstances, including activities, weather, and problems which effect observing. Operations software automatically generates most entries for routine observing activities; in a night of routine observing, time tracking requires little or no attention from the observing staff. A graphical user interface allows observers to make entries marking time lost to weather and equipment, and to correct inaccurate entries made by the observing software. The last is necessary when the change in activity is not marked by a change in the state of the software or instruments, or when the time is used for engineering or other observing not part of routine survey data collection. A second utility generates reports of time usage from these logs. These reports include totals for the time spent for each observing task, time lost to weather and problems, efficiency statistics for comparison with the survey baseline, and a detailed listing of what activities and problems were present in any covered time period.
NTIS
Sky Surveys (Astronomy); Time Measurement; Tracking (Position)

20030052253 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
Circular Orbits of Corotating Binary Black Holes: Comparison between Analytical and Numerical Results
Damour, T.; Gourgoulhon, E.; Grandclement, P.; Apr. 2002; 26 pp.
Report No.(s): PB2003-102085; IHES/P/02/10; No Copyright; Avail: CASI; A03, Hardcopy

The authors compare recent numerical results, obtained within a 'helical Killing vector' (HKV) approach, on circular orbits of corotating binary black holes to the analytical predictions made by the effective one body (EOB) method (which has been recently extended to the case of spinning bodies).
NTIS
Black Holes (Astronomy); Circular Orbits

90
ASTROPHYSICS

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

20030037176 Lawrence Livermore National Lab., Livermore, CA
BRIGHT Lights, BIG City: Massive Galaxies, Giant Ly-A Nebulae, and Proto-Clusters
van Breugel, W.; Reuland, M.; de Vries, W.; Stanford, A.; Dey, A.; Sep. 30, 2002; In English
Report No.(s): DE2002-15002113; UCRL-JC-149640; No Copyright; Avail: National Technical Information Service (NTIS)

High redshift radio galaxies are great cosmological tools for pinpointing the most massive objects in the early Universe: massive forming galaxies, active super-massive black holes and proto-clusters. We report on deep narrow-band imaging and spectroscopic observations of several radio galaxy fields to investigate the nature of giant Ly-a nebulae centered on the galaxies and to search for over-dense regions around them. We discuss the possible implications for our understanding of the formation and evolution of massive galaxies and galaxy clusters.
NTIS
Galaxies; Nebulae; Star Clusters

20030038794 Lawrence Livermore National Lab., Livermore, CA
Portent of Heine's Reciprocal Square Root Identity
Cohl, H. S.; Oct. 12, 2002; 12 pp.
Report No.(s): DE2002-15002149; UCRL-JC-150467; No Copyright; Avail: Department of Energy Information Bridge

Precise efforts in theoretical astrophysics are needed to fully understand the mechanisms that govern the structure, stability, dynamics, formation, and evolution of differentially rotating stars. Direct computation of the physical attributes of a star can be facilitated by the use of highly compact azimuthal and separation angle Fourier formulations of the Green's functions for the linear partial differential equations of mathematical physics.
NTIS
Star Formation; Boundary Value Problems

20030038846 Lawrence Livermore National Lab., Livermore, CA
Radio AGN Surveys
De Breuck, C.; van Breugel, W.; Rottgering, H.; Carilli, C.; Nov. 13, 2001; 12 pp.
Report No.(s): DE2002-802845; UCRL-JC-148807; No Copyright; Avail: Department of Energy Information Bridge
We present a short overview of radio surveys for AGN, including the 'complete' flux limited surveys and 'filtered' surveys. We also describe our ultra-steep spectrum search for the highest redshift radio galaxies, and our follow-up VLA and ATCA observations of the most distant (z = 5.19) and the most luminous z less than 2 radio galaxy known.
NTIS
Radio Galaxies; Radio Sources (Astronomy); Red Shift

20030039006 Lawrence Livermore National Lab., Livermore, CA
Super-LOTIS/LOTIS/LITE: Prompt GRB Followup Experiments
Park, H. S.; Ables, E.; Barthelmy, S.; Bradshaw, M.; Cline, T.; Jun. 25, 2001; 10 pp.
Report No.(s): DE2002-15002110; UCRL-JC-145249; No Copyright; Avail: Department of Energy Information Bridge
LOTIS (Livermore Optical Transient Imaging System) and Super-LOTIS are automatic telescope systems that measure very prompt optical emission occurring within seconds of the gamma-ray energy release during a Gamma Ray Burst (GRB). This paper describes performance of these systems. We also present our plan to replace the current optical CCD camera on the Super-LOTIS to a near infrared camera to be able to probe dusty GRB environment.
NTIS
Gamma Ray Bursts; Telescopes

