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Langley Research Center

Scientific and Technical Information Program Office

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NASA STI Program ... in Profile

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Subject Term Index

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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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*.

20050071533 NASA Dryden Flight Research Center, Edwards, CA, USA

The NASA Dryden Flight Test Approach to an Aerial Refueling System

Hansen, Jennifer L.; Murray, James E.; Campos, Norma V.; February 2005; 30 pp.; In English; AIAA Atmospheric Flight Mechanics Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains color illustrations

Contract(s)/Grant(s): WU 710-61-14-SE

Report No.(s): NASA/TM-2005-212859; H-2577; No Copyright; Avail: CASI; A03, Hardcopy

The integration of uninhabited aerial vehicles (UAVs) into controlled airspace has generated a new era of autonomous technologies and challenges. Autonomous aerial refueling would enable UAVs to travel further distances and loiter for extended periods over time-critical targets. The NASA Dryden Flight Research Center recently has completed a flight research project directed at developing a dynamic hose and drogue system model to support the development of an automated aerial refueling system. A systematic dynamic model of the hose and drogue system would include the effects of various influences on the system, such as flight condition, hose and drogue type, tanker type and weight, receiver type, and tanker and receiver maneuvering. Using two NASA F/A-18 aircraft and a conventional hose and drogue aerial refueling store from the Navy, NASA has obtained flight research data that document the response of the hose and drogue system to these effects. Preliminary results, salient trends, and important lessons are presented

Author

Air to Air Refueling; Dynamic Models; Autonomy

20050071558 Hughes Technical Center, Atlantic City International Airport, NJ, USA

Commuter Aircraft Video Landing Parameter Surveys, Summary Report: London City Airport, Philadelphia International Airport, and Atlantic City International Airport

DeFiore, T.; Jones, T.; Micklos, R.; Dec. 2004; In English

Report No.(s): PB2005-102503; No Copyright; Avail: National Technical Information Service (NTIS)

The Federal Aviation Administration (FAA) William J. Hughes Technical Center is conducting a series of video landing parameter surveys at high-activity commercial airports. The intent of this research is to develop a better understanding of typical landing contact conditions for a wide variety of aircraft. This information is used to assess the validity of current aircraft certification criteria. This report documents survey results for commuter aircraft. This report documents the commuter results from surveys conducted at London City Airport (LCY), Philadelphia International Airport (PHL), and Atlantic City International Airport (ACY). The LCY survey was performed in the summer of 1997 and the PHL survey in the summer of 1999. Additional data collected at the FAA ACY facility is also included in this report. Previous survey reports, focused on mainline jet operation, were issued for surveys conducted at John F. Kennedy International Airport (JFK) in June 1994, at Washington National Airport (DCA) in June 1995, and at Honolulu International Airport (HNL) in April 1996. Landing parameters presented herein include sink rate; approach speed; touchdown pitch, roll, and yaw angles and rates; off-center distance; and the touchdown distance from runway threshold. Wind and weather conditions were also recorded. All the data were processed and presented without regard to the airline or flight number. The results from this survey and the prior landing parameter surveys at JFK, DCA, and HNL differ substantially from aircraft survey results reported 35 years ago during the

National Aeronautics and Space Administration (NASA) surveys. No other efforts to collect operational landing data were performed by either the FAA or NASA in the interim.
NTIS
Airports; Commuter Aircraft; Video Communication; Aircraft Landing

20050071561 National Aerospace Lab., Tokyo
National Aerospace Laboratory: Transition Analysis of Boundary Layer in Supersonic Flow Using Complex Ray Theory
Atobe, T.; 2003; 20 pp.; In Japanese
Report No.(s): PB2005-101936; Copyright; Avail: National Technical Information Service (NTIS)

Transition analysis of boundary layers in supersonic flow using complex ray theory was numerically verified. A sharp cone at Mach 2 and an experimental airplane of the National EXperimental Supersonic Transport (NEXST) program were examined. Numerical predictions in this paper are based on the e(sup n) method, with compressible Navier-Stokes equations used for stability analyses. The collocation method has been employed for the eigenvalue problem to improve the accuracy of numerical results. Results for the sharp cone show that the complex ray theory is useful for transition analysis in supersonic flow. Furthermore, the results for the experimental airplane show clearly not only the amplitude but also the propagation path of disturbances.
NTIS
Boundary Layer Flow; Numerical Analysis; Supersonic Flow; Boundary Layer Transition

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*.

20050070729 NASA Langley Research Center, Hampton, VA, USA
Management of Vortices Trailing Flapped Wings via Separation Control
Greenblatt, David; [2005]; 22 pp.; In English; 43rd AIAA Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2005, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-064-10-34
Report No.(s): AIAA Paper 2005-0061; No Copyright; Avail: CASI; A03, Hardcopy

A pilot study was conducted on a flapped semi-span model to investigate the concept and viability of near-wake vortex management via separation control. Passive control was achieved by means of a simple fairing and active control was achieved via zero mass-flux blowing slots. Vortex sheet strength, estimated by integrating surface pressure ports, was used to predict vortex characteristics by means of inviscid rollup relations. Furthermore, vortices trailing the flaps were mapped using a seven-hole probe. Separation control was found to have a marked effect on vortex location, strength, tangential velocity, axial velocity and size over a wide range of angles of attack and control conditions. In general, the vortex trends were well predicted by the inviscid rollup relations. Manipulation of the separated flow near the flap edges exerted significant control over both outboard and inboard edge vortices while producing negligible lift excursions. Dynamic separation and attachment control was found to be an effective means for dynamically perturbing the vortex from arbitrarily long wavelengths down to wavelengths less than a typical wingspan. In summary, separation control has the potential for application to time-independent or time-dependent wake alleviation schemes, where the latter can be deployed to minimize adverse effects on ride-quality and dynamic structural loading.
Author
Vortex Alleviation; Active Control; Separated Flow; Wing Tip Vortices; Boundary Layer Separation; Wind Tunnel Tests; Wing Flaps; Dynamic Control; Vortices

20050071632 Federal Aviation Administration, Atlantic City, NJ
Evaluation of In-Pavement Runway Guard Lights
Patterson, J. W.; Dec. 2004; 20 pp.; In English
Report No.(s): PB2005-102507; No Copyright; Avail: CASI; A03, Hardcopy

In-pavement Runway Guard Lights are a series of alternate-flashing yellow, unidirectional in-pavement lighting fixtures

(L-852G) equally spaced along a runway holding position marking that are only visible to aircraft approaching the hold position from the taxiway side of the fixture. In some instances, however, problems have been encountered where pilots have reported the lights visible from the opposite side of the fixtures, i.e., to aircraft exiting the runway. This situation produced false information to the pilots that resulted in operational problems. The purpose of this effort was to determine the extent, cause, and solution for specific operational problems resulting from these runway guard lights installed at hold lines at the Chicago O'Hare International Airport.
NTIS
Runway Lights; Runways; Operational Problems; Airports

20050080267 Maryland Univ., College Park, MD USA
Free to Roll Investigation of Uncommanded Lateral Motions for an Aircraft with Vented Strakes
Bryant, Elaine M.; Owens, D. B.; Barlow, Jewel B.; Jan. 2005; 8 pp.; In English
Report No.(s): AD-A428906; CI04-934; No Copyright; Avail: CASI; A02, Hardcopy

A free-to-roll study of the low-speed lateral characteristics of the pre-production F/A-18E was conducted in the NASA Langley 12-Foot Low-Speed Tunnel. In developmental flight tests the F/A-18E unexpectedly experienced uncommanded lateral motions in the power approach configuration. The objective of this study was to determine the feasibility of using the free-to-roll technique for the detection of uncommanded lateral motions for the pre-production F/A-18E in the power approach configuration. The data revealed that this technique in conjunction with static data revealed insight into the cause of the lateral motions. The free-to-roll technique identified uncommanded lateral motions at the same angle-of-attack range as experienced in flight tests. The cause of the uncommanded lateral motions was unsteady asymmetric wing stall. The paper also shows that free-to-roll data or static force and moment data alone are not enough to accurately capture the potential for an aircraft to experience uncommanded lateral motion.
DTIC
Fighter Aircraft; Flight Tests; Roll; Strakes

20050080317 Defence Science and Technology Organisation, Victoria, Australia
Wind Tunnel Simulations of the Mock Urban Setting Test - Experimental Procedures and Data Analysis
Gailis, Ralph; Jul. 2004; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429005; DSTO-TR-1532; DODA-AR-013-153; No Copyright; Avail: Defense Technical Information Center (DTIC)

The MUST experiment was a large outdoor field study in atmospheric dispersion, attempting to simulate an urban boundary layer by the construction of a regular array of shipping containers. The current report gives details of a wind tunnel dispersion study of the MUST array, aimed at bridging some of the gaps between laboratory and full-scale outdoor trials. The experimental setup and wind tunnel instrumentation are discussed in detail, the measurements made together with the organisation of the dataset if fully described, and a comprehensive description of the data analysis techniques is given. Emphasis is placed on the scaling arguments used to compare data between a wind tunnel and full-scale study, and on methods of uncertainty analysis to provide a rigorous underpinning to the dataset. The report serves as a complete documentation for users of the MUST wind tunnel simulation dataset, which can be obtained by contacting the author.
DTIC
Atmospheric Physics; Field Tests; Wind Tunnel Tests

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*.

20050061287 Airbus Industrie, Blagnac, France
Cockpit Automation Philosophy
Tarnowski, Etienne; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. KN4-1 - KN4-12; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As you know, the civil aviation environment has considerably and rapidly evolved in the past decades. In the 70s, 500 billion passengers per kilometer have been transported; in the 80s, this figure has doubled and in the 90s it has doubled again reaching 2000 billion passengers per kilometer. The cargo demand, in parallel increased at an average rate of 10% per year. This has enlarged the air traffic rate and created severely congested skies. At the same time, many new airlines have been born, lack of pilot has forced operators to employ young cadets, old aircraft have had to co-exist with new technology aircraft. These factors have created new risks in commercial aviation. On the other hand, flight safety criteria became more stringent; efficiency of the flight in all its aspects (fuel cost, maintenance and crew costs, minimum delays, etc), became a primary concern. All those new contradictory objectives could not be met on older generation aircraft. New technology, automated system availability have helped aircraft manufacturers to upgrade the pilot's working environment -the cockpit- so as to provide the crew with the proper means to fulfill his role while keeping up with all these new constraints.
Derived from text
Cockpits; Aircraft Control; Flight Safety

20050061301 National Aerospace Lab., Amsterdam, Netherlands
Evaluating Human Interaction with Advanced Air Traffic Management Automation
Hilburn, Brian G.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 17-1 - 17-12; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The global Air Traffic Management (ATM) system represents one of the most complex human-machine systems known. As the system has evolved in step with traffic demands, automation has been increasingly called upon to augment the capacities of the human operator, namely the air traffic controller. Future generations of ATM automation seek to augment, or even replace, such human faculties as decision making and strategic control. As such, they represent some of the most ambitious attempts at automation conceivable. Against this backdrop, the NLR is actively involved in the development and evaluation of new forms of ATM automation, both in the cockpit and on the ground. This effort centres on: 1) Exploring new concepts for advanced automation, such as adaptive automation, in which a system is capable of dynamically adjusting its level of assistance on the basis of some measured or otherwise inferred need for task assistance; and 2) Refining methods for evaluating human interaction with advanced automation. One of the chief techniques used in this regard has been realtime human-in-the-loop simulations, used in conjunction with objective psychophysiological measures of human performance. This paper summarizes results of two studies conducted by the NLR. The first study examined air traffic controllers attitudes toward possible new forms of automation. In the second study, a series of human-in-the-loop simulations was conducted to evaluate the potential benefits of advanced ATM automation on human-machine system performance. Evaluations relied on a set of objective (including psychophysiological) measures of human performance.
Author
Air Traffic Controllers (Personnel); Automatic Control; Human-Computer Interface; Human Performance

20050071557 Galaxy Scientific Corp., Egg Harbor Township, NJ, USA
Operational Life of Airport Pavements
Garg, N.; Guo, E.; McQueen, R.; Dec. 2004; In English
Report No.(s): PB2005-102502; No Copyright; Avail: National Technical Information Service (NTIS)

The objective of the study was to determine whether the Federal Aviation Administration (FAA) standards used to determine the appropriate thickness for hot mix asphalt and concrete airfield pavements are in accordance with the FAA standard for a 20-year life requirement. FAA airport pavement design standards, Advisory Circular (AC) 150/5320-6D (1995), including changes 1, 2, and 3 (2004), and related references, including some unpublished FAA technical reports and full-scale test results, were reviewed. The effects of many parameters, directly used in the failure model and indirectly used through the pavement response model, on the pavement structural life were analyzed. A sensitivity analysis of parameters on pavement structural life was used to quantitatively evaluate the effects of the most important parameters in different airport pavement design procedures. Some full-scale test results were used to support the findings in the analysis. Much of the airport pavement surveyed data collected from previous FAA projects, including some unpublished ones, was also reviewed. A portion of that data was used in this report for the analysis. Based on the surveyed data, it was found that the average Structural Condition Index of both hot mix asphalt and Portland cement concrete pavements in all age groups is higher than 80. Based on the definition adopted in this report, the airport pavements designed following AC 150/5320-6D have sufficient thickness to provide a 20-year structural life.
NTIS
Airports; Full Scale Tests; Pavements; Service Life

20050071605 Transportoekonomisk Inst., Oslo

2003 Norewegian Air Travel Survey

Denstadli, J. M.; Rideng, A.; Strand, S.; Apr. 2004; In Norwegian

Report No.(s): PB2005-101256; TOI-713/2004; Copyright; Avail: National Technical Information Service (NTIS)

This report gives results from the 2003 Norwegian Air Travel Survey. Information from 110,064 passengers on domestic and international scheduled flights; and international charter flights, were collected and analyzed. Results show that approximately 1.7 million Norwegians made one or more domestic flights in 2003, and some 1.1 million people made at least one journey abroad by air. Leisure travel constitutes almost half (48 percent) of domestic travel, and 56 percent of international scheduled air travel. The corresponding figures in 1998 were 61 and 60 percent respectively. These changes are caused by a strong increase in the number of leisure trips owing to price reductions, and a decrease in the number of business trips.

NTIS

Air Transportation; Travel; Surveys; Norway; Passengers

20050080262 Massachusetts Inst. of Tech., Cambridge, MA USA

Multi-Mission Optimized Re-Planning in Air Mobility Command's Channel Route Execution

Koepke, Corbin G.; Nov. 2004; 145 pp.; In English

Report No.(s): AD-A428079; CI04-896; No Copyright; Avail: CASI; A07, Hardcopy

The USA Air Force's Air Mobility Command is responsible for creating a schedule and executing that schedule for a large-scale air mobility network that encompasses different mission areas. One of the mission areas is channel route. Channel route execution often experiences disruptions that motivate a need for changes in the current channel route schedule. Traditionally, re-planning the channel route schedule has been a manual process that usually stops after the first feasible set of changes is found, due to the challenges of large amounts of data and urgency for a re-plan. Other challenges include subjective trade-offs and a desire for minimal changes to the channel route schedule. We re-plan the channel route schedule using a set of integer programs and heuristics that overcomes these challenges. The integer programs' variables incorporate many of Air Mobility Command's operating constraints, so they do not have to be explicitly included in the formulations. The re-plan uses opportunities in the other mission areas and reroutes channel route aircraft. Finally, our methods can quickly find a solution, allow for 'what-if' analysis and interaction with the user, and can be adapted to an evolution in Air Mobility Command's operations while the underlying models remain constant.

DTIC

Mobility; Routes; Scheduling

20050080311 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Using the Air Force to Conduct Humanitarian Assistance in a Hostile Environment

Pavich, Todd M.; Jun. 2004; 81 pp.; In English

Report No.(s): AD-A428990; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA Air Force (USAF) dedicates aircraft, crews, and ground personnel to deliver humanitarian assistance (HA) when and where it is needed. Occasionally this entails penetrating hostile airspace, and these cases are not unique or obscure. Since 1990, political leaders have tasked the USAF to conduct HA airdrops in Northern Iraq, Bosnia, and Afghanistan. The USAF has a role and is being utilized to assist relief efforts. The exact nature of this role, however, is still undefined in Air Force doctrine. This thesis will determine if the Air Force should be used to conduct the HA mission in a hostile environment. It will focus primarily on airlift assets in a hostile environment and assess USAF abilities using the feasibility, acceptability, and suitability or FAS test. Operations in Bosnia and Kosovo serve as case studies and provide environments where HA could and could not be conducted. The USAF airlift fleet has both a global reach and the ability to operate in austere environments. It is feasible to task these assets to provide conventional relief. Acceptability is based on risk and cost. A political-military plan was developed for each case study to identify interest, objectives, end state, and others. In Bosnia, the risk to U.S. personnel was acceptable, and in Kosovo, it was not. This will always change with environment, technology, and political will. The Mohonk criteria provide guidance on when it is suitable to use the military for HA. In both case studies, the USAF met the established criteria and delivered HA when other agencies could not. Humanitarian airdrops were conducted within Bosnia to stranded civilians. Airlift missions to austere fields were conducted on the periphery of Kosovo for refugees. The USAF has a role in HA operations and doctrine is required to provide operational and tactical guidance.

DTIC

Air Drop Operations

20050080319 Army Command and General Staff Coll., Fort Leavenworth, KS USA

The History of the Airborne Forward Air Controller in Vietnam

Walton, Andrew R.; Jun. 2004; 96 pp.; In English

Report No.(s): AD-A429021; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Department of Defense predicts that ground forces of the future will wage tomorrow's wars by replacing large numbers of personnel and organic firepower with advanced technology and superior maneuverability. Those forces must be prepared to face an unconventional enemy who will operate in small, lethal units interspersed with the civilian population rather than facing coalition forces with massed formations. This scenario of blurred lines of battle and difficulty determining friend from foe resembles very closely what the U.S. military faced in Vietnam. This paper will address the successes and failures of USA airborne forward air controllers (FACs), particularly in Vietnam, and whether combat lessons learned were passed from service to service or historically from conflict to conflict. The FAC mission has not significantly changed since the end of the Vietnam War, and a thorough study of operational and tactical lessons learned by those aircrew will significantly enhance today's FACs ability to find and destroy dispersed enemy forces in a wide array of environments.

DTIC

Alternating Current; Controllers; Flight Crews; Vietnam; Warfare

20050080320 Army Command and General Staff Coll., Fort Leavenworth, KS USA

The Evolution of Fire Support Doctrine Was Driven by Airmobile Doctrine and New Weapon Systems During the Vietnam War

Why, Robert A.; Jun. 2004; 99 pp.; In English

Report No.(s): AD-A429022; No Copyright; Avail: Defense Technical Information Center (DTIC)

After the Korean War, development of the helicopter as a transportation and weapons system capability resulted in new doctrine and subsequent organization of the airmobile division. With this came a requirement for new fire support doctrine. Thus, the central research question was: What role did fire support provide in the execution of airmobile doctrine, along with the new weapons systems onto the battlefields of Vietnam? To understand how fire support doctrine evolved, this thesis addresses three subordinate questions. First, what was the current fire support doctrine prior to the Vietnam War? Second, how fire support doctrine evolved in supporting airmobile combat operations on the Vietnam battlefield? The final effort centered on determining how these changes in fire support doctrine influenced future fire support doctrine. Two realizations were noteworthy. First, fire support doctrine changed very little from the end of World War II to the end of the Korean conflict. Secondly, operational tempo and reach of airmobile operations, coupled with new weapons, significantly influenced changes to fire support doctrine. This thesis demonstrates how fire support doctrine evolved to meet the new challenges of supporting combat operations on a nonlinear and noncontiguous battlefield.

DTIC

Fires; Vietnam; Warfare; Weapon Systems

20050080321 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Trial by Fire: Forging American Close Air Support Doctrine, World War I through September 1944

Wielhouwer, Philip W.; Jun. 2004; 98 pp.; In English

Report No.(s): AD-A429023; No Copyright; Avail: Defense Technical Information Center (DTIC)

Proper doctrine for close support of American ground forces by airpower has been a tumultuous issue since the first days of combat aircraft. Air and ground leaders struggled with interservice rivalry, parochialism, employment paradigms, and technological roadblocks while seeking the optimum balance of missions given the unique speed, range, and flexibility of aircraft. Neither ground force concepts of airpower as self-defense and extended organic artillery, nor air force theories focused on command of the air and strategic attack fit the middle ground of close air support (CAS), leaving a doctrinal void prior to American combat in World War II. This thesis focuses on the critical period from September 1939 through the doctrinal and practical crucible of North Africa, which eventually produced a resoundingly successful system. Theoretical and practical changes in organization and command, airpower roles, and the tactical air control system are examined, with sub-area focus on cooperation and communications technology. Upon examination, discerning leadership, able to transcend earlier compromises and failures, emerges as the essential element for CAS success during the war. While many airpower concepts proved valid, air-ground cooperation through liaison proved indispensable, a lesson repeated even today.

DTIC

Forging; Military Operations; Support Systems

20050080345 Air Univ., Maxwell AFB, AL USA

Air University Library Index to Military Periodicals: Historical Index of Titles 1949-2004

Collins, Amber; Dial, Ron; Simpson, Diana; Jan. 2004; 162 pp.; In English

Report No.(s): AD-A429081; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Air University Library Index to Military Periodicals was created in 1949 to provide access to articles and book reviews in military and aeronautical publications. Until then, the majority of these publications had not been included in any government or commercial index. The original index included twenty-three titles. Currently, eighty periodicals are indexed by librarians at Air University Library and cooperating libraries, and include journals published in both the USA and abroad. The Air University Library Index to Military Periodicals: Historical Index of Titles 1949-2004 offers a comprehensive listing of all the titles covered by the Index since its inception. The dates of coverage are shown for each journal, along with all title changes.

DTIC

Histories; Libraries; Periodicals

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*.

20050070738 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The Network Data of Communication at Real Time for Monitoring of Movement of Jets at Jabotobek and Kepulauan Seribu

Budiyanta, Ari Sugeng; Sadiyatmo, Momon; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 40-45; In Malay-Indonesian; See also 20050070732; Copyright; Avail: Other Sources

Vehicles Monitoring System through radio has been developed into line-of-sight coverage from base station. Vehicle position data are able to be shown real-time on the monitoring system on the operational area map. The line-of-sight radio system has several limits in the signal coverage distance between the object and the base station that a transmission disturbance sometimes occurs. To enlarge the coverage distance while maintaining the real-time function, it requires integrated data communication network. Protocol development as data current control and repeater system addition becomes an alternative in vehicle monitoring system with GPS basis need for a large coverage area. Store and forward mode will be applied in controlling data traffic and will be functioned as digital repeater system. The system still uses one working frequency. Thus, it will increase the data transmission time delay.

Author

Air Traffic; Radio Tracking; Communication Networks

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*.

20050061295 Air Force Research Lab., Wright-Patterson AFB, OH, USA

Differences in Pilot Automation Philosophies in the US and Russian Air Forces Ground Collision Avoidance Systems

Albery, William B.; Khomenko, Mikhail N.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 8-1 - 8-8; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

G-induced loss of consciousness (G-LOC) is a pilot human factors (HF) problem that plagues all air forces that fly high performance fighter aircraft. Spatial disorientation (SD) is an even more serious HF problem that affects not only the military but also commercial aviation. By some estimates, one out of every four aircraft mishaps is due to a HF problem, and the pilot flies a perfectly operating aircraft into the terrain. Altitude warning systems and other voice or buzzer devices in the cockpit have been relatively ineffective at reducing the number of mishaps. In order to stem the tremendous loss of pilots and aircraft because of HF-related mishaps, the US Air Force and Russian Air Force have developed automated collision avoidance

systems. The US Air Force has developed a Ground Collision Avoidance System (GCAS) that is automatic and requires no pilot intervention. The philosophy behind this system is reliability, pilot unobtrusiveness, and invisibility. The Russians have also developed a pilot state monitoring system that is automatic, but includes the pilot in its control loop. The Russian system even includes an onboard video camera that allows ground operators to observe the pilot during the mission. The objective of this paper is to discuss these two automated collision avoidance systems and to distinguish between the roles of the human in both systems.
Author
Automatic Control; Collision Avoidance; Warning Systems; Cockpits

20050061321 Naval Postgraduate School, Monterey, CA USA
Human Systems Integration and Automation Issues in Small Unmanned Aerial Vehicles
McCauley, Michael E.; Matsangas, Panagiotis; Oct. 2004; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A428073; NPS-OR-04-008; No Copyright; Avail: CASI

The goal of this report is to identify Human System Integration (HSI) and automation issues that contribute to improved effectiveness and efficiency in the operation of U.S. military Small Unmanned Aerial Vehicles (SUAVs). HSI issues relevant to SUAV operations are reviewed and observations from field trials are summarized. Short-term improvements are suggested research issues are identified and an overview is provided of automation technologies applicable to future SUAV design.
DTIC
Drone Vehicles; Human Factors Engineering; Pilotless Aircraft; Systems Integration

20050071084 Southampton Univ., UK
A RANS CFD Coupid Model for Predicting Coaxial Jet Noise
Self, R. H.; January 2005; 55 pp.; In English
Report No.(s): ISVR-TR-304; Copyright; Avail: Other Sources

This paper describes an acoustic prediction scheme for the far field noise spectra of coaxial jets that uses a Reynolds Averaged Navier-Stokes CFD (with kappa-epsilon turbulence model) prediction of the coaxial jet turbulent flow as input to an advanced noise model. Previous work by the author and others has demonstrated the applicability of such a method to the prediction of single-stream isothermal jet noise and coaxial jet noise at a far-field observation angle of 900 deg.to the jet axis. The present work improves the theoretical basis of the model and increases the range of applicability by computing the far-field acoustic spectra of a number of isothermal coaxial jet configurations over a range of observation angles. The motivation for developing this methodology comes from the continuing importance of jet noise as a major component of the noise emission from civil turbofan aircraft, and the requirement to find accurate and reliable methods for predicting it.
Derived from text
Computational Fluid Dynamics; Coaxial Flow; Noise Spectra; Jet Aircraft Noise; Mathematical Models

20050071550 Federal Aviation Administration, Washington, DC
THERMOD: An Enhanced Thermal Model for Determining Aircraft Operational Temperatures, User's Manual
Govindarajoo, N.; Dec. 2004; 46 pp.; In English
Report No.(s): PB2005-102505; DOT/FAA/AR-04/52; No Copyright; Avail: CASI; A03, Hardcopy

An enhanced version of a thermal analysis computer program called THERMOD has been developed for determining the maximum operating limit (MOL) temperatures of general aviation aircraft. This report is the second of two reports prepared in conjunction with this project. Enhancements included program debugging and corrections as well as development of an alternate implicit finite difference method, which is used in transient analysis. Numerical validation of THERMOD was undertaken with respect to the finite element methods. Good correlation was found. Experimental validation was also performed. The validated THERMOD can be used to determine the MOL temperatures of a typical aircraft that has a low wing.
NTIS
Operating Temperature; General Aviation Aircraft; Thermal Analysis; User Manuals (Computer Programs)

20050071555 Federal Aviation Administration, Washington, DC
THERMOD: An Enhanced Thermal Model for Determining Aircraft Operational Temperatures
Govindarajoo, N.; Dec. 2004; In English
Report No.(s): PB2005-102504; DOT/FAA/AR-04/51; No Copyright; Avail: National Technical Information Service (NTIS)

An enhanced version of a thermal analysis computer program called THERMOD was developed for determining the

maximum operating limit (MOL) temperatures of general aviation aircraft. The project was undertaken under a Federal Aviation Administration-AGATE sponsorship. This report is the second of two reports prepared in conjunction with this project. Enhancements included program debugging and corrections as well as development of an alternate implicit finite difference method, which is used in transient analysis. Numerical validation of THERMOD was undertaken with respect to the finite element methods. Good correlation was found. The validated THERMOD can be used to determine the MOL temperatures of a typical aircraft that has a low wing configuration.
NTIS
Operating Temperature; Thermal Analysis; General Aviation Aircraft; Computer Programs

20050071559 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Evaluation of Fuel Tank Flammability and the FAA Inerting System on the NASA 747 SCA
Burns, M.; Cavage, W. M.; Morrison, R.; Summer, S.; Dec. 2004; In English
Report No.(s): PB2005-102501; No Copyright; Avail: National Technical Information Service (NTIS)

Extensive development and analysis has illustrated that fuel tank inerting could, potentially, be cost-effective if air separation modules, based on hollow-fiber membrane technology, could be packaged and used in an efficient way. To illustrate this, the Federal Aviation Administration (FAA) has developed a prototype onboard inert gas generation system that uses aircraft bleed air to generate nitrogen-enriched air (NEA) at varying flows and purities during a commercial airplane flight cycle. A series of ground and flight tests were performed, in conjunction with National Aeronautics and Space Administration (NASA) aircraft operations personnel, designed to evaluate the FAA inerting system used in conjunction with a compartmentalized center wing tank (CWT). Additionally, the flammability of both the CWT and one inboard wing fuel tank was measured. The system was mounted on a Boeing 747, operated by NASA, and used to inert the aircraft CWT during testing. The inerting system, CWT, and the number 2 main wing tanks were instrumented to analyze the system performance, fuel tank inerting, and flammability. The results of the testing indicated that the FAA prototype inerting system operated as expected. Using a variable-flow methodology allowed a greater amount of NEA to be generated on descent when compared to the simple dual-flow methodology, but it had no measurable effect on the resulting average ullage oxygen concentration after each test, while improving inert gas distribution by decreasing the worst bay oxygen concentration when three similar tests were compared. The highest average ullage oxygen concentration observed on any flight test correlates directly with the worst bay oxygen concentration, illustrating the importance of maintaining a low average ullage oxygen concentration in good inert gas distribution. Oxygen diffusion between the bays of the tank was relatively rapid, and overnight dispersion of the ullage oxygen concentration was measured to be very small. Flammability measurements showed trends very similar to what was expected based on both experimental and computer model data. The equilibrium data agreed favorably with data from both the Fuel Air Ratio Calculator and the Condensation Model, while transient data trends matched closely with the Condensation Model with some discrepancies in total hydrocarbon concentration magnitude at altitude.
NTIS
Boeing 747 Aircraft; Flammability; Fuel Tanks; Civil Aviation; NASA Programs

20050071633 Hughes Technical Center, Atlantic City International Airport, NJ, USA
Evaluation of the Flammability of Aircraft Wiring
Cahill, P.; Dec. 2004; In English
Report No.(s): PB2005-102506; No Copyright; Avail: National Technical Information Service (NTIS)

This report discusses the flammability tests conducted on aviation and nonaviation electrical wiring that were performed to re-evaluate the effectiveness of the current Federal Aviation Administration (FAA)-mandated 60 deg Bunsen burner flammability test requirement for aircraft wiring. The evaluation included a 60 deg flammability test, an intermediate-scale vertical flammability test, and an intermediate-scale cabin attic flammability test. Test results showed that the 60 deg single wire Bunsen burner flammability test may not be adequate to qualify wire when bundled and subjected to a severe ignition source.
NTIS
Electric Wire; Aircraft; Burners; Wiring

20050080265 BAE Systems, Leicestershire, UK
Military/Aerospace MEMS Applications - AVT Task Group 078
Schadow, Klaus; El-Fatatry, Ayman; Apr. 2004; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A428707; No Copyright; Avail: Defense Technical Information Center (DTIC)

No abstract available
Aerospace Engineering; Microelectromechanical Systems; Military Technology; Technology Transfer

20050080304 Oregon Graduate Inst. of Science and Technology, Beaverton, OR USA
Sigma-Point Kalman Filter Based Sensor Integration Estimation and System Identification for Enhanced UAV Situational Awareness and Control
Wan, Eric; Oct. 2004; 14 pp.; In English
Contract(s)/Grant(s): N00014-02-C-0248
Report No.(s): AD-A428975; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this contract was to develop and demonstrate a machine learning framework for probabilistic vehicle state and model parameter inference, aiding the sensor integration and processing for the autonomous control of UAVs. The core technology that this approach is based on is the Sigma-Point Kalman Filter (SPKF). The current industry standard and most widely used algorithm for estimation is the extended Kalman filter (EKF). The EKF combines the sensor measurements with predictions coming from a model of vehicle motion (either dynamic or kinematic), in order to generate an estimate of the current navigational state (position, velocity, and attitude). This study points out the inherent shortcomings in using the EKF and presents, as an alternative, a family of improved derivativeless nonlinear Kalman filters called sigma-point Kalman filters (SPKF). We demonstrated the improved state estimation performance of the SPKF by applying it to the problem of loosely coupled GPS/INS integration. A novel method to account for latency in the GPS updates was also developed.
DTIC
Drone Vehicles; Inference; Kalman Filters; Multisensor Fusion; Situational Awareness; System Identification