20030045704 Lawrence Livermore National Lab., Livermore, CA
Large Space Telescopes using Fresnel Lens for Power Beaming, Astronomy and Sail Missions
Early, J. T.; Oct. 15, 2002; 16 pp.; In English
Report No.(s): DE2002-15002266; UCRL-JC-150797; No Copyright; Avail: Department of Energy Information Bridge
The concept of using Fresnel optics as part of power beaming, astronomy or sail systems has been suggested by several authors. The primary issues for large Fresnel optics are the difficulties in fabricating these structures and deploying them in space and for astronomy missions the extremely narrow frequency range of these optics. In proposals where the telescope is used to transmit narrow frequency laser power, the narrow bandwidth has not been an issue. In applications where the optic is to be used as part of a telescope, only around 10(sub 5) to 10(sub 6) of the optical energy band can be focused into an image. The limited frequency response of a Fresnel optic is addressed by the use of a corrective optic that will broaden the frequency response of the telescope by three or four orders of magnitude. This broadening will dramatically increase the optical power capabilities of the system and will allow some spectroscopy studies over a limited range. Both the fabrication of Fresnel optics as large as five meters and the use of corrector optics for telescopes have been demonstrated at LLNL. For solar and laser sail missions the use of Fresnel amplitude zone plates made of very thin sail material is also discussed.
NTIS
Telescopes; Fresnel Lenses; Power Beaming

20030045777 Lawrence Livermore National Lab., Livermore, CA
Solar Opacities
Rozsnyai, B. F.; Oct. 04, 2000; 20 pp.; In English
Report No.(s): DE2002-792816; UCRL-JC-140161; No Copyright; Avail: Department of Energy Information Bridge
Solar opacities are presented from the center of the sun to the photosphere. The temperatures, densities and hydrogen mass fractions are taken from the standard solar model. For the heavy element abundances the Grevesse mixture is used. In the solar interior photoabsorption is dominated by free-free absorption and we compare two sets of opacities based on two different models for the inverse bremsstrahlung. The radiative luminosities calculated from the two sets of opacities are compared with those predicted by previous models of the standard solar model and also with the known luminosity of the sun. Pressures, specific heats and the speed of sound in the solar plasma are also presented.
NTIS
Opacity; Sun; Solar Atmosphere; Mathematical Models

20030051402 New Mexico Univ., Los Alamos, NM, USA
Extraterrestrial Studies Using Nuclear Interactions
Reedy, Robert C.; May 1, 2003; 5 pp.; In English
Contract(s)/Grant(s): NAG5-11764; No Copyright; Avail: CASI; A01, Hardcopy

Cosmogenic nuclides were used to study the recent histories of the aubrite Norton County and the pallasite Brenham using calculated production rates. Calculations were done of the rates for making cosmogenic noble-gas isotopes in the Jovian satellite Europa by the interactions of galactic cosmic rays and especially trapped Jovian protons. Cross sections for the production of cosmogenic nuclides were reported and plans made to measure additional cross sections. A new code, MCNPX, was used to numerically simulate the interactions of cosmic rays with matter and the subsequent production of cosmogenic nuclides. A review was written about studies of extraterrestrial matter using cosmogenic radionuclides. Several other projects were done. Results are reviewed here with references to my recent publications for details.
Author
Extraterrestrial Matter; Nuclear Interactions; Nuclides; Stony-Iron Meteorites; Cosmochemistry; Radioactive Isotopes

20030051488 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Exploration of the Characteristics of the Time Variable Component of the Coronal Heating Process
Wagner, William, Technical Monitor; Habbal, Shadia R.; May 2003; 3 pp.; In English
Contract(s)/Grant(s): NAG5-6211; No Copyright; Avail: CASI; A01, Hardcopy