20050080307 Air War Coll., Maxwell AFB, AL USA
Aviation Urban Operations. Are We Training Like We Fight?
Kemper, Todd G.; Sep. 2004; 49 pp.; In English
Report No.(s): AD-A428980; No Copyright; Avail: CASI; A03, Hardcopy

The battle for the bridges of An Nasiriyah, Iraq, was one of the most important engagements of Operation Iraqi Freedom and a baptism by fire for joint urban operations (JUO) doc- trine. At 0400 local time on 23 March 2003, tanks and a combined antiarmor team from the 1st Battalion, 2nd Marines, entered the city as lead elements for the battalion. The unit had as its objective three key bridges north of the city. Terrain of questionable trafficability kept the advancing vehicles predominantly road-bound. Three brigades of Iraqi fighters defended the city, and units from the Republican Guard, Saddam Fedayeen, Al Quds, and regular army lay in wait in an area that marines had already named 'ambush alley.'
DTIC
Education; Warfare

20050080323 Army Command and General Staff Coll., Fort Leavenworth, KS USA
What are the Right Fire Support Requirements for Army Airborne Forced Entry Operations with the Changing Contemporary Operational Environment?
Healey, Anthony J.; Jun. 2004; 96 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429026; No Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis studies the use of fire support platforms for Army airborne operations conducted within the new operational environment. It focuses on how field artillery can be a combat enabler for maneuver during forced entry operations (FEO). It is argued that the contemporary operational environment (COE) is more dangerous and less predictable than the previous operational environment of the Cold War. In this context, the National Command Authority should maintain a rapid response, forcible entry capability to set conditions for follow-on forces. Units, such as the 82d Airborne Division and Army Rangers, can lead the effort in FEOs. When a maneuver commander conducts an FEO he or she visualizes how the operation will unfold. As part of the visualization the commander must determine the right fire support requirement to help achieve success. Currently, the maneuver commander is supported by AC-130 gunships to different types of airborne field artillery and mortar units. For the commander to achieve success, he or she must decide on the right combination of versatility, firepower, and maneuver within the different capabilities of each fire support platform. This thesis analyzes the comparison of criteria for these systems. This allows the maneuver commander and staff to decide on the right fire support platform to conduct FEOs. (10 tables, 73 refs.)
DTIC
Air Drop Operations; Artillery Fire; Fires; Howitzers; Military Operations; Support Systems

20050080333 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick, Germany
Der Forschungsflughafen und das Institut fuer Luft- und Raumfahrtsysteme
Voersmann, Peter; Jul. 2004; 43 pp.; In German; Original contains color illustrations
Report No.(s): AD-A429057; No Copyright; Avail: Defense Technical Information Center (DTIC)

Briefing charts on presentation of the history and research conducted in Germany on aerospace systems, technology transfer, and development of the micro air vehicle 'Carolo.'
DTIC
Aeronautical Engineering; Germany

20050080384 United Technologies Research Center, East Hartford, CT USA
Separation Control for Rotorcraft
Lorber, Peter F.; McCormick, Duane C.; Wake, Brian E.; Florea, Razvan; Aug. 2002; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAG55-98-C-0066
Report No.(s): AD-A429137; UTRC-2002-5.200.0015-5; ARO-P-39174-EG; No Copyright; Avail: Defense Technical Information Center (DTIC)

Active flow control can play a significant role in improving rotorcraft performance by delaying flow separation. Retreating blade stall (RBS) limits rotor capability to generate lift and transmits large pitching moments to the flight control system. This project developed compact, high-power flow control actuators for RBS and evaluated them using a combination of computation and a wind tunnel test on a full scale helicopter blade section. A set of electromechanical Directed Synthetic Jet (DSJ) actuator modules were designed, fabricated, and installed. The actuators produced the intended unsteady momentum coefficient of 0.1% at Mach 0.4 at 260 Hz. Flow control improved airfoil steady and dynamic stall characteristics, but the improvements were not as large as desired, especially for dynamic stall at higher Mach number. Additional computations of the coupled flow fields showed that moving the DSJ exit slot further aft could increase recovery of post-stall lift, but could not further increase unsteady peak lift or stall delay at momentum coefficients less than 0. 5%. A 2nd generation DSJ actuator was designed and bench tested. By operating two slots, inboard and outboard of the piston, this actuator avoids back acoustic losses and can tolerate the centrifugal loads of a rotating blade.
DTIC
Rotary Wing Aircraft

20050080701 Boeing Commercial Airplane Co., Seattle, WA, USA
Gen 2.0 Mixer/Ejector Nozzle Test at LSAF June 1995 to July 1996
Arney, L. D.; Sandquist, D. L.; Forsyth, D. W.; Lidstone, G. L.; Long-Davis, Mary Jo, Technical Monitor; February 2005; 136 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS3-27235; WBS 22-714-09-46
Report No.(s): NASA/CR-2005-213334; E-14804; No Copyright; Avail: CASI; A07, Hardcopy

Testing of the HSCT Generation 2.0 nozzle model hardware was conducted at the Boeing Low Speed Aeroacoustic Facility, LSAF. Concurrent measurements of noise and thrust were made at critical takeoff design conditions for a variety of mixer/ejector model hardware. Design variables such as suppressor area ratio, mixer area ratio, liner type and thickness, ejector length, lobe penetration, and mixer chute shape were tested. Parallel testing was conducted at G.E.'s Cell 41 acoustic free jet facility to augment the LSAF test. The results from the Gen 2.0 testing are being used to help shape the current nozzle baseline configuration and guide the efforts in the upcoming Generation 2.5 and 3.0 nozzle tests. The Gen 2.0 results have been included in the total airplane system studies conducted at MDC and Boeing to provide updated noise and thrust performance estimates.
Author
Performance Tests; Nozzle Design; Mixers; Ejectors

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*.

20050061298 Office National d'Etudes et de Recherches Aerospatiales, Salon Air, France
A Concept of Flight Execution Monitor (FEM) for Helicopter Pilot Assistance
LeBlaye, Patrick; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 24-1 - 24-10; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

PAVE (Pilot Assistant in the Vicinity of hElipads) is a global research project conducted under the ONERA-DLR common research programme. Several new technologies are now available for helicopter on-board applications which have potentialities to support the pilot s perception and decision making. The technologies addressed in the frame of this project include an advanced flight control system, calculation of flight envelope limitations, enhanced and synthetic vision, mission in-flight planning and guidance. In order to obtain actual performance and safety benefits, integration of these technologies is one of the key issues addressed in the project. ONERA is especially involved in the development of a particular module of the pilot assistant, called the Flight Execution Monitor (FEM). The module is dedicated to the monitoring of the current helicopter situation and of the pilot s procedural activity. It is based on a high level Petri net description of the procedures, derived from the specifications of the flight manual and from interviews with the users. This Petri net description is used to monitor the execution of the procedure, to graphically display the progress of the helicopter situation and also to provide the information required given the current situation, including some flight limitations which are calculated on line and displayed to support the pilot s decision. A first prototype of the module has been developed and implemented in a man-in-the-loop simulation environment. The rationale behind the concept, the architecture of the current prototype and the possible future directions are presented. This development results from applied research on control execution software; it is also a pragmatic attempt to investigate the possible alternatives in the task allocation between the human operator and an automated system such as the modern helicopter.

Author

Flight Control; Helicopters; Decision Making; Enhanced Vision; Flight Envelopes

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*.

20050061226 SRI International Corp., Menlo Park, CA, USA

Explicit Finite Element Modeling of Multilayer Composite Fabric for Gas Turbine Engine Containment Systems, Part 3, Model Development and Simulation of Experiments

Simmons, J.; Erlich, D.; Shockey, D.; Nov. 2004; In English

Report No.(s): PB2005-102472; No Copyright; Avail: National Technical Information Service (NTIS)

Under the Federal Aviation Administration Airworthiness Assurance Center of Excellence and with support from the Aircraft Catastrophic Failure Prevention Program, SRI International collaborated with Arizona State University; Honeywell Engines, Systems and Services; and the National Aeronautics and Space Administration Glenn Research Center to develop a computational model for designing and evaluating ballistic fabric containment structures. This report describes the model and compares the results of static and impact penetration tests with the results of computational simulations.

NTIS

Fabrics; Finite Element Method; Gas Turbine Engines; Mathematical Models; NASA Programs; Simulation; Composite Materials

20050061227 Honeywell Engines, Systems and Services, Phoenix, AZ, USA

Explicit Finite Element Modeling of Multilayer Composite Fabric for Gas Turbine Engine Containment Systems, Part 4: Model Simulation for Ballistic Rests, Engine Fan Blade-Out, and Generic Engine

Gomuc, R.; Nov. 2004; In English

Report No.(s): PB2005-102473; No Copyright; Avail: National Technical Information Service (NTIS)

Honeywell Engines, Systems & Services (Phoenix, AZ) collaborated with Arizona State University (Tempe, AZ), SRI International (Menlo Park, CA), and NASA Glenn Research Center (Cleveland, OH) to develop a robust explicit finite element analysis modeling methodology for gas turbine engine containment systems using multilayer composite fabrics. Honeywells role was to simulate ballistic tests using LS-DYNA to validate the fabric material models (Task 3) and to apply the methodologies developed during this program to an engine fan blade containment analysis (Task 4). In addition, Honeywell developed a generic model for demonstration purposes. This report describes the work performed and the results obtained.

NTIS

Fabrics; Finite Element Method; Mathematical Models; Ballistics; Fan Blades; Composite Materials; Gas Turbine Engines

20050061228 NASA Glenn Research Center, Cleveland, OH, USA

Explicit Finite Element Modeling of Multilayer Composite Fabric for Gas Turbine Engine Containment Systems, Part 2, Ballistic Impact Testing

Pereira, J. M.; Revilock, D. M.; Nov. 2004; 40 pp.; In English

Report No.(s): PB2005-102471; No Copyright; Avail: CASI; A03, Hardcopy

Under the Federal Aviation Administration's Airworthiness Assurance Center of Excellence and the Aircraft Catastrophic Failure Prevention Program, National Aeronautics and Space Administration Glenn Research Center collaborated with Arizona State University, Honeywell Engines, Systems and Services, and SRI International to develop improved computational models for designing fabric-based engine containment systems. In the study described in this report, ballistic impact tests were conducted on layered dry fabric rings to provide impact response data for calibrating and verifying the improved numerical models. This report provides data on projectile velocity, impact and residual energy, and fabric deformation for a number of different test conditions.

NTIS

Containment; Fabrics; Gas Turbine Engines; Ballistics; Composite Materials; Finite Element Method

20050061230 Arizona State Univ., Tempe, AZ, USA

Explicit Finite Element Modeling of Multilayer Composite Fabric for Gas Turbine Engine Containment Systems, Part 1, Static Tests and Modeling

Rajan, S. D.; Mobasher, B.; Sharda, J.; Yanna, V.; Deenadaylu, C.; Nov. 2004; In English

Report No.(s): PB2005-102470; No Copyright; Avail: National Technical Information Service (NTIS)

Under the Federal Aviation Administrations Airworthiness Assurance Center of Excellence and with support from the Aircraft Catastrophic Failure Prevention Program, the team consisting of Arizona State University, Honeywell Engines, Systems & Services, National Aeronautics and Space Administration Glenn Research Center, and SRI International collaborated to develop testing procedures and computational models for designing and evaluating ballistic fabric turbine engine containment structures. This report contains the details of the static tests and their finite element simulations carried out at Arizona State University.

NTIS

Containment; Fabrics; Finite Element Method; Gas Turbine Engines; Mathematical Models; Static Tests; Composite Materials

20050061232 Boeing Co., Seattle, WA, USA

Indications of Propulsion System Malfunctions

Clark, S. T.; Iverson, R. E.; Mumaw, R. J.; Sikora, J. A.; Vian, J. L.; Nov. 2004; In English

Report No.(s): PB2005-102469; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the concepts, risks, issues, and conclusions of efforts to assess technical feasibility and operational appropriateness of providing indications of propulsion system malfunctions.

NTIS

Malfunctions; Technology Assessment; Propulsion System Performance; Jet Aircraft

20050080684 General Electric Aircraft Engines, Cincinnati, OH, USA

Low NO(x) Combustor Development

Kastl, J. A.; Herberling, P. V.; Matulaitis, J. M.; February 2005; 263 pp.; In English

Contract(s)/Grant(s): NAS3-25951; WBS 22-714-09-46

Report No.(s): NASA/CR-2005-213326; E-14786; No Copyright; Avail: CASI; A12, Hardcopy

The goal of these efforts was the development of an ultra-low emissions, lean-burn combustor for the High Speed Civil Transport. The HSCT Mach 2.4 FLADE C1 Cycle was selected as the baseline engine cycle. A preliminary compilation of performance requirements for the HSCT combustor system was developed. The emissions goals of the program, baseline engine cycle, and standard combustor performance requirements were considered in developing the compilation of performance requirements. Seven combustor system designs were developed. The development of these system designs was facilitated by the use of spreadsheet-type models which predicted performance of the combustor systems over the entire flight envelope of the HSCT. A chemical kinetic model was developed for an LPP combustor and employed to study NO(x) formation kinetics, and CO burnout. These predictions helped to define the combustor residence time. Five fuel-air mixer concepts were analyzed for use in the combustor system designs. One of the seven system designs, one using the Swirl-Jet

and Cyclone Swirler fuel-air mixers, was selected for a preliminary mechanical design study.
Author
Emission; Combustion Chambers; Supersonic Transports; Fuel Combustion

20050080709 NASA Glenn Research Center, Cleveland, OH, USA
High-Altitude, Long-Endurance Airships for Coastal Surveillance
Dolce, James L.; Collozza, Anthony; February 2005; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS-22-066-20-08
Report No.(s): NASA/TM-2005-213427; E-14961; No Copyright; Avail: CASI; A03, Hardcopy

A high altitude solar powered airship provides the ability to carry large payloads to high altitudes and remain on station for extended periods of time. This study examines applications and background of this type of concept vehicle, reviews the history of high altitude flight and provides a point design analysis. The capabilities and limitations of the airship are demonstrated and possible solutions are proposed. Factors such as time of year, latitude, wind speeds, and payload are considered in establishing the capabilities of the airship. East and west coast operation is evaluated. The key aspect to success of this type of airship is the design and operation of the propulsion and power system. A preliminary propulsion/power system design was produced based on a regenerative fuel cell energy storage system and solar photovoltaic array for energy production. Results on power system requirements for year long operation is presented.
Author
Airships; Coasts; Surveillance; High Altitude Balloons; Solar Powered Aircraft

20050080718 NASA Glenn Research Center, Cleveland, OH, USA
Hydrogen-Oxygen PEM Regenerative Fuel Cell Energy Storage System
Bents, David J.; Scullin, Vincent J.; Chang, Bei-Jiann; Johnson, Donald W.; Garcia, Christopher P., et al.; January 2005; 26 pp.; In English; 2004 Fuel Cell Seminar, 1-5 Nov. 2004, San Antonio, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-708-02-04
Report No.(s): NASA/TM-2005-213381; E-14888; Paper-209; No Copyright; Avail: CASI; A03, Hardcopy

An introduction to the closed cycle hydrogen-oxygen polymer electrolyte membrane (PEM) regenerative fuel cell (RFC), recently constructed at NASA Glenn Research Center, is presented. Illustrated with explanatory graphics and figures, this report outlines the engineering motivations for the RFC as a solar energy storage device, the system requirements, layout and hardware detail of the RFC unit at NASA Glenn, the construction history, and test experience accumulated to date with this unit.
Author
Electrolytes; Energy Storage; Regenerative Fuel Cells; Polymers; Hydrogen Oxygen Fuel Cells

08
AIRCRAFT STABILITY AND CONTROL

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

20050080745 Physics and Electronics Lab. TNO, The Hague, Netherlands
System Identification Techniques Applied to Telemetry Data Analysis
Keijer, W.; Weiss, M.; June 2004; 52 pp.; In English
Contract(s)/Grant(s): TNO Proj. 015.30706
Report No.(s): TD-2003-0225; FEL-04-A002; Copyright; Avail: Other Sources

Telemetry data collected during live firings with NATO Sea Sparrow missiles is used to determine the aerodynamic response of the missile to control surface deflections. System identification techniques are used to estimate the parameters of the aerodynamic response, and the estimation error that is due to the noisy input data. The estimates of physically significant parameters are also validated using their known typical values.
Author
Sparrow Missiles; Missile Control; System Identification

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)*.

20050061114 NASA Langley Research Center, Hampton, VA, USA
Flow Visualization at Cryogenic Conditions Using a Modified Pressure Sensitive Paint Approach
Watkins, A. Neal; Goad, William K.; Obara, Clifford J.; Sprinkle, Danny R.; Campbell, Richard L.; Carter, Melissa B.; Pendergraft, Odis C., Jr.; Bell, James H.; Ingram, JoAnne L.; Oglesby, Donald M., et al.; [2005]; 11 pp.; In English; 43rd AIAA Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2005, Reno, NV, USA
Report No.(s): AIAA Pape -2005-0456; No Copyright; Avail: CASI; A03, Hardcopy

A modification to the Pressure Sensitive Paint (PSP) method was used to visualize streamlines on a Blended Wing Body (BWB) model at full-scale flight Reynolds numbers. In order to achieve these conditions, the tests were carried out in the National Transonic Facility operating under cryogenic conditions in a nitrogen environment. Oxygen is required for conventional PSP measurements, and several tests have been successfully completed in nitrogen environments by injecting small amounts (typically \h 3000 ppm) of oxygen into the flow. A similar technique was employed here, except that air was purged through pressure tap orifices already existent on the model surface, resulting in changes in the PSP wherever oxygen was present. The results agree quite well with predicted results obtained through computational fluid dynamics analysis (CFD), which show this to be a viable technique for visualizing flows without resorting to more invasive procedures such as oil flow or minitufts.
Author
Flow Visualization; Cryogenic Wind Tunnels; Blended-Wing-Body Configurations; Pressure Sensitive Paints; Wind Tunnel Tests

20050080318 Army Engineer Research and Development Center, Vicksburg, MS USA
Evaluation of Expedient Methods for Mitigating Dust on Helipads
Tingle, Jeb S.; Harrison, Andrew; Rushing, John F.; Sep. 2004; 90 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429008; ERDC/GSL-TR-04-10; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army Engineer Research and Development Center (ERDC) was tasked by the Marine Corps Systems Command to develop two dust control systems, one for expeditionary use on Forward Area Refueling Points (FARPs) and one for sustainment use on roads and other large area applications. The project consisted of the evaluation of various dust palliatives and application equipment under controlled laboratory conditions and during field tests. The products of this effort include equipment recommendations, palliative recommendations and complete application guidance. This report addresses testing performed to evaluate commercial palliatives and palliative distribution systems for expeditionary use in constructing and maintaining FARP sites. Eighteen helipads were constructed at Marine Corps Air Station Yuma using both experimental and commercial palliatives for dust abatement. The application methods were principally topical (spray-on) and expeditionary in nature. Each helipad was subjected to CH-46 rotary-wing aircraft traffic and selected helipads were subjected to CH-53 traffic. The helipads were evaluated based upon effectiveness in controlling dust durability foreign object damage (FOD) potential, and overall surface condition. Pertinent conclusions from the testing conducted are noted and recommendations for selecting dust abatement methods and materials are provided.
DTIC
Dust; Dust Collectors; Evaluation; Heliports; System Effectiveness

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*.

20050080314 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Lost in Space: Future Force Leaders and Visualization of Space Operations
Gibney, Cristine; May 2004; 64 pp.; In English
Report No.(s): AD-A428997; No Copyright; Avail: Defense Technical Information Center (DTIC)

Space operations are important to today's Army and will be increasingly important to the Future Force. Currently, the Army has an opportunity to develop Future Force leaders to best utilize space to achieve full spectrum dominance. If the Army does not take this opportunity and develop leaders that can visualize space, there could be grave consequences for the Nation and the Army as the space environment becomes more complex. There are three main documents that provide direction for space operations in the Future Force: Army Space Policy, Army Space Master Plan (ASMP) and Training and Doctrine Command Pamphlet 525-3-14. ASMP outlines the overarching concepts to implement Army Space Policy and TRADOC PAM 525-3-14 details the Army's modernization plan for space. This monograph studies the plans outlined in these documents as they relate to the doctrine, training, leader development, organization and personnel implications for Army space requirements. It examines these concepts in order to answer the question: Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace?' This is a four-part study that first analyzes the Army's plan for space. Next it examines the anticipated threats to space operations and current space-based training, education and doctrine. The third part of the study analyzes the Army's concept of visualization as a function of battle command. Since the Army does not explain how to develop visualization skills in leadership or operational doctrine, the monograph analyzes similar leadership doctrine concepts and examines the concept of intuition as described by Dr. Gary Klein. The final part of the study analyzes the current Army plan for space to determine if the Army's plan will develop intuition or visualization skills in Future Force leaderT
DTIC
Aerospace Environments; Education; Leadership; Military Operations; Military Personnel; Space Missions

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20050061166 National Inst. of Information and Communications Technology, Tokyo, Japan
A Folding Parabola Antenna with Flat Facets
Jang, Jae-Hyeuk; Yamamoto, Shin-ichi; Miura, Amane; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 169-176; In English; See also 20050061163; Copyright; Avail: Other Sources

A folding parabola antenna with flat facets designed for portable earth stations of satellite communications systems using the S-band is proposed. High-data-rate satellite communications systems using low power terminals and/or measurement of satellite antenna properties require the use of portable, high-gain antenna. The reflector of this proposed antenna is constructed of flat facets, enabling it to be easily folded and carried. An experimental model of the antenna with a diameter of 68cm has a gain of 21 dBi at 2.5 GHz. Key words Folding antenna, Flat facets, Portable earth stations
Author
Satellite Antennas; Ground Stations; Flat Surfaces; Parabolas; Satellite Communication; Communication Satellites

20050061175 National Inst. of Information and Communications Technology, Japan
Time Comparison Experiment: Earth Station of Time Comparison Experiment
Fujieda, Miho; Gotoh, Tadahiro; Imae, Michito; Takahashi, Yasuhiro; Nakagawa, Fumimaru; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 243-249; In English; See also 20050061163; Copyright; Avail: Other Sources

The Time Comparison Equipment (TCE) for ETS-VIII has been developed to transfer time precisely between the ground reference clock, UTC (CRL) and the on-board atomic clock. We have finished the development of the TCE and been under construction of the earth station as well as a data-analysis program. In order to upgrade the stability of the time transfer, temperature control of the outdoor unit, improvement of the code-phase resolution and so on are planned in the earth station. Keywords ETS-VIII, Time transfer, Satellite Navigation
Author
Time Temperature Parameter; Control Equipment; Atomic Clocks; Ground Stations

20050061186 National Inst. of Information and Communications Technology, Tokyo, Japan

Portable Earth Station: RF Unit for Portable Earth Station

Jang, Jae-Hyeuk; Yamamoto, Shin-ichi; Miura, Amane; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 169-176; In English; See also 20050061163; Copyright; Avail: Other Sources

For the purpose of verifying the in-orbit electrical characteristics of the Engineering Test Satellite VIII (ETS-VIII) on-board antenna, we plan to measure the receiving signal power at multiple points in the beam area of it. We developed the portable earth station for measuring the receiving signal power and measured the electrical performance. The measurement results snow that tine expected performance can be achieved for the portable earth station. Keywords Engineering Test Satellite VIII, On-board antenna, In-orbit electrical characteristics, Portable earth station.

Author

Ground Stations; Electrical Properties; Engineering Test Satellites; Radio Frequencies; Electrical Engineering

20050061188 National Inst. of Information and Communications Technology, Tokyo, Japan

S-band Earth Station for Mobile Communication

Yamamoto, Shin-ichi; Yamazaki, Ichiroh; Obara, Noriaki; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 137-144; In English; See also 20050061163; Copyright; Avail: Other Sources

Engineering Test Satellite VIII (ETS-VIII) is scheduled for launch in the summer of 2004. The Communications Research Laboratory (CRL) is planning various mobile satellite communications experiment using On-Board Processor, On-Board Packet Switch etc., which were carried in the satellite, and the satellite broadcasting experiment. An S-band e& station was installed in the Kashima Space Research Center, in order to measure characteristics which serve as a basis in the communication and the broadcasting experiment, between ETS-VIII and a mobile station. This paper describes the outlook of an S-band earth station and the electric characteristic. Key words Personal satellite communication, ETS-VIII, S-band earth station, Service link

Author

Ground Stations; Mobile Communication Systems; Satellite Communication; Engineering Test Satellites; Broadcasting; Superhigh Frequencies; Communication Satellites

20050061189 National Inst. of Information and Communications Technology, Japan

Land Mobile Station for ETS-VIII Mobile Satellite Communications Experiments

Miura, Amane; Yamamoto, Shin-Ichi; Satoh, Masaki; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 161-166; In English; See also 20050061163; Copyright; Avail: Other Sources

This paper describes the Land Mobile Station (IMS) developed for the mobile satellite communications experiments on the Engineering Test Satellite VIII (E-VIII). The LMS has a communications system consisting of terminal equipment, an up-converter (U/C) and a down-converter (D/C). These convert the signal frequency between 140 MHz and S-band (2.6/2.5 GHz). it also has a 50-W solid state power amplifier (SSPA) and a low noise amplifier (LNA). An antenna rotator capable of azimuth and elevation rotation and covered with a radome is installed on the LMS roof-top. An open-loop antenna tracking control by using the LMS attitude and a satellite direction is available. An S-band active phased array antenna and an S-band stairs type antenna were developed as the mobile antenna. This is a key component of the mobile terminal. The S-band active phased array antenna uses electronic beam-scanning to transmit and receive functions. It can track the satellite by using closed-loop control. The S-band stairs type antenna is a fixed-beam array antenna. This can track the satellite by using mechanical tracking in the azimuth direction. The antenna gain of these antennas is about 12 dBi. A gas-turbine generator supplies power to the equipment onboard the LMS. The LMS during the phase after the initial checkout of the satellite after launch will be dedicated to the mobile satellite communications experiments and the evaluation of the mobile antenna using the ETS-VIII. Keywords ETS-VIII, S-band, Land mobile station, Mobile satellite communications, Antenna tracking system, Mobile antenna

Author

Land Mobile Satellite Service; Down-Converters; Up-Converters; Mobile Communication Systems; Power Amplifiers; Antenna Arrays

20050070864 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Radiance Data Products at the GES DAAC

Savtchenko, A.; Ouzounov, D.; Acker, J.; Johnson, J.; Leptoukh, G.; Qin, J.; Rui, H.; Smith, P.; Teng, W.; [2004]; 1 pp.; In English; AGU Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The Goddard Earth Sciences Distributed Active Archive Center (GES DAAC) has been archiving and distributing Radiance data, and serving science and application users of these data, for over 10 years now. The user-focused stewardship of the Radiance data from the AIRS, AVHRR, MODIS, SeaWiFS, SORCE, TOMS, TOVS, TRMM, and UARS instruments exemplifies the GES DAAC tradition and experience. Radiance data include raw radiance counts, onboard calibration data, geolocation products, radiometric calibrated and geolocated-calibrated radiance/reflectance. The number of science products archived at the GES DAAC is steadily increasing, as a result of more sophisticated sensors and new science algorithms. Thus, the main challenge for the GES DAAC is to guide users through the variety of Radiance data sets, provide tools to visualize and reduce the volume of the data, and provide uninterrupted access to the data. This presentation will describe the effort at the GES DAAC to build a bridge between multi-sensor data and the effective scientific use of the data, with an emphasis on the heritage of the science products. The intent is to inform users of the existence of this large collection of Radiance data; suggest starting points for cross-platform science projects and data mining activities; provide data services and tools information; and to give expert help in the science data formats and applications.

Author

Atmospheric Sounding; Data Acquisition; Data Mining; Radiance

20050071081 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Proven Ground System Architecture for Promoting Collaboration and Common Solutions at NASA

Smith, Danford; January 2005; 2 pp.; In English; Ground Station Architecture Workshop, 1-3 Mar. 2005, Manhattan Beach, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA Goddard Space Flight Center's 'GMSEC' ground system architecture was presented at GSAW2003 as a concept being studied. GMSEC would utilize a publish/subscribe middleware framework and standardized interfaces to allow custom and COTS ground system components to plug-and-play. This capability, in turn, would reduce integration costs, allow for technology infusion over time, and encourage the development and sharing of common components across missions and organizations. At GSAW2004, GMSEC was presented at a breakout session as a system working well in the NASA lab and being applied as an integral piece of reengineering efforts for several GSFC missions. Today, GMSEC is supporting five satellites at GSFC and has been selected by several future missions. Over 30 plug-and-play components are now available to missions using the GMSEC approach. Other organizations, including Marshall Space Flight Center, Johns Hopkins University's Applied Physic Lab, and the Institute for Scientific Research are each developing GMSEC-compatible components. Based on the success of GMSEC and efforts at other NASA Centers, the message bus approach is now being evaluated as a NASA Agency-wide approach for many future missions involving multiple NASA Centers as we move towards the goals of NASA s new Exploration Initiative. The presentation will explain the basic technical concepts of using a publish/subscribe framework for mission operations support (and its applicability to flight systems as well). Lessons learned on NASA's GMSEC program will allow the audience to better understand the significant benefits of this architecture approach over the traditional 'one-off' solution approach. The point of the presentation is to show the long-term benefits of using a ground system architecture which incorporates many of the successful GMSEC concepts - message bus, mix of COTS and custom software, standard interfaces, plug-and-play, etc. The implications for the development process will also be discussed.

Author

Applications Programs (Computers); Architecture (Computers); Ground Stations; Networks

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

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

20050061126 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The calculation figures of merit (GF) using sun tracking method IN Bumios Band Iapan Isro Biak.

TriJudianto, Chusnul; [2003]; 52 pp.; In Malay-Indonesian; Copyright; Avail: Other Sources

For enhancing the quality of receive and transmit signal of ground station, the kinejance of all ground station equipment have to be achieved. The most important parameter that supporting the kinejance of ground station in both receiving and

transmitting signal from satellite are Figure of Merit (G/T), Effective Isotropic Radiated Power (EIRP), BER (Bit Error Rate), Timing Accuracy, Frequency Stability and Ranging Accuracy. One of the important parameter that indicate the kinejance of receiver system of ground station is Figure of Merit (G/T), ratio of receiver antenna gain to system noise temperature (Ts). For measuring value of figure of merit of ground station used sun tracking method, that measure the signal strength of noise source of sun (hot sky) and compare with noise signal strength in other site (cold sky) by pointing the antenna 30 deg away from sun. Finally by adding some of correction parameter to the measurement result, the real G/T value will be obtained. Author

Figure of Merit; Sun; Tracking (Position); Signal Transmission

20050061163 National Inst. of Information and Communications Technology, Tokyo, Japan

Journal of the National Institute of Information and Communications Technology. Special Issue on the Engineering Test Satellite VIII (ETS-VIII)., Volume 50, Nos. 3/4

Takahashi, Tetsuo, Editor; Tomita, Fumihiko, Editor; Kurihara, Noriyuki, Editor; Hamamoto, Naokazu, Editor; December 1, 2003; ISSN 1349-3205; 267 pp.; In English; See also 20050061164 - 20050061198; Original contains color and black and white illustrations; Copyright; Avail: Other Sources

The engineering test satellite VIII (ETS-VIII) is Japan's first three-ton-class large-scale geostationary satellite. Its mission is to develop and test large-bus technology and other technologies that will be required in a mobile satellite communications system equipped with a large satellite-borne antenna. This special issue reports on the current status of the ETS-VIII experimental program, in cooperation with the relevant organizations, with a summary of the details of the ETS-VIII program of experiments and the results of development of an onboard transponder and the experimental ground station. We hope that our research efforts will aid the ETS-VIII satellite project and contribute to the realization of Japan's future mobile satellite communications system.