By coordinating coronal SOHO observations in white light, ultraviolet, extreme ultraviolet, with radio occultation measurements, and complementing these with modeling, two break-throughs were achieved from this funding: (1) The discovery that minor ions are accelerated much faster than protons in the fast solar wind, and (2) that the imprint of coronal density structures is carried outwards from the Sun into the solar wind. Three refereed papers and one invited review, published in the proceedings of the conference, resulted from this funding. A summary of each is given.
Author
Soho Mission; Solar Corona; Radio Occultation; Astrophysics; Sun

20030051520 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Evolution of Pre-Main Sequence Accretion Disks
Hartmann, Lee W.; April 2003; 7 pp.; In English
Contract(s)/Grant(s): NAG5-9670; No Copyright; Avail: CASI; A02, Hardcopy

The aim of this project is to develop a comprehensive global picture of the physical conditions in, and evolutionary timescales of, pre-main sequence accretion disks. The results of this work will help constrain the initial conditions for planet formation. To this end we are developing much larger samples of 3-10 Myr-old stars to provide better empirical constraints on protoplanetary disk evolution; measuring disk accretion rates in these systems; and constructing detailed model disk structures consistent with observations to infer physical conditions such as grain growth in protoplanetary disks.
Derived from text
Accretion Disks; Planetary Evolution; Pre-Main Sequence Stars; Protoplanetary Disks

20030051535 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Luminous Binary Supersoft X-Ray Sources
Oliversen, Ronald J., Technical Monitor; DiStefano, Rosanne; April 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10705; No Copyright; Avail: CASI; A01, Hardcopy

We have made remarkable progress in the study of luminous supersoft X-ray sources during the past year. We have begun to discover a population of ultraluminous SSSs (e.g., in NGC 300 [Kong & Di Stefano 20031 as well as in Ml0l [Di Stefano & Kong 2003]), which may be accreting intermediate-mass (50-100 solar mass) black holes. This work follows from an algorithm we have developed (Di Stefano & Kong 2003) to identify SSSs in external galaxies, selecting them from among each galaxy s total population of X-ray sources. We have applied the algorithm to approximately one dozen galaxies and will make it public after it has been published in its entirety. Through our own application of the algorithm, we have discovered SSSs in every galaxy, mapping their spatial distribution, to obtain important clues to their fundamental natures. We have discovered that there is a large population of X-ray sources which are slightly hotter (100-250 eV) than standard SSSs. Some of these may be accreting BHs with masses between roughly 50 anf 100 solar masses. To explore this possibility, we are working on theoretical models for the formation and evolution of such systems (Di Stefano 2003).
Derived from text
Luminosity; X Ray Sources; Binary Stars; Astrophysics; Black Holes (Astronomy)

20030051562 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Probing the Reverse Shock in an Oxygen-Rich Supernova Remnant
Sonneborn, George, Technical Monitor; Gaetz, Terrance J.; May 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-12295; No Copyright; Avail: CASI; A01, Hardcopy

The aim of this proposal was to examine the O VI emission at three positions around the X-ray bright ring of the remnant in order to investigate the relation between the O VI emission, the X-ray O VII and O VIII emission, and the optical [O III] emission, and how these vary around the rim of the remnant. So far, only one Far Ultraviolet Spectroscopic Explorer (FUSE) pointing at the remnant has been performed, together with the background pointing needed to subtract the diffuse scattered light from nearby O stars. The data were recalibrated using the CalFUSE calibration pipeline, but the emission is faint enough that hand processing will be needed for this pointing to optimize the extraction. Rereduction of the data is underway. A postdoctoral fellow has also been hired, and in part she will assist with the analysis.
Author
Supernova Remnants; Oxygen; Emission; X Ray Astronomy

20030052033 Lawrence Livermore National Lab., Livermore, CA
Laboratory Astrophysics using a Spare XRS Microcalorimeter
Porter, F. S.; Audley, M. D.; Beiersdorfer, P.; Boyce, K. R.; Brekosky, R. P.; Aug. 07, 2000; 18 pp.; In English
Report No.(s): DE2002-791519; UCRL-JC-138656; No Copyright; Avail: Department of Energy Information Bridge