Derived from text

Engineering Test Satellites; Geosynchronous Orbits; Mobile Communication Systems; Satellite Communication; Satellite Design

20050061164 Japan Aerospace Exploration Agency, Tokyo, Japan

Large Deployable Reflector (LDR)

Shintate, Kyoji; Usui, Motofumi; Miyasaka, Akihiro; Terada, Koji; Tsujihata, Akio; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 30-39; In English; See also 20050061163; Copyright; Avail: Other Sources

Large Deployable Reflectors (LDRs) are carried on Engineering Test Satellite VIII (ETS- VIII), which is scheduled to be launched in 2004 (JFY) and demonstrates mobile communications via geostationary satellite using cellular-phone-sized terminals. LDR is required to have a tennis-court-sized reflector and high accuracy of its surface. To meet the requirements, LDR is designed based on a modular-mesh concept in which the structure consists of several basic modules. This paper describes concept of design and verification tests of LDR. Key words Large Deployable Reflector, LDR, Engineering Test Satellite VIII, Deployable antenna

Author

Large Deployable Reflector; Mobile Communication Systems; Engineering Test Satellites; Satellite Antennas; Passive Satellites

20050061165 Tohoku Univ., Japan

Beam Forming Network

Matsumoto, Yasushi; Ide, Toshiyuki; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 73-83; In English; See also 20050061163; Copyright; Avail: Other Sources

A newly developed BFN (Beam Forming Network) for a phased array feed on ETS-VIII satellite is described. The BFN controls the excitation weight of the feed arrays, which are located at a defocus position of the large deployable reflector antennas. The BFN described here has a unique architecture by which excitation weight for beam steering can be sheared by multiple beams. This enables simple and effective calibration of beam pointing errors caused by mechanical, thermal, or electrical environment in satellite orbit. The BFN also has a self-calibration function to reduce excitation weight errors caused by thermal environment. Keywords Phased array antenna, Satellite antenna, Beam forming network, Multi beam antenna, Satellite communications

Author

Beamforming; Phased Arrays; Antenna Arrays; Large Deployable Reflector; Satellite Communication; Beam Steering

20050061168 National Inst. of Information and Communications Technology, Tokyo, Japan

Deployable Antenna Equipment

Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 281-282; In English; See also 20050061163; Copyright; Avail: Other Sources

This invention consists of a small, lightweight, parabolic antenna that one can easily carry. As shown in Fig.1. the reflector surface of the antenna is divided into several segments (one of which is shown (four segments). in a simplified manner in Fig. 1 a). The segments are structured permitting further folding in a manner similar to origami (Fig.lb). The divided and folding structure makes this antenna easy to store and carry. Adjacent segments can be connected via magnet joints. for example, permitting convenient assembly of the antenna without requiring tools. Although the reflection surface of a parabolic antenna is generally curved, flat facets are employed in this antenna. which is based on the principle of compact storage via a folding mechanism. This design allows for a simple antenna structure featuring small dimensions in the folded state. enhancing portability and enabling reliable and stable folding and deployment operations.

Author

Deployment; Parabolic Antennas; Reflector Antennas; Folding Structures; Flat Surfaces

20050061169 Japan Aerospace Exploration Agency, Japan

Development of Satellite System: Overview of ETS-VIII Satellite

Yonezawa, Katsuo; Homma, Masanori; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 13-22; In English; See also 20050061163; Copyright; Avail: Other Sources

Engineering Test Satellite VIII (ITS-VIII) has purposes of establishing 3-ton-class geostationary satellite bus technology in the world class, equipped with large deployable reflectors, answering to the emerging demands in mobile communications and global positioning necessary for the early 21-st century, and conducting the relevant experiments on orbit. ETS-VIII satellite bus incorporates NASDA-developed technologies such as reduced-weight modular body structures, 7.5 kw-class high power supply in 100 volts, multipurpose 15538 data bus and CCSDS-based packet transmission, attitude stabilization for the satellite with large flexible structures, unified satellite controller of 64-bit MPU with reprogramming capability.

Author

Engineering Test Satellites; Geosynchronous Orbits; Large Deployable Reflector; Mobile Communication Systems; Channels (Data Transmission)

20050061170 Japan Aerospace Exploration Agency, Japan

High Accuracy Clock (HAC)

Noda, Hiroyuki; Sano, Kazuhiko; Hama, Shinichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 101-107; In English; See also 20050061163; Copyright; Avail: Other Sources

To obtain the basic technology of satellite positioning system, NASDA will conduct experiments of ETS-VIII high accurate orbit determination and time synchronization, satellite navigation signal relay, user positioning by ETS-VIII combined with GPS satellites. High Accuracy Clock (HAC) generates and transmits L/S-band navigation signal synchronized with high stability frequency signal from Cs atomic clock on board, and conducts coherent relays of navigation signal transmitted from ground station. Positioning experiment system consists of the satellite segment of ETS-VIII, GPS satellite and the ground segment of satellite monitor stations receiving navigation signals and generating ranging data, master control station processing the ranging data, navigation signal transmitting station and laser ranging stations.

Author

Atomic Clocks; Time Synchronization; Orbit Determination; Navigation Satellites; Global Positioning System; Data Transmission

20050061172 National Inst. of Information and Communications Technology, Tokyo, Japan

Beam-forming Network (BFN) Operating System

Ide, Toshiyuki; Okumura, Minoru; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 155-160; In English; See also 20050061163; Copyright; Avail: Other Sources

Numerous parameters are required for the setup of Beam-Forming Networks used in phased-array antenna systems. For this reason, a fixed BFN operating system was established with the aim of increasing efficiency and saving labor. This system

manages the various parameters required for the employment of a BFN unitary, resulting in the more efficient use of BFN. Author

Antenna Arrays; Beamforming; Phased Arrays; Telemetry; Antenna Design

20050061173 National Inst. of Information and Communications Technology, Tokyo, Japan

Experimental Communications and Broadcasting Terminals: Functional Model of a Hand-held Terminal for On-board Processor (OBP) Experiments

Hashimoto, Yukio; Yamamoto, Shin-ichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 197-203; In English; See also 20050061163; Copyright; Avail: Other Sources

We developed an experimental terminals used with on-board processor (OBP) for a mobile satellite voice-communication experiment. It consists of rack-mounted experiment equipment, in addition to an antenna for hand-held terminals. We made terminals with S band RF transmitters and terminals for base stations without S-band RF transmitters. These terminals handle a fixed communication mode and a normal OBP operational mode and respond to pre-assigned channels as well as the demand assignment access method. In addition to their function as communication terminals, they load operational programs and control and observe OBP with the assistance of attached equipment. We checked all the functions using a combination of tests with the OBP installed on the engineering test satellite VIII (ETS-VIII). Key words Satellite communication, Regenerative transponder, Digital signal processing, Hand- held Terminal

Author

Communication Networks; Satellite Communication; Transponders; Signal Processing; Radio Frequencies

20050061178 National Inst. of Information and Communications Technology, Tokyo, Japan

Configuration for Mobile Communication Satellite System and Broadcasting Satellite Systems

Kozono, Shin-Ichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 23-31; In English; See also 20050061163; Copyright; Avail: Other Sources

To realize S-band mobile satellite communications and broadcasting systems, onboard mission systems and equipment were designed for the Engineering Test Satellite VIII (ETS-VIII). Voice communication is performed using handheld terminals, high-speed data communications, and multimedia broadcasting through a geostationary satellite. To enhance the efficiency and flexibility of the communication system, the onboard mission system features phased-array-fed reflector antennas with large antennas and baseband switching through onboard processors. Keywords Engineering Test Satellite VIII, Mobile satellite communication, Mobile satellite broadcasting, S-band, Ka-band, Large deployable antenna, On-board processor, Onboard packet switch

Author

Engineering Test Satellites; Mobile Communication Systems; Satellite Communication; Antenna Arrays; Large Space Structures; Onboard Equipment; Broadcasting

20050061179 Japan Aerospace Exploration Agency, Japan

Onboard Ka-band Feeder Link Communications Equipment

Kohata, Hiroki; Hama, Shinichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 41-49; In English; See also 20050061163; Copyright; Avail: Other Sources

Onboard Ka-band Feeder Link Communications Equipment (FLCE) is one of the mobile satellite communications payloads carried by the Engineering Test Satellite VIII (ETS-VIII) and communicates signals with a ground feeder link station. NASDA has developed and installed the Ka-band feeder link communications equipments for inter-satellite communications on the ETS-VI, COMETS and DRTS, and developed the FLCE based on their technologies. This paper describes the function and performance of the FLCE and summarizes its development. Key words Feeder link communications equipment, Ka-band, Mobile satellite communications, ETS-VIII

Author

Engineering Test Satellites; Communication Equipment; Mobile Communication Systems; Satellite Communication; Radio Communication

20050061180 National Inst. of Information and Communications Technology, Tokyo, Japan

S-band Frequency Converter

Hashimoto, Yukio; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 51-55; In English; See also 20050061163; Copyright; Avail: Other Sources

We developed the S-band converter for engineering test satellite VIII (ETS-VIII). The S-band converter consists of an IF-band switch network, frequency converters, and an S-band switch network. The Ka-band RF section and two on-board switches were connected to an S-band RF section by an IF-band switch network. We adjusted the TX/FH frequency conversion function, signal route and the transmission/received signal levels. We refurbished engineering model frequency converters into flight models. The IF-band and S-band switches were used from the initial development stages. We maintained the specification performance after the engineering model tests. Key words Mobile satellite communication, ETS-VIII, S-band
Author

Frequency Converters; Superhigh Frequencies; Ultrahigh Frequencies; Satellite Communication; Radio Frequencies; Engineering Test Satellites

20050061181 Hokkaido Inst. of Tech., Japan

Feed System

Ueno, Kenji; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 57-60; In English; See also 20050061163; Copyright; Avail: Other Sources

Japanese Engineering Test Satellite VIII (ETS-VIII) is being developed and is scheduled to be launched into a geostationary Earth orbit to experimentally establish mobile communications and multimedia broadcasting services. Of the key technologies in E-VIII, we focus on an array-feed system for making multiple beams and illuminating large, deployable reflectors. Assembled array-feed system have been tested, and their ability to control RF signals in amplitude and phase has been confirmed satisfactorily. Based on measured array-feed radiation patterns, we have derived reasonable secondary radiation patterns of ETS-VIII S-band antennas. Environmental tests implemented to the feed units which are being placed outside the satellite body have certified sufficient durability in the launching period and space environment. Key words Satellite communication, Engineering Test Satellite VIII, Multibeam antenna, Feed system, Feed unit
Author

Antenna Feeds; Satellite Communication; Engineering Test Satellites; Feed Systems; Mobile Communication Systems; Large Deployable Reflector; Multibeam Antennas

20050061182 National Inst. of Information and Communications Technology, Japan

The On-Board Processor for a Voice Communication Switching

Hashimoto, Yukio; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 85-94; In English; See also 20050061163; Copyright; Avail: Other Sources

We developed the on-board processor (OBP) used for voice communication switching of mobile satellite communication systems. It uses multi-carrier time division multiple access to support high-capacity voice communication systems. Most functions (filtering, switching, carrier composition, and regeneration) are performed by digital signal processing; ASIC technology is used to reduce device size and power consumption. The switching function is controlled autonomously by software (call management, user management, and OBP management, as well as by using statistical and logistical data). We tested the interface functions of the OBP after it was installed on engineering test satellite VIII (ETS-VIII) and determined that the OBP proto-flight performance test results met the system requirements. Key words Satellite communication, Regenerative transponder, On-board processing, Digital signal processing, Hand-held Terminal
Author

Onboard Data Processing; Application Specific Integrated Circuits; Satellite Communication; Transponders; Signal Processing; Engineering Test Satellites; Mobile Communication Systems

20050061187 Hokkaido Inst. of Tech., Japan

Feed Array Element: Configuration of the Feed System

Ueno, Kenji; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 57-66; In English; See also 20050061163; Copyright; Avail: Other Sources

A new design of microstrip antenna (MSA) is studied for satellite-borne phased array antennas. Noble characteristics, low mass, simple construction, high efficiency, low mutual coupling, are achieved by a honeycomb-based structure with a surrounding metal cylinder (cup MSA). S-band cup MSAs are successfully developed for phased array-fed antennas on Engineering Test Satellite VIII (ETS-VIII). Phased array antenna, Satellite antenna, Feed array, Element antenna, Microstrip antenna
Author

Antenna Arrays; Antenna Feeds; Engineering Test Satellites; Superhigh Frequencies; Satellite Antennas; Phased Arrays

20050061191 National Inst. of Information and Communications Technology, Tokyo, Japan

Data Collection System

Miura, Amane; Nagai, Seiji; Jang, Jae-Hyeuk; Taira, Shinichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 191-195; In English; See also 20050061163; Copyright; Avail: Other Sources

We plan to verify the on-orbit antenna patterns in the framework of the electrical characteristics verification test for the Engineering Test Satellite VIII (ETS-VIII) on-board antenna by using electric power data measured at portable terminals located at multiple points. The Data collection system measures the receiving signal power at each portable terminal and delivers them to the host terminal. The system is designed to minimize operation at the portable terminals and to have all terminals controlled by the host terminal. It is composed of portable terminals with wireless communications, like the Personal Handyphone System terminal or cellular phone terminals (five terminals are planned), and a host terminal located at the Kashima Space Research Center of the Communications Research Laboratory. Commands and data are transferred via the Internet using an Internet Service Provider. Data measurement is performed at each portable terminal based on the commands generated at the host terminal. The frequency and power of the received signals with GPS times are measured at a maximum rate of about four samples per second. Real-time data collection for the host terminal from each portable terminal and visualization of the data enables the operator of the host terminal to immediately verify the data. Additionally, the host terminal can monitor the state of the equipment of the portable terminals: this is called the 'health- check' function. It can also set the state of the equipment in the portable terminal. Key words ETS-VIII, Large deployable antenna, Antenna measurement, Data collection, Internet

Author

Data Processing Terminals; Data Acquisition; Antenna Radiation Patterns; Real Time Operation

20050061192 National Inst. of Information and Communications Technology, Tokyo, Japan

Terminals for High-Data-Rate Satellite Communications Experiments

Taira, Shinichi; Hamamoto, Naokazu; Ide, Toshiyuki; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 205-210; In English; See also 20050061163; Copyright; Avail: Other Sources

The Communications Research Laboratory has been studying the mobile satellite communications network and developing an onboard packet switch. An onboard switch makes satellite communications with a multi-beam structure more efficient. In this communications system, a compact mobile earth station that can be installed in a mobile system or that is easily portable is assumed. The terminal equipment for the mobile station and the feeder link station has already been developed. This paper describes the characteristics of terminal equipment, which performs well enough to meet the requirements of experiments to evaluate the mobile satellite communications system and onboard packet switch.

Author

Communication Networks; Packet Switching; Satellite Communication; Data Processing Terminals; Mobile Communication Systems; Engineering Test Satellites

20050061195 National Inst. of Information and Communications Technology, Japan

Development of a Signal Processing and Packet-switching (OBP/PKT) Communication Terminal

Hamamoto, Naokazu; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 225-233; In English; See also 20050061163; Copyright; Avail: Other Sources

A developmental trial was carried out of a communication terminal to be used for satellite communication experiments using the signal-processing (OBP) and packet-switching (PKT) equipment onboard ETS-VIII. The OBP and the PKT are the satellite voice-communication equipment and data-communication equipment, respectively, for mobile satellite communications. They have different transmitting speeds and communication protocols from each other. The terminal developed has two functions: 91) to operate as a communication terminal for the OBP, and (2) to act as a terminal for the PKT. To accomplish these two different functions using the same terminal, digital signal processing techniques were adapted from the area of modulation and demodulation processing in the base-band to the process of frequency conversion between the base-band and inter-medium frequency band. These signal-processing techniques were performed using integrated-circuit semiconductors for digital frequency conversions and software signal processing with a high-speed digital signal processor. This trial showed that it is feasible to build a unique, compact communication terminal (A4 size without the RF sections) that can be operated for both types of communication systems.

Author

Packet Switching; Satellite Communication; Signal Processing; Data Processing Terminals; Engineering Test Satellites; Onboard Equipment

20050061196 National Inst. of Information and Communications Technology, Tokyo, Japan

An OFDM Terminal for Experiment of a Satellite Audio Broadcasting

Yamamoto, Shin-ichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 211-218; In English; See also 20050061163; Copyright; Avail: Other Sources

An OFDM terminal, with sound quality equivalent to that of a compact disk, is used for experiments on satellite audio broadcasting using Engineering Test Satellite VIII (ETS-VIII). The terminal consists of an OFDM signal generator, and a test receiver for estimating OFDM signals. The modulation method used is a multi-carrier OFDM system. A feature of this OFDM method is that good transmission characteristics are acquired even if a delay wave exists in a transmission path. It is suitable for reception of signals in urban areas where delay waves often exist as a result of reflections from buildings, etc. However, since it is a multi-carrier, when there are nonlinear characteristics in the transmission path, the transmission characteristic deteriorates due to the influence of inter-modulation. For this reason, when a satellite transponder designed to achieve electric-power efficiency is used, it is thought that a bit error rate may deteriorate under this influence. This paper describes an outline of an OFDM terminal for satellite audio broadcasting experiments. The results of a ground test using an electric model of ETS-VIII (SEM) and an OFDM terminal are also reported.

Author

Broadcasting; Engineering Test Satellites; Satellite Transmission; Audio Equipment; Data Processing Terminals

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20050070733 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The Effect of Non-Streamlined and Non Symmetrical Erection of Flap on Flying Prestige Rocket RX 250 LPN

Atmadi, Sulistyo; Riyadi, Ahmad; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 1-5; In Malay-Indonesian; See also 20050070732; Copyright; Avail: Other Sources

The performance of a rocket depend on several factor, one of which is the value of drag experienced during flight. This drag is contributed by the shape and the many components of the rocket. This paper discussed the fin misalignment and asymetrisness in in respect to its main axis, which results in a change in the drag of RX-250-LPN rocket. The discussion was conducted with assuming the variation of this fin alignment from 1 deg. to 2 deg. DATCOM was used to obtain aerodynamic parameters of the rocket. In addition, MATLAB 6.3. was used to calculate the performance of rocket. The knowledge of this fin misalignment can be used to get the minimum accuracy needed for better fin setting during rocket assembly.

Author

Alignment; Construction; Drag; Fins; Rocket Flight

20050071087 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Modular, Adaptive, Reconfigurable Systems: Technology for Sustainable, Reliable, Effective, and Affordable Space Exploration

Esper, Jaime; December 07, 2004; 11 pp.; In English; Space Technology Applications International Forum, 2005; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

In order to execute the Vision for Space Exploration, we must find ways to reduce cost, system complexity, design, build, and test times, and at the same time increase flexibility to satisfy multiple functions. Modular, Adaptive, Reconfigurable System (MARS) technologies promise to set the stage for the delivery of system elements that form the building blocks of increasingly ambitious missions involving humans and robots. Today, space systems are largely specialized and built on a case-by-case basis. The notion of modularity however, is nothing new to NASA. The 1970's saw the development of the Multi-Mission Modular spacecraft (MMS). From 1980 to 1992 at least six satellites were built under this paradigm, and included such Goddard Space Flight Center missions as SSM, EUVE, UARS, and Landsat 4 and 5. Earlier versions consisted of standard subsystem 'module' or 'box' components that could be replaced within a structure based on predefined form factors. Although the primary motivation for MMS was faster/cheaper integration and test, standardization of interfaces, and ease of incorporating new subsystem technology, it lacked the technology maturity and programmatic 'upgrade infrastructure' needed to satisfy varied mission requirements, and ultimately it lacked user buy-in. Consequently, it never evolved and was

phased out. Such concepts as the Rapid Spacecraft Development Office (RSDO) with its regularly updated catalogue of prequalified busses became the preferred method for acquiring satellites. Notwithstanding, over the past 30 years since MMS inception, technology has advanced considerably and now modularity can be extended beyond the traditional MMS module or box to cover levels of integration, from the chip, card, box, subsystem, to the space system and to the system-of-systems. This paper will present the MARS architecture, cast within the historical context of MMS. Its application will be highlighted by comparing a state-of-the-art point design vs. a MARS-enabled lunar mission, as a representative robotic case design.
Author
Spacecraft Modules; Spacecraft Design; Standardization; Spacecraft Configurations

20050071089 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Miniature Loop Heat Pipe with Multiple Evaporators for Thermal Control of Small Spacecraft
Ku, Jentung; Ottenstein, Laura; Douglas, Denya; Pauken, Michael; Birur, Gajanana; [2005]; 13 pp.; In English; Government Microcircuit Applications and Critical Technology Conference, 4-7 Apr. 2005, Las Vegas, NV, USA; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents an advanced miniature heat transport system for thermal control of small spacecraft. The thermal system consists of a loop heat pipe (LHP) with multiple evaporators and multiple deployable radiators for heat transfer, and variable emittance coatings on the radiators for performance enhancement. Thermoelectric coolers are used to control the loop operating temperature. The thermal system combines the functions of variable conductance heat pipes, thermal switches, thermal diodes, and the state-of-the-art LHPs into a single integrated thermal system. It retains all the performance characteristics of state-of-the-art LHPs and offers additional advantages to enhance the functionality, performance, versatility, and reliability of the system. Steady state and transient analytical models have been developed, and scaling criteria have also been established. A breadboard unit has been built for functional testing in laboratory and thermal vacuum environments. Experimental results show excellent performance of the thermal system and correlate very well with theoretical predictions.
Author
Evaporators; Temperature Control; Miniaturization; Heat Pipes; Heat Transfer; Spacecraft Design

20050071090 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Design and Development of the Space Technology 5 (ST5) Solar Arrays
Lyons, John; Fatemi, Navid; Gamica, Robert; Sharma, Surya; Senft, Donna; Maybery, Clay; [2005]; 4 pp.; In English; 31st IEEE Photovoltaic Specialists Conference, 3-7 Jan. 2005, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail: CASI; A01, Hardcopy

The National Aeronautics and Space Administration's (NASA's) Space Technology 5 (ST5) is designed to flight-test the concept of miniaturized 'small size' satellites and innovative technologies in Earth's magnetosphere. Three satellites will map the intensity and direction of the magnetic fields within the inner magnetosphere. Due to the small area available for the solar arrays, and to meet the mission power requirements, very high-efficiency multijunction solar cells were selected to power the spacecraft built by NASA Goddard Space Flight Center (GSFC). This was done in partnership with the Air Force Research Lab (AFRL) through the Dual-Use Science and Technology (DUS&T) program. Emcore's InGaP/lnGaAs/Ge Advanced triple-junction (ATJ) solar cells, exhibiting an average air mass zero (AMO) efficiency of 28.0% (one-sun, 28 C), were used to populate the arrays. Each spacecraft employs 8 identical solar panels (total area of about 0.3 square meters), with 15 large-area solar cells per panel. The requirement for power is to support on-orbit average load of 13.5 W at 8.4 V, with plus or minus 5% off pointing. The details of the solar array design, development and qualification considerations, as well as ground electrical performance & shadowing analysis results are presented.
Author
Flight Tests; Solar Arrays; Small Scientific Satellites; Satellite Design; NASA Space Programs; Fabrication; Technology Utilization

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20050061183 National Inst. of Information and Communications Technology, Japan

Onboard Packet Switch for High-Data-Rate Satellite Communications

Taira, Shinichi; Hamamoto, Naokazu; Hashimoto, Yukio; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 95-100; In English; See also 20050061163; Copyright; Avail: Other Sources

An onboard switch makes satellite communications systems with a multi-beam structure more efficient. The Communications Research Laboratory has been studying the mobile satellite communications network and developing an onboard packet switch. The switch has the function as bridges operating at the data link layer of the open systems interconnect networking model. When the switch is located in a satellite, the satellite can be regarded as the central hub. One beam of the mobile links corresponds to one segment of the network. The bridges' learning process is carried out between the beams, and the switching system builds and maintains tables with Media Access Control address information. The performance test results of the proto-flight model show that the performance of the onboard packet switch is sufficient to meet the system requirements. This onboard packet switch will be installed on the Engineering Test Satellite VIII (ETS-VIII), which is a geostationary satellite with large deployable antennas, high power amplifiers, and onboard switches for S-band personal and mobile satellite communications and sound broadcasting. After the launch of the ETS-VIII by the H-IIA rocket, various experiments will be carried out. Key words Engineering Test Satellite VIII, Onboard switch, Mobile satellite communication, Packet switching Author

Packet Switching; Satellite Communication; Data Links; Communication Networks; Access Control

20050061184 National Inst. of Information and Communications Technology, Japan

On-Board Data Processing Part Time-Comparison-Equipment Processing Unit (TCE-PRO)

Liuchi, Hitoshi; Takahashi, Yasuhiro; Nakagawa, Fumimaru; Hosokawa, Mizuhiko; Imae, Michito; Gotoh, Tadahiro; Fujieda, Miho; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 117-126; In English; See also 20050061163; Copyright; Avail: Other Sources

In satellite positioning systems, such as the Global Positioning System (GPS), the receiver's position is calculated from the measured pseudo-range of the received radio signal. This signal is generated by the satellite based on its on-board atomic clock. Any error in the on-board clock directly affects the pseudo-range. Synchronization between the clocks on-board satellites and clocks on earth is thus indispensable for the development of next-generation systems. The goal of our research is to establish a precise method for comparing the time between earth and satellite clocks. The time-comparison-equipment processing unit (TCE-PRO) on-board Engineering Test Satellite VIII (ETS VIII) functions as the TCE-control unit; it controls data acquisition as well as digital data processing. It calculates the pseudo-ranges and instrumental delay from the code phases and carrier phases of a combined IF signal (the received signal, the transmitted signal, and the delay calibration signal), enabling the time to be synchronized between earth and satellite clocks. Key words ETS-VIII, Satellite positioning, Time comparison/transfer, Digital signal processing, Delay lock loop (DLL), Costas loop

Author

Onboard Data Processing; Global Positioning System; Atomic Clocks; Radio Signals

20050061185 National Inst. of Information and Communications Technology, Japan

Telemetry and Command Processing System for Experiments

Ohashi, Hajime; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 145-154; In English; See also 20050061163; Copyright; Avail: Other Sources

Two telemetry and command processing systems are being prepared as part of the ground facilities by CRL to monitor and control CRL's onboard equipment of ETS-VIII. One is for mobile communication experiments and another is for time comparing experiments. They have the almost same architecture but databases and amount of host hardware are adjusted for each target telemetry and command set respectively. So all telemetries and commands are transmitted through TT&C system of NASDA that CRL's T&C systems communicate with ETS-VIII through NASDA's TT&C system. Some of telemetries and commands from/to CRL's onboard equipment which are critical for ETS-VIII satellite system safety are monitored and

checked by NASDA's TT&C system too. The other telemetries and commands are simply relayed by NASDA's lT&C between CRL's onboard equipment and CRL's T&C systems. CRL's T&C system have realtime and non-realtime servers and some terminals. Servers manage the communication with NASDA's TT&C system, process telemetries and commands, and archive telemetry data and command history data. On each terminal, operators can monitor the status of onboard equipment and control them by sending commands. In this paper, the architecture of CRL's T&C systems and their functions are introduced. Keywords ETS-VIII, Eighth Engineering Test Satellite, lT&C, Telemetry and Command, CCSDS, Ground segment
Author
Telemetry; Command Guidance; Control Equipment; Onboard Equipment; Engineering Test Satellites

20050061193 National Inst. of Information and Communications Technology, Japan
Time Comparison Equipment: RF Part
Takahashi, Yasuhiro; Gotoh, Tadahiro; Nakagawa, Fumimaru; Fujieda, Miho; Imae, Michito; Kiuchi, Hitoshi; Hosokawa, Mizuhiko; Noda, Hiroyuki; Sano, Kazuhiko; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 109-116; In English; See also 20050061163; Copyright; Avail: Other Sources

The Engineering Test Satellite VIII (ETS-VIII) missions will include application experiments using Cesium atomic clocks in space. Using this satellite, the CRL (Communications Research Laboratory) and the JAXA (Japan Aerospace Exploration Agency) is planning to conduct a precise time and frequency transfer between an atomic clock on-board the satellite and a ground-reference clock. This paper describes the system for precise time transfer between the ground reference clock and on-board clock.
Author
Engineering Test Satellites; Atomic Clocks; Cesium; Time Measurement; Satellite Communication

20050071104 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Technology 5: Changing the Mission Design without Changing the Hardware
Carlisle, Candace C.; Webb, Evan H.; Slavin, James A.; [2005]; 10 pp.; In English; 2004 IEEE Aerospace Conference, 5-12 Mar. 2005, Big Sky, MT, USA
Report No.(s): IEEEAC Paper-1367; No Copyright; Avail: CASI; A02, Hardcopy

The Space Technology 5 (ST-5) Project is part of NASA's New Millennium Program. The validation objectives are to demonstrate the research-quality science capability of the ST-5 spacecraft; to operate the three spacecraft as a constellation; and to design, develop, test and flight-validate three capable micro-satellites with new technologies. A three-month flight demonstration phase is planned, beginning in March 2006. This year, the mission was re-planned for a Pegasus XL dedicated launch into an elliptical polar orbit (instead of the Originally-planned Geosynchronous Transfer Orbit.) The re-plan allows the mission to achieve the same high-level technology validation objectives with a different launch vehicle. The new mission design involves a revised science validation strategy, a new orbit and different communication strategy, while minimizing changes to the ST-5 spacecraft itself. The constellation operations concepts have also been refined. While the system engineers, orbit analysts, and operations teams were re-planning the mission, the implementation team continued to make progress on the flight hardware. Most components have been delivered, and the first spacecraft is well into integration and test.
Author
Mission Planning; Satellite Constellations; Microsatellites

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SPACECRAFT PROPULSION AND POWER

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

20050080680 Washington Univ., Seattle, WA, USA
Tests of Mach's Principle With a Mechanical Oscillator
Millis, Marc G., Technical Monitor; Cramer, John G.; Fey, Curran W.; Casissi, Damon V.; October 2004; 15 pp.; In English
Contract(s)/Grant(s): NASA Order C-78671-K; WBS 22-62-949-10-01
Report No.(s): NASA/CR-2004-213310; E-14770; No Copyright; Avail: CASI; A03, Hardcopy

James F. Woodward has made a prediction, based on Sciama's formulation of Mach's Principle in the framework of general relativity, that in the presence of an energy flow the inertial mass of an object may undergo sizable variations, changing as the second time derivative of the energy. We describe an attempt to test for the predicted effect with a charging capacitor, using a technique that does not require an unbalanced force or any local violation of Newton s 3rd law of motion. We attempt to observe: (1) the gravitational effect of the varying mass and (2) the effect of the mass variation on a driven harmonic oscillator with the charging capacitor as the oscillating mass. We report on the predicted effect, the design and implementation of the measurement apparatus, and initial experience with the apparatus. At this time, however, we will not report on observations of the presence or absence of the Woodward effect.
Author
Mechanical Oscillators; Gravitational Effects; Mach Number

20050080711 Analex Corp., Brook Park, OH, USA
Addressing the Real-World Challenges in the Development of Propulsion IVHM Technology Experiment (PITEX)
Maul, William A.; Chicatelli, Amy; Fulton, Christopher E.; Balaban, Edward; Sweet, Adam; Hayden, Sandra Claire; Bajwa, Anupa; January 2005; 20 pp.; In English; AIAA 1st Intelligent Systems Technical Conference, 20-22 Sep. 2004, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-00145; WBS-22-794-40-56
Report No.(s): NASA/CR-2005-213422; AIAA Paper 2004-6361; E-14948; No Copyright; Avail: CASI; A03, Hardcopy

The Propulsion IVHM Technology Experiment (PITEX) has been an on-going research effort conducted over several years. PITEX has developed and applied a model-based diagnostic system for the main propulsion system of the X-34 reusable launch vehicle, a space-launch technology demonstrator. The application was simulation-based using detailed models of the propulsion subsystem to generate nominal and failure scenarios during captive carry, which is the most safety-critical portion of the X-34 flight. Since no system-level testing of the X-34 Main Propulsion System (MPS) was performed, these simulated data were used to verify and validate the software system. Advanced diagnostic and signal processing algorithms were developed and tested in real-time on flight-like hardware. In an attempt to expose potential performance problems, these PITEX algorithms were subject to numerous real-world effects in the simulated data including noise, sensor resolution, command/valve talkback information, and nominal build variations. The current research has demonstrated the potential benefits of model-based diagnostics, defined the performance metrics required to evaluate the diagnostic system, and studied the impact of real-world challenges encountered when monitoring propulsion subsystems.
Author
Systems Health Monitoring; Technology Utilization; Spacecraft Propulsion; Systems Engineering; X-34 Reusable Launch Vehicle

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*.