The XRS instrument on Astro-E is a fully self-contained microcalorimeter x-ray instrument capable of acquiring, optimally filtering, and characterizing events for 32 independent pixels. We have recently integrated a full engineering model XRS detector system into a laboratory cryostat for use on the electron beam ion trap (EBIT) at Lawrence Livermore National Laboratory.
NTIS
Spacecraft Instruments; Calorimeters; X Ray Detectors

20030052037 Massachusetts Inst. of Tech., Cambridge, MA, USA
Formation and Evolution of Binary Systems Containing Collapsed Stars
Rappaport, Saul; West, Donald, Technical Monitor; May 05, 2003; 4 pp.; In English
Contract(s)/Grant(s): NAG5-8368; No Copyright; Avail: CASI; A01, Hardcopy

This research includes theoretical studies of the formation and evolution of five types of interacting binary systems. Our main focus has been on developing a number of comprehensive population synthesis codes to study the following types of binary systems: (i) cataclysmic variables (#3, #8, #12, #15), (ii) low- and intermediate-mass X-ray binaries (#13, #20, #21), (iii) high-mass X-ray binaries (#14, #17, #22), (iv) recycled binary millisecond pulsars in globular clusters (#5, #10, #ll), and (v) planetary nebulae which form in interacting binaries (#6, #9). The numbers in parentheses refer to papers published or in preparation that are listed in this paper. These codes take a new unified approach to population synthesis studies. The first step involves a Monte Carlo selection of the primordial binaries, including the constituent masses, and orbital separations and eccentricities. Next, a variety of analytic methods are used to evolve the primary star to the point where either a dynamical episode of mass transfer to the secondary occurs (the common envelope phase), or the system evolves down an alternate path. If the residual core of the primary is greater than 2.5 solar mass, it will evolve to Fe core collapse and the production of a neutron star and a supernova explosion. In the case of systems involving neutron stars, a kick velocity is chosen randomly from an appropriate distribution and added to the orbital dynamics which determine the state of the binary system after the supernova explosion. In the third step, all binaries which commence stable mass transfer from the donor star (the original secondary in the binary system) to the compact object, are followed with a detailed binary evolution code. Finally, we include all the relevant dynamics of the binary system. For example, in the case of LMXBs, the binary system, with its recoil velocity from the supernova explosion, is followed in time through its path in the Galactic potential. For our globular cluster study, detailed three-body calculations are used to follow the interactions of the binary with passing field stars.
Derived from text
X Ray Binaries; Astrophysics; Stellar Evolution; Star Formation; Binary Stars; Gravitational Collapse

20030052068 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Wilkinson Microwave Anisotropy Probe (WMAP) First Year Observations: TE Polarization
Kogut, A.; Spergel, D. N.; Barnes, C.; Bennett, C. L.; Halpern, M.; Hinshaw, G.; Jarosik, N.; Limon, M.; Meyer, S. S.; Page, L.; Oegerle, William, Technical Monitor; [2001]; 14 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

The Wilkinson Microwave Anisotropy Probe (WMAP) has mapped the full sky in Stokes I, Q, and U parameters at frequencies 23, 33, 41, 61, and 94 GHz. We detect correlations between the temperature and polarization maps significant at more than 10 standard deviations. The correlations are inconsistent with instrument noise and are significantly larger than the upper limits established for potential systematic errors. The correlations are present in all WAMP frequency bands with similar

amplitude from 23 to 94 GHz, and are consistent with a superposition of a CMB signal with a weak foreground. The fitted CMB component is robust against different data combinations and fitting techniques. On small angular scales (theta less than 5 deg), the WMAP data show the temperature-polarization correlation expected from adiabatic perturbations in the temperature power spectrum. The data for l greater than 20 agree well with the signal predicted solely from the temperature power spectra, with no additional free parameters. We detect excess power on large angular scales (theta greater than 10 deg) compared to predictions based on the temperature power spectra alone. The excess power is well described by reionization at redshift 11 is less than z(sub r) is less than 30 at 95\% confidence, depending on the ionization history. A model-independent fit to reionization optical depth yields results consistent with the best-fit ACDM model, with best fit value t = 0.17 +/- 0.04 at 68\% confidence, including systematic and foreground uncertainties. This value is larger than expected given the detection of a Gunn-Peterson trough in the absorption spectra of distant quasars, and implies that the universe has a complex ionization history: WMAP has detected the signal from an early epoch of reionization.
Author
Microwave Anisotropy Probe; Polarization (Waves); Temperature Dependence; Microwaves; Sky Surveys (Astronomy); Mapping