20050061213 Surtek, Inc., Golden, CO, USA
Coupling the Alkaline-Surfactant-Polymer Technology and the Gelation Technology to Maximize Oil Production
Pitss, M.; Qi, J.; Wilson, D.; Dowling, P.; 2004; In English
Report No.(s): DE2004-828457; No Copyright; Avail: National Technical Information Service (NTIS)

Gelation technologies have been developed to provide more efficient vertical sweep efficiencies for flooding naturally fractured oil reservoirs or more efficient areal sweep efficiency those with high permeability contrast 'thief zones'. The field proven alkaline-surfactant-polymer technology economically recovers 15% to 25% OOIP more oil than waterflooding in the swept pore space of an oil reservoir. However, alkaline-surfactant-polymer technology is not amenable to the naturally fractured reservoirs or those with thief zones because much of the injected solution bypasses the target pore space containing oil. The objective of this work is to investigate whether combining these two technologies could broaden the applicability of alkaline-surfactant-polymer flooding into these reservoirs. Fluid-fluid interaction with different gel chemical compositions and alkaline-surfactant-polymer solution with pH values ranging from 9.2 to 12.9 have been tested. Aluminum-polyacrylamide gels are not stable to alkaline-surfactant-polymer solutions at any pH. Chromium - polyacrylamide gels with polymer to chromium ion ratios of 25 or greater were stable to alkaline-surfactant-polymer solutions if solution pH was 10.6 or less. When

the polymer to chromium ion was 15 or less, chromium-polyacrylamide gels were stable to alkaline-surfactantpolymer solutions with pH values up to 12.9. Chromium-xanthan gum gels were stable to alkaline-surfactant-polymer solutions with pH values of 12.9 at the polymer to chromium ion ratios tested. Silicate-polyacrylamide, resorcinol-formaldehyde, and sulfomethylated resorcinolformaldehyde gels were also stable to alkaline-surfactant-polymer solutions with pH values ranging from 9.2 to 12.9. Iron-polyacrylamide gels were immediately destroyed when contacted with any of the alkaline-surfactant-polymer solutions with pH values of 9.2 to 12.9.
NTIS
Surfactants; Oils; Gums (Substances); Chemical Composition

20050061261 Boston Univ., Boston, MA, USA
Mediation of Heterogeneous Oxidation of Aliphatic Hydrocarbons
Stavropoulos, P.; Levy, B.; 2002; 18 pp.; In English
Report No.(s): DE2004-821786; No Copyright; Avail: Department of Energy Information Bridge

Our research has as its primary objective the development and mechanistic investigation of suitable photocatalytic surfaces, as mediators of energy-efficient heterogeneous oxidation of aliphatic hydrocarbons. Particular emphasis is placed on mixed iron(III)/titanium(IV) oxide semiconductor particulates, featuring low %Fe content, for which a novel synthetic protocol has been developed in this laboratory, relying on sol-gel hydrolysis of high purity iron and titanium isopropoxide precursors, followed by thermal treatment to develop the active anatase phase. This methodology leads to replacement of Ti(IV) ions by Fe(III) sites in the TiO(sub 2) (anatase) lattice, and is contrasted to samples prepared by physical mixing of nanometer-sized a-Fe(sub 2)O(sub 3) (gift from MACH I, Inc.) and TiO(sub 2) (Degussa P-25). Mechanistic understanding of these systems involves multifaceted approaches. Our unique ability to evaluate charge-carrier separation distances, as measured by time-resolved photocharge experiments (TRPC) on instrumentation pioneered by Dr. Levy, permits correlation of this important photophysical property to photocatalytic efficiency and reaction mechanism. A major redesign of our benchmark TRPC apparatus was recently undertaken, which provides for controlled environments during measurement, i.e., vacuum; controlled atmosphere (inert or reactive); and temperature control (-100 to +150 C). Operation of this new TRPC cell necessitated insulation from RF noise, which was achieved by employing a walk-in Faraday enclosure to house the apparatus and supporting instrumentation.
NTIS
Aliphatic Hydrocarbons; Oxidation; Semiconductors (Materials)

20050071072 Houston Univ., TX, USA
Characteristic Length Scales of Step Bunching in KDP Crystalgrowth: In-situ Differential Phase-shifting Interferometry Study
Vekilov, Peter G.; Booth, N. A.; Chernov, A. A.; Crystal Growth; 2002; Vol. 237-239, Part 1, pp. 1818-1824; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources

No abstract available
Bunching; Differential Interferometry; Crystal Growth

20050071591 Lawrence Livermore National Lab., Livermore, CA
Influence of Composition, Helium Generation Rate and Dpa Rate on Neutron-Induced Swelling of Fe-15Cr-16Ni-0.25Ti Alloys in FFTF at (approx) 400 Degrees C
Okita, T.; Wolfer, W. G.; Sato, T.; Sekimura, N.; Garner, F. A.; Aug. 05, 2003; In English
Report No.(s): DE2004-15007889; USRL-JC-154744; No Copyright; Avail: National Technical Information Service (NTIS)

Contrary to the behavior of swelling of f.c.c. Fe-15Cr-16Ni and Fe-15Cr-16Ni-0.25Ti alloys irradiated together in the same FFTF-MOTA experiment, Fe-15Cr-16Ti-0.25Ti-0.05C does not exhibit a dependence of swelling on dpa rate at approx. 400 degrees C. The transient regime of swelling is prolonged by carbon addition, however. Addition of boron to the carbon-doped alloy decreases the swelling somewhat but does not restore the sensitivity to dpa rate. It appears that the primary influence of boron is chemical in nature, probably associated with boron's impact on the behavior of carbon. Boron's role as a source of helium is thought to be secondary.
NTIS
Iron Alloys; Nickel Alloys; Chromium Alloys

20050071638 Gas Technology Inst., Des Plaines, IL, USA, Maurer Technology, Inc., Sugar Land, TX, USA
Sealing Large-Diameter Cast-Iron Pipe Joints Under Live Conditions
Apr. 2004; In English
Report No.(s): DE2004-825559; No Copyright; Avail: National Technical Information Service (NTIS)

Utilities in the U.S. operate over 75,000 km (47,000 miles) of old cast-iron pipes for gas distribution. The bell-and-spigot joints that connect pipe sections together tend to leak as these pipes age. Current repair practices are costly and highly disruptive. The objective of this program is to design, test and commercialize a robotic system capable of sealing multiple cast-iron bell and spigot joints from a single pipe entry point. The proposed system will perform repairs while the pipe remains in service by traveling through the pipe, cleaning each joint surface, and installing a stainless-steel sleeve lined with an epoxy-impregnated felt across the joint. This approach will save considerable time and labor, avoid traffic disruption, and eliminate any requirement to interrupt service to customers (which would result in enormous expense to utilities).
NTIS
Pipes (Tubes); Maintenance; Utilities; Robotics

24
COMPOSITE MATERIALS

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

20050061221 Missouri Univ., Columbia, MO, USA
Structural Integrity of RC Columns Wrapped with FRP Sheet Subjected to Various Environmental Conditions Including Corrosion
Belarbi, A.; Myers, J. J.; Chandarskekhara, K.; Watkins, S. E.; Bae, S. W.; Nov. 2004; In English
Report No.(s): PB2005-102492; No Copyright; Avail: National Technical Information Service (NTIS)

Although the short-term performance of reinforced concrete (RC) columns wrapped with fiber reinforced polymer (FRP) composite materials has been widely studied, research studies on the long-term performance are limited. The objective of this study was to evaluate the effects of various environmental conditions on the long-term behavior of RC columns wrapped with FRP sheets. The experimental program comprised two parts; ambient environmental effect tests and corrosion tests. The environmental conditions considered in the ambient environmental tests included (1) freeze-thaw cycles, (2) high-temperature cycles, (3) high humidity cycles, (4) ultraviolet (UV) radiation, and (5) saline solution; while the corrosion tests dealt with the corrosion of steel reinforcement embedded in RC columns wrapped with FRP sheets. RC columns were wrapped with carbon fiber reinforced polymer (CFRP) sheets and glass fiber reinforced polymer (GFRP) sheets and conditioned under the environmental conditions listed. After the environmental conditioning, uni-axial compression tests were conducted in order to evaluate the effects on the mechanical properties, such as column capacity, stiffness, and ductility. The test results showed that the mechanical properties were affected due to the environmental conditioning and the corrosion of steel reinforcement, and the effects varied according to the types of environmental conditions. Based on these results, improved design guidelines for the RC columns wrapped with FRP sheet were proposed. The proposed design guidelines included an analytical model and reduction factors to account for the effects of various environmental conditions.
NTIS
Concretes; Environmental Tests; Glass Fiber Reinforced Plastics; Structural Failure; Mechanical Properties; Corrosion Tests

20050061282 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Reforming of Liquid Hydrocarbons in a Novel Hydrogen-Selective Membrane-Based Fuel Processor
Ilias, S.; Jun. 2003; 14 pp.; In English
Report No.(s): DE2004-825381; No Copyright; Avail: Department of Energy Information Bridge

We propose to develop an inorganic metal-metal composite membrane to study reforming of liquid hydrocarbons and methanol by equilibrium shift in membrane-reactor configuration, viewed as fuel processor. Based on our current understanding and experience in the Pd-ceramic composite membrane, we propose to further develop this membrane to a Pd and Pd-Ag alloy membrane on microporous stainless steel support to provide structural reliability from distortion due to thermal cycling. Because of the metal-metal composite structure, we believe that the associated end-seal problem in the Pd-ceramic composite membrane in tubular configuration would not be an issue at all. We plan to test this membrane as membrane-reactorseparator for reforming liquid hydrocarbons and methanol for simultaneous production and separation of high-purity hydrogen for PEM fuel cell applications. To improve the robustness of the membrane film and deep penetration into the pores, we have used osmotic pressure field in the electroless plating process. Using this novel method, we deposited

thin Pd-film on the inside of microporous stainless steel tube and the deposited film appears to robust and defect free. Work is in progress to evaluate the hydrogen perm-selectivity of the Pd-stainless steel membrane.
NTIS
Membranes; Hydrocarbons; Palladium; Silver; Alloys

20050070910 Beijing Univ. of Technology, Beijing, China
The Study Of Special ELID Precision Surface Grinding Fluids For Composite Materials
Guan, Jia-Liang; Fan, Jin-Wei; Liu, Ben-Dong; Huang, Xu-Dong; Progress of Machining Technology; December 2004, pp. 158-162; In English; See also 20050070885; Copyright; Avail: Other Sources

On the basis of the grinding principles and grinding characteristics of the composite material, considering the characteristic of electrolytic dressing, the effect of activation and passivation and machining mechanisms of grinding fluid in ELID grinding, the study on ELID special grinding fluid for composite material has been carried out based on the general ELID grinding fluid by large numbers of assaying. The special ELID grinding fluid had been developed fit for the grinding characteristic of composite material. The experiment of ELID precision mirror surface to the representative material steel-bonded carbide had been conducted.
Author
Machining; Passivity; Composite Materials; Carbides

20050070952 South China Univ. of Technology, Guangzhou, China
Fractal Surface of SiC(sub p) Metal Matrix Composites and Its Wear Resistance
Liu, Ya-Jun; Wan, Zheng-Ping; Tang, Yong; Progress of Machining Technology; December 2004, pp. 975-979; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-31322; Copyright; Avail: Other Sources

Fractal characterization of surface topography is applied to study the wear processes of SiC particle-reinforced metal matrix composites (SiC(sub p) MMC). The Weierstrass-Mandelbrot function is used to simulate the profile curve of the finished surface and the fractal dimension D is calculated by least square fitting method (LSFM). Experimental results of wear testing showed that the wear rate decreased with the increasing of D in the range 1.30-1.58. The effect of fractal dimension D on the wear resistance is also discussed in this paper.
Author
Fractals; Metal Matrix Composites; Silicon Carbides; Wear Resistance; Surface Properties; Particulate Reinforced Composites

20050070958 Osaka Univ., Suita, Japan
Study On Grinding Of Carbon Fiber Reinforced Plastics In Dry Method
Fujiwara, Junsuke; Tashiro, Tetsuya; Hanasaki, Shinsaku; Progress of Machining Technology; December 2004, pp. 27-32; In English; See also 20050070885; Copyright; Avail: Other Sources

CFRP (Carbon Fiber Reinforced Plastics) are used for the precision parts and the demand for the severe dimensional tolerance is increasing. Such parts are generally finished with the grinding process. In this study, the surface grinding of CFRP was carried out. In order to investigate the grinding mechanism, the cloth CFRP and the unidirectional CFRP were ground. The fiber angle of CFRP was 0, 45, 90 and 135deg. The ground surface was thinly covered with epoxy resin which was the matrix of CFRP. In order to investigate the influence of grinding heat on the plastic deformation of the epoxy resin, the grinding temperature in dry method was measured with a thermo couple. The grinding temperature using an air cooler was also measured. And chips were observed in detail. The main results obtained were as follows: (1) The carbon fiber was cut to pieces by the grinding. (2) The grinding temperature of CFRP was about 125 C when a SD230PV wheel was used. And the epoxy resin was not softened by the grinding heat.
Author
Carbon Fiber Reinforced Plastics; Grinding Machines; Cutting; Epoxy Resins

20050070999 Harbin Inst. of Tech., China
Mill-Grinding Machining for Particle-Reinforced Aluminum Matrix Composites
Yao, Ying-Xue; Li, De-Pu; Yuan, Zhe-Jun; Progress of Machining Technology; December 2004, pp. 258-263; In English; See also 20050070885; Copyright; Avail: Other Sources

With the excellent mechanical properties, particle-reinforced aluminum matrix composites have gained widely application

in aeronautics and astronautics industries. Due to the high brittleness, workpiece breakage often occurs during the cutting processes, as the results, the machining quality is hard to be satisfied. In the paper, a mill-grinding method for machining particle-reinforced aluminum matrix composites is proposed and studies on machining effect of the method and tool wear are carried out based on experiments. The results indicate that the mill-grinding can avoid workpiece breakage in the machining process and it is an effective method for machining particle-reinforced aluminum matrix composites.
Author
Aluminum Alloys; Machining; Metal Matrix Composites; Grinding (Material Removal)

20050071046 Tsinghua Univ., Hsinchu, China
Analysis Of Delamination In Drilling Composite Materials Using Core-Saw Drill
Hocheng, Hong; Tsao, Chungchen; Progress of Machining Technology; December 2004, pp. 38-43; In English; See also 20050070885
Contract(s)/Grant(s): NSC90-2212-E-007-041; Copyright; Avail: Other Sources

Advanced composite materials offer significant advantages in strength and stiffness coupled with light weight relative to conventional metallic materials. Amongst all machining operations, drilling using twist drill is the most commonly applied method for generating holes for riveting and fastening structural assemblies. The research references of the drilling of fiber-reinforced plastics report that the quality of the cut surfaces is strongly dependent on drilling geometry. The size of the delamination zone has been shown to be related to the thrust force developed during the drill process and there is a critical thrust force below which no damage occurs. This paper presents a comprehensive analysis of delamination in use of core-saw drill. The critical thrust force at the onset of delamination is predicted and compared with the twist drill. A guide for drill design can be developed based on the proposed model, and this approach can be extended to examine the effects of various drill or future innovative drill design.
Author
Drilling; Composite Materials; Machining; Cutting; Delaminating

20050080329 Florida Agricultural and Mechanical Univ., Tallahassee, FL USA
Cohesive Zone Model Approach to Multiscale Modeling of Nanotube Reinforced Composites
Chandra, Namas; Oct. 2004; 8 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0202
Report No.(s): AD-A429051; AFRL-SR-AR-TR-04-0637; No Copyright; Avail: CASI; A02, Hardcopy

Our primary focus in this to apply the concept of cohesive zone models to link atomistic effect within a continuum based multi-scale model. We have used this approach to consider the effect of interfaces in carbon nanotubes on the properties of CNT based polymer matrix composites.
DTIC
Carbon Nanotubes; Cohesion; Composite Materials; Nanotubes

20050080339 Florida Agricultural and Mechanical Univ., Tallahassee, FL USA
Comprehensive Property Characterization of Nanotube Buckypaper-Reinforced Composite Materials
Wang, Ben; Liang, Richard; Zhang, Chuck; Kramer, Leslie; Apr. 2004; 204 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08630-01-1-0010; Proj-2502
Report No.(s): AD-A429065; AFRL-MN-EG-TR-2004-7112; No Copyright; Avail: Defense Technical Information Center (DTIC)

Recent investigations have shown that SWNTs possess remarkable mechanical properties exceeding those of any existing composite reinforcement materials, such as 1M7 carbon fibers. The exceptional thermal and electrical properties of SWNTs also demonstrate great potential for developing multifunctional materials. However, using nanotubes as reinforcements to produce quality composites is still a challenging issue due to their nanoscale dimension, unique chemical characteristics and intensive molecular interactions with resin molecules during composite processing.
DTIC
Carbon Nanotubes; Composite Materials; Nanotubes

20050080417 Army Defense Ammunition Center, McAlester, OK USA
NATO Pallet with Javelin Missiles, MIL-STD-1660 Tests
Nov. 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429210; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV) conducted tests in accordance with MIL-STD-1660, 'Design Criteria for Ammunition Unit Loads' on the NATO pallet with Javelin missiles. The NATO pallet was manufactured for the Lockheed Martin Javelin Joint Venture Office, Orlando, Florida. The Test Units were loaded to the correct weight of 660 Ibs. The tests accomplished on the Test Units were the stacking, repetitive shock, edgewise-rotational drop, incline-impact, forklifting, and disassembly tests. The unitization procedures were provided by DAC, Transportation Engineering Division (SJ MAC-DET).
DTIC
Missiles; North Atlantic Treaty Organization (NATO)

20050080712 NASA Glenn Research Center, Cleveland, OH, USA
Comparison of Elevated Temperature Tensile Properties and Fatigue Behavior of Two Variants of a Woven SiC/SiC Composite
Kalluri, Sreeramesh; Brewer, David N.; Sreeramesh, Kalluri; January 2005; 8 pp.; In English; 29th International Cocoa Beach Conference on Advanced Ceramics and Composites, 23-28 Jan. 2004, Cocoa Beach, FL, USA
Contract(s)/Grant(s): NCC3-1041; WBS-22-714-30-09; No Copyright; Avail: CASI; A02, Hardcopy

Tensile properties (elastic modulus, proportional limit strength, in-plane tensile strength, and strain at failure) of two variants of a woven SiC/SiC composite, manufactured during two separate time periods (9/99 and 1/01), were determined at 1038 and 1204 C by conducting tensile tests on specimens machined from plates. Continuous cycling fatigue tests (R = 0.05) and 20 cpm) were also conducted at the same two temperatures on specimens from both composites. In this study, average tensile properties, 95% confidence intervals associated with the tensile properties, and geometric mean fatigue lives of both composite materials are compared. The observed similarities and differences in the tensile properties are highlighted and an attempt is made to understand the relationship, if any, between the tensile properties and the fatigue behaviors of the two woven composites.
Author
Silicon Carbides; Ceramic Matrix Composites; Woven Composites; Modulus of Elasticity; Tensile Strength; Thermal Fatigue; Fatigue Tests

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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*.