20030052087 Lawrence Livermore National Lab., Livermore, CA
Model for Short Gamma-Ray Bursts: Heated Neutron Stars in Close Binary Systems
Salmonson, J. D.; Wilson, J. R.; Dec. 17, 2001; 10 pp.; In English
Report No.(s): DE2002-803170; UCRL-JC-146997; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
NTIS
Gamma Rays; Neutron Stars

20030052091 Lawrence Livermore National Lab., Livermore, CA
Complex Exposure History of the Gold Basin L4-Chondrite Shower From Cosmogenic Radionuclides and Noble Gases
Welten, K. C.; Nishiizumi, K.; Caffee, M. W.; Masarik, J.; Wieler, R.; Apr. 30, 2001; 8 pp.; In English
Report No.(s): DE2002-803427; UCRL-JC-145406; No Copyright; Avail: Department of Energy Information Bridge
Gold Basin is a large L4 chondrite shower, that was recently discovered in the Mojave Desert, Arizona. Based on (10)Be and (14)C concentrations in several fragments, the pre-atmospheric radius of this shower was estimated to be 3-4 meters. Among chondrites, Gold Basin is one of the largest, thus providing a unique opportunity for comparing measured cosmogenic nuclide concentrations with model calculations for large objects. Noble gas measurements combined with (10)Be data of most Gold Basin samples suggest a single-stage exposure of 15-30 Myr, although a few samples may require a complex exposure history. We selected eight samples of the Gold Basin shower that were analyzed for noble gases; these samples represent a wide range of shielding depths.
NTIS
Rare Gases; Radioactive Isotopes; Meteorites

20030052092 Lawrence Livermore National Lab., Livermore, CA
Exposure Histories of Lunar Meteorites Northwest Africa 032 and Dhofar 081
Nishiizumi, K.; Caffee, M. W.; Apr. 01, 2001; 8 pp.; In English
Report No.(s): DE2002-803429; UCRL-JC-145405; No Copyright; Avail: Department of Energy Information Bridge
Recent additions to the list of lunar meteorites include Northwest Africa (NWA) 032 and Dhofar 081. NWA 032 is an unbrecciated basalt, found in Morocco; Dhofar 081 is a fragmented feldspathic breccia, found in Oman. The goal is the determination of the cosmic ray exposure history of these objects. Most lunar meteorites have complex cosmic ray exposure histories, having been exposed both at some depth on the lunar surface before their ejection and as small bodies in space during transport from the moon to the earth. These exposures were then followed by residence on the earth's surface, the terrestrial residence time.
NTIS
Meteorites; Lunar Surface; Exposure

20030052098 Fermi National Accelerator Lab., Batavia, IL
Dark Matter and Dark Energy: The Critical Questions
Turner, M. S.; Nov. 2002; 14 pp.; In English
Report No.(s): DE2003-804699; FERMILAB-CONF-02/283-A; No Copyright; Avail: Department of Energy Information Bridge

Stars account for only about 0.5\% of the content of the Universe; the bulk of the Universe is optically dark. The dark side of the Universe is comprised of: at least 0.1\% light neutrinos; 3:5\% plus or minus 1\% baryons; 29\% plus or minus 4\% cold dark matter; and 66\% plus or minus 6\% dark energy. Now that we have characterized the dark side of the Universe, the challenge is to understand it. The critical questions are: (1) What form do the dark baryons take; (2) What is (are) the constituent(s) of the cold dark matter; (3) What is the nature of the mysterious dark energy that is causing the Universe to speed up.
NTIS
Extraterrestrial Matter; Dark Matter; Astrophysics; Universe

20030052211 Lawrence Livermore National Lab., Livermore, CA
X-Ray Photoionized Plasmas in the Laboratory
Heeter, R. F.; Foord, M. E.; Thoe, R. S.; Emig, J. A.; Springer, P. T.; Apr. 22, 2000; In English
Report No.(s): DE2002-792813; UCRL-JC-137493; No Copyright; Avail: National Technical Information Service (NTIS)
This paper presents the basic approach and first results of laboratory experiments developed to help resolve one of the important physics challenges arising in X-ray astronomy, and outlines the foreseeable progress which is expected in this area in the coming year. A large fraction of astrophysical X-ray sources are accretion-powered objects where an intense core X-ray source illuminates and photoionizes the surrounding gas. The Chandra and XMM observatories are capable of obtaining spectroscopic data with much higher resolution than previously possible in X-ray astronomy.
NTIS
X Ray Sources; Plasmas (Physics)

20030052223 Chicago Univ., IL
Cosmic Perspective from Lapland in 2001
Turner, M. S.; Dec. 2002; 24 pp.; In English
Report No.(s): DE2002-805422; No Copyright; Avail: Department of Energy Information Bridge
A convergence of ideas, observations and technology have led to the greatest period of cosmological discovery yet. Over the past three years we have determined the basic features of our Universe. We are now challenged to make sense of what we have found. The outcome of planned experiments and observations as well as new ideas will be required. If we succeed, ours truly will be a Golden Age of Cosmology.
NTIS
Cosmology; Quantum Mechanics; Astrophysics

20030052733 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Low-Metallicity Galaxy, I Zw 18 (Z=1/50 Z(circle dot))
Heap, Sara R.; [2003]; 1 pp.; In English; The First Stars II Conference, 29-31 May 2003, State College, PA, USA; No Copyright; Avail: Other Sources; Abstract Only
Both observations and evolutionary models indicate that rotation becomes a more important factor at lower metallicities. Some important effects of rotation include: increasing the rate of mass-loss; lowering the effective gravity; altering the evolutionary track on the Hertzsprung-Russell Diagram (HRD); extending the main-sequence phase (both on the HR diagram and in time); and mixing of CNO-processed elements up to the stellar surface. We discuss these effects for massive stars in the low-metallicity galaxy, I Zw 18 (Z=1/50 Z(circle dot)) and their implications for the first stars.
Author
Metallicity; Galaxies; Rotation; Massive Stars

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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*.

20030039172 Lawrence Livermore National Lab., Livermore, CA
Practical High-Order Adaptive Optics Systems for Extrasolar Planet Searches
Macintosh, B.; Oliver, S.; Bauman, B.; Brase, J.; Carr, E.; Aug. 29, 2001; 16 pp.; In English
Report No.(s): DE2002-15002227; UCRL-JC-145248; No Copyright; Avail: Department of Energy Information Bridge

Direct detection of photons emitted or reflected by an extrasolar planet is an extremely difficult but extremely exciting application of adaptive optics. Typical contrast levels for an extrasolar planet would be 109 - Jupiter is a billion times fainter than the sun. Current adaptive optics systems can only achieve contrast levels of 106, but so-called 'extreme' adaptive optics systems with 104 -105 degrees of freedom could potentially detect extrasolar planets. We explore the scaling laws defining the performance of these systems, first set out by Angel (1994), and derive a different definition an optimal system. Our sensitivity predictions are somewhat more pessimistic than the original paper, due largely to slow decorrelation timescales for some noise sources, though choosing to site an ExAO system at a location with exceptional to (e.g. Mauna Kea) can offset this. We also explore the effects of segment aberrations in a Keck-like telescope on ExAO; althougb the effects are significant, they can be mitigated through Lyot coronagraphy.
NTIS
Adaptive Optics; Noise Reduction; Extrasolar Planets

20030052051 Lawrence Livermore National Lab., Livermore, CA
Design of a Novel Survey for Small Objects in the Solar System
Alcock, C.; Cook, K.; Marshall, S.; Akerlof, C.; Chen, W. P.; Aug. 21, 2000; 16 pp.; In English
Report No.(s): DE2002-793926; UCRL-ID-140150; No Copyright; Avail: Department of Energy Information Bridge

We evaluated several concepts for a new survey for small objects in the Solar System. We designed a highly novel survey for comets in the outer region of the Solar System, which exploits the occultations of relatively bright stars to infer the presence of otherwise extremely faint objects. The populations and distributions of these objects are not known; the uncertainties span orders of magnitude. These objects are important scientifically as probes of the primordial solar system, and programmatically now that major investments may be made in the possible mitigation of the hazard of asteroid or comet collisions with the Earth.
NTIS
Solar System; Near Earth Objects; Astrophysics; Telescopes

20030052189 Fermi National Accelerator Lab., Batavia, IL, Johns Hopkins Univ., Baltimore, MD
Sloan Digital Sky Survey Photometric Telescope Automation and Observing Software
Neilsen, E. H.; Uomoto, A.; Kent, S.; Annis, J.; Oct. 2002; 16 pp.; In English
Report No.(s): DE2002-803081; FERMILAB-CONF-02/167-A; No Copyright; Avail: Department of Energy Information Bridge

The photometric telescope (PT) provides observations necessary for the photometric calibration of the Sloan Digital Sky Survey (SDSS). Because the attention of the observing staff is occupied by the operation of the 2.5 meter telescope which takes the survey data proper, the PT must reliably take data with little supervision. In this paper we describe the PT's observing program, MOP, which automates most tasks necessary for observing. MOP's automated target selection is closely modeled on the actions a human observer might take, and is built upon a user interface that can be (and has been) used for manual operation. This results in an interface that makes it easy for an observer to track the activities of the automating procedures and intervene with minimum disturbance when necessary. MOP selects targets from the same list of standard star and calibration fields presented to the user, and chooses standard star fields covering ranges of airmass, color, and time necessary to monitor atmospheric extinction and produce a photometric solution. The software determines when additional standard star fields are unnecessary, and selects survey calibration fields according to availability and priority. Other automated features of MOP, such as maintaining the focus and keeping a night log, are also built around still functional manual interfaces, allowing the observer to be as active in observing as desired; MOP's automated features may be used as tools for manual observing, ignored entirely, or allowed to run the telescope with minimal supervision when taking routine data.
NTIS
Photometry; Telescopes; Calibrating; Observation

20030052213 Fermi National Accelerator Lab., Batavia, IL, Washington Univ., Seattle, Princeton Univ. Observatory, NJ, Johns Hopkins Univ., Baltimore, MD
Extreme BAL Quasars from the Sloan Digital Sky Survey
Hall, P. B.; Gunn, J. E.; Knapp, G. R.; Narayanan, V. K.; Strauss, M. A.; Oct. 2002; 10 pp.; In English
Report No.(s): DE2002-802890; FERMILAB-CONF-01/407-A; No Copyright; Avail: Department of Energy Information Bridge

The Sloan Digital Sky Survey has discovered a population of broad absorption line quasars with various extreme

properties. Many show absorption from metastable states of Fe II with varying excitations; several objects are almost completely absorbed bluewards of Mg II; at least one shows stronger absorption from Fe III than Fe II, indicating temperatures T greater than 35000 K in the absorbing region; and one object even seems to have broad H(beta) absorption. Many of these extreme BALs are also heavily reddened, though 'normal' BALs (particularly LoBALs) from SDSS also show evidence for internal reddening.
NTIS
Quasars; Sky Surveys (Astronomy); Nuclei (Nuclear Physics); Interstellar Extinction

20030052261 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Seeing Red: Mars Mania and the Real Mars
Rubincam, Dave; [2002]; 30 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents a general overview of the descriptions of Mars during the 19th century compared to observations of Mars made in the 21st century.
CASI
Mars (Planet); Planetary Evolution; Mars Exploration; Extraterrestrial Life

20030052280 Michigan Univ., Ann Arbor, MI, USA
Studies of Solar Wind Interaction and Ionospheric Processes at Venus and Mars
Bogan, Denis, Technical Monitor; Nagy, Andrew F.; May 14, 2003; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8946
Report No.(s): UM-F002579/039577; No Copyright; Avail: CASI; A03, Hardcopy

This is the final report summarizing the work done during the last three years under NASA Grant NAG5-8946. Our efforts centered on a systematic development of a new generation of three dimensional magneto-hydrodynamic (MHD) numerical code, which models the interaction processes of the solar wind or fast flowing magnetospheric plasma with 'non-magnetic' solar system bodies (e.g. Venus, Mars, Europa, Titan). We have also worked on a number of different, more specific and discrete studies, as various opportunities arose. In the next few pages we briefly summarize these efforts.
Derived from text
Solar Wind; Magnetohydrodynamics; Models; Planetary Ionospheres; Venus Atmosphere; Mars Atmosphere; Solar Planetary Interactions

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