20050061215 Commissariat a l'Energie Atomique, Grenoble, France
Reliability and Consistency of Surface Contamination Measurements
2002; In English
Report No.(s): DE2004-828420; No Copyright; Avail: National Technical Information Service (NTIS)

Surface contamination evaluation is a tough problem since it is difficult to isolate the radiations emitted by the surface, especially in a highly irradiating atmosphere. In that case the only possibility is to evaluate smearable (removeable) contamination since ex-situ countings are possible. Unfortunately, according to our experience at CEA, these values are not consistent and thus non relevant. In this study, we show, using in-situ Fourier Transform Infra Red spectrometry on contaminated metal samples, that fixed contamination seems to be chemisorbed and removeable contamination seems to be physisorbed. The distribution between fixed and removeable contamination appears to be variable. Chemical equilibria and reversible ion exchange mechanisms are involved and are closely linked to environmental conditions such as humidity and temperature.
NTIS
Contamination; Emittance; Chemical Equilibrium; Chemisorption

20050061259 Texas A&M Univ., College Station, TX
Progress Report for the Three Year Funding Period April 2001-March 2004
2004; 22 pp.; In English
Report No.(s): DE2004-823593; No Copyright; Avail: Department of Energy Information Bridge

OAK-B135 Our BES funded research is aimed at determining structure(s) of model gas-phase ions and understanding

how structure influences unimolecular reactivity. The model gas-phase ions include positional isomers of di- and tri-amino acids synthesized in my laboratory, i.e., RGG, GRG, and GGR, to peptides derived from proteolytic digestion of biologically relevant proteins. We are especially interested in understanding the role of intramolecular interactions in the stabilizing ion structure and how changing the charge-site affects structure. The location of charge of gas-phase ions can be manipulated by changing the position of the charge carrying amino acid (basic vs. acidic side chains) and by derivatization of the N- and/or C-terminus. For example, the proton of(M+ H)+ ions is mobile and migrates over the entire molecule, whereas Li+, Na+, and to some extent K+ prefers to bind to the C-terminal or side-chain carboxylic acid groups, and Cu+ binds exclusively to the N-terminus and/or basic side-chains such as H, K, and R. The studies are carried out using tandem TOF mass spectrometry, viz. 193 nm (6.43 eV) photodissociation, low (Elab= 10-100 eV) and high kinetic energy (Elab= 1-10 keV) collision-induced dissociation (CID) and surface-induced dissociation (SID)(Elab= 20-70 eV). These techniques are used to probe the structure of model gas-phase ions, i.e., to determine the amino acid sequence of the peptide ions or metal ion (alkali metal and/or transition metal ions) binding site(s) or the site(s) of other charge-carrying functional groups, i.e. , oxidized side-chains as well as phosphate or sulfate groups. We are especially interested in understanding how metal ion binding alters the secondary/tertiary (2o/3o) structure of the peptide, i.e., intra-molecular interactions. We have also combine these studies with solution-phase studies and ion mobility spectrometry (IMS), which can be used to study 2o/3o structure of low-internal energy (collisionally stabilized) ions. It is difficult to probe 2o/3o structure of gas-phase ions using fragmentation chemistry, because the energy barriers to inter-conversion of different structural forms lie below the fragmentation threshold, studies of low internal energy ions are more suited for these studies. A major challenge for gas-phase ion research is the design of experimental structural probes that can be used in parallel with computational chemistry, molecular modeling and/or classical structural diagnostic tools to aid interpretation of the experimental data. Our experimental design and selection of research problems is guided by this philosophy. The following section of the progress report focus on three main issues: (1) technique and instrument development, and (2) studies of ion structure and ion chemistry.
NTIS
Ions; Structural Design

20050061277 Korea Advanced Inst. of Science and Technology, Taejon, Korea, Republic of, HK Research Corp., Baltimore, MD, USA
Sorption Characteristics of Aqueous Co(II) on Preformed Iron Ferrite Impregnated into Phenolsulphonic Formaldehyde Resin
Lee, K. J.; Kim, Y. K.; 2002; In English
Report No.(s): DE2004-828315; No Copyright; Avail: National Technical Information Service (NTIS)
A series of stepwise procedures to prepare a new organic-inorganic composite magnetic resin with phenolsulphonic-formaldehyde and freshly formed iron ferrite was established, based upon wet-and-neutralization method for synthesizing iron ferrite and pearl-polymerization method for synthesizing rigid bead-type composite resin. The composite resin prepared by the above method shows stably high removal efficiency (maximally over 3.1 meq. /gresin) to Co(II) species from wastewater in a wide range of solution pH. The wide range of applicable solution pH (i.e. pH 4.09 to 10.32) implies that the composite resin overcomes the limitations of the conventional ferrite process that is practically applicable only to alkaline conditions. It has been found that both ion exchange (by the organic resin constituent) and surface adsorption (by the inorganic adsorbent constituent) are major reaction mechanisms for removing Co(II) from wastewater, but surface precipitation results in the high sorption capacity to Co(II) beyond normal ion exchange capacity of the phenolsulphonic-formaldehyde resin.
NTIS
Ferrites; Resins; Formaldehyde; Adsorbents; Adsorption

20050070736 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Translation Test of Preparation of Polymethyl Methacrylate (PMMA)
Wahyuni Dwi; Dewi, Sri Rukmini; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 22-32; In Malay-Indonesian; See also 20050070732; Copyright; Avail: Other Sources
The polymethyl methacrylate (PMMA) research has been executed. Methyl methacrylate is polymerized by the free radical inisiation with the suspension condition using benzoyl peroxide inisiator, water as a solution and the gelatine stabilizer. In this research is executed as a standard ratio (part/part : monomer : water : stabilizer = 100 : 350 : (0,l contains as a subset 1) with the inisiator to monomer ratio variation (part/part) are : 0,1/50 ; 0,175/50 ; 0,25/50, the temperature variation are: 30 C, 45 C , 60 C and the time polymerization until 320 minutes. The result showed that the optimum monomer polymerized was at the inisiator to monomer ratio 0,25/50, the temperature at 45 C and at the time polymerization until 300 minutes with the monomer conversion was 86 %. The infrared spectroscopy analyses showed that there are polymethyl methacrylate in the

product. The gas liquid chromatography analysis showed the evolution of the monomer (methyl methacrylate concentration. Author
Monomers; Polymerization; Methyl Compounds; Acrylic Resins

20050070845 Houston Univ., TX, USA
Diffusion-limited Kinetics of Phase Transitions in Solutions
Vekilov, Peter G.; 2002; 3 pp.; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Diffusion; Kinetics; Phase Transformations; Solutions

20050070859 Houston Univ., TX, USA
Diffusion-Limited Kinetics of the Solution Solid Phase Transition of Molecular Substances
Vekilov, Peter G.; Petsev, D. N.; Chen, K.; [2003]; In English; Material and Crystal Growth Seminar, 16 May 2003, Huntsville, AL, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Molecular Diffusion; Kinetics; Solid Solutions; Phase Transformations

20050070863
Solidification/Stabilization of Elemental Mercury Waste by Amalgamation
Yim, S. P.; Ahn, B. G.; Lee, H. J.; Shon, J. S.; Chung, H.; 2003; In English
Report No.(s): DE2004-826236; No Copyright; Avail: National Technical Information Service (NTIS)
Experiments on solidification of elemental mercury waste were conducted by amalgamation with several metal powders such as copper, zinc, tin, brass and bronze. Unlike the previous studies which showed a dispersible nature after solidification, the waste forms were found to possess quite large compressive strengths in both copper and bronze amalgam forms. The durability was also confirmed by showing very minor changes of strength after 90 days of water immersion. Leach ability from the amalgam forms is also shown to be low: measured mercury concentration in the leachate by the Toxicity Characteristic Leaching Procedure (TCLP) was well below the Environmental Protection Agency (EPA) limit. Long term leaching behavior by Accelerated Leach Test (ALT) has shown that the leaching process was dominated by diffusion and the effective diffusion coefficient was quite low. The mercury vapor concentration from the amalgam forms were reduced to a 20% level of that for elemental mercury and to one-hundredth after 3 months.
NTIS
Solidification; Stability; Mercury Amalgams; Waste Disposal

20050071584 Lawrence Livermore National Lab., Livermore, CA, USA
New Sol-Gel Synthetic Route to Transition and Main-Group Metal Oxide Areogels Using Inorganic Salt Precursors
Gash, A. E.; Tillotson, T. M.; Satcher, J. H.; Hrubesh, L. W.; Simpson, R. L.; 2004; 22 pp.; In English
Report No.(s): DE2004-15003266; No Copyright; Avail: Department of Energy Information Bridge
We have developed a new sol-gel route to synthesize several transition and main-group metal oxide aerogels. The approach is straightforward, inexpensive, versatile, and it produces monolithic microporous materials with high surface areas. Specifically, we report the use of epoxides as gelation agents for the sol-gel synthesis of chromia aerogels and xerogels from simple Cr(III) inorganic salts. The dependence of both gel formation and its rate was studied by varying the solvent used, the Cr(III) precursor salt, the epoxide/Cr(III) ratio, as well as the type of epoxide employed. All of these variables were shown to affect the rate of gel formation and provide a convenient control of this parameter. Dried chromia aerogels were characterized by high-resolution transmission electron microscopy (HRTEM) and nitrogen adsorption/desorption analyses, results of which will be presented. Our studies have shown that rigid monolithic gels can be prepared from many different metal ions salts, provided the formal oxidation state of the metal ion is greater than or equal to +3. Conversely, when divalent transition metal salts are used precipitated solids are the products.
NTIS
Sol-Gel Processes; Aerogels; Metal Oxides

20050071590 Lawrence Livermore National Lab., Livermore, CA

Progress Toward Remediation of Uranium Tailings in Mailuu-Suu, Kyrgystan

Buckley, P. B.; Ranville, J.; Honeyman, B. D.; Smith, D. K.; Rosenberg, N.; Jul. 09, 2003; 14 pp.; In English

Report No.(s): DE2004-15007879; UCRL-JC-153644; No Copyright; Avail: Department of Energy Information Bridge

The town of Mailuu-Suu in Kyrgyzstan inherited 23 distinct tailings deposits from Soviet-Era uranium mining operations. Mailuu-Suu is located in the narrow landslide-prone valley of the Mailuu-Suu River about 25 km from the Uzbekistan border. Large-scale release of the radioactive tailings, as a result of landslides, could lead to irreversible contamination of the river and downstream areas. The Mailuu-Suu River is a tributary to the Syr-Darya River, the Fergana valley's main source of irrigation water. The Fergana Valley is a key agricultural region and major population center that spans Kyrgyzstan, Tajikistan, and Uzbekistan. The trans-boundary nature of the Mailuu-Suu tailings issue presents an opportunity for collaboration among these Central Asian states. A cooperative approach to addressing environmental issues such as Mailuu-Suu may contribute to the region's stability by facilitating peaceful associations. Experience from remediation of sites in the US under the Uranium Mill Tailings Remediation Action Project (UMTRA) will be useful in progressing toward remediation at Mailuu-Suu.

NTIS

Uranium; Mining; Deposits; Radioactivity

20050071595 Lawrence Livermore National Lab., Livermore, CA

Thermal Conductivity of Tetryl by Modulated Differential Scanning Calorimetry

Weese, R. K.; Jul. 28, 2003; In English

Report No.(s): DE2004-15007887; UCRL-JC-154532; No Copyright; Avail: National Technical Information Service (NTIS)

We investigated the use of the Modulated Differential Scanning Calorimeter to measure thermal conductivity (K) of the explosive, Tetryl, using two different methods, isothermal and nonthermal. A discussion of our methods and a comparison of our measured values to literature values of K for Tetryl, which deviated by as much as 50%, will be presented.

NTIS

Explosives; Thermal Conductivity

20050071625 Bechtel Hanford, Inc., Richland, WA, USA

Electrochemical Corrosion Studies, Core 313, Segments 19/19R1 and 19R3, Tank 241-AZ-102

2004; 94 pp.; In English

Report No.(s): DE2004-827711; RPP-20910; No Copyright; Avail: Department of Energy Information Bridge

This report describes the electrochemical corrosion testing of Tank 241-AZ-102 core 313 segments 19/19r1 and segment 19R3. The report contains cyclic potentiodyamic scans as well as chronoamperometry for both segment samples. Corrosion rates are reported based on electrochemical cyclic potentiodynamic scans.

NTIS

Electrochemical Corrosion; Tanks (Containers)

20050071635 Virginia Transportation Research Council, Charlottesville, VA

Evaluation of Two Corrosion Inhibitors Using Two Surface Application Methods for Reinforced Concrete Structures

Sharp, S. R.; Dec. 2004; In English

Report No.(s): PB2005-102687; VTRC 05-R16; No Copyright; Avail: National Technical Information Service (NTIS)

This study investigated the use of penetrating corrosion inhibitors to extend the life of existing reinforced concrete bridge decks. The use of assisted (vacuum/pressure injection) and unassisted (diffusion) treatment methods and two inhibitors were evaluated. The inhibitors were FerroGard 903, from Sika Corp., and TPS-II, from Surtreat International. Testing was performed on exposure slabs with 15 lb/yd3 of NaCl in the top layer and no NaCl in the bottom layer. The slab design was a variation of the specimen design provided in ASTM G109, with each slab containing nine steel reinforcing rods instead of three. The exposure slabs had either a uniform cover over the top pieces of steel or an inclined cover over the steel. TPS-II was also evaluated on the deck of a bridge in Orange County, Virginia. The study found that when applied to the concrete surface, neither inhibitor penetrated the concrete to reach the steel reinforcement. The vacuum/pressure injection method showed promise but requires refinement. In addition, based on macro-cell measurements, a sufficient quantity of inhibitor can be injected into the concrete to reduce the charge passed.

NTIS

Service Life; Corrosion Prevention; Composite Materials

20050071642 Florida Atlantic Univ., Boca Raton, FL, USA

Critical Literature Review of High-Performance Corrosion Reinforcements in Concrete Bridge Applications

Hartt, W. H.; Powers, R. G.; Leroux, V.; Lysogorski, D. K.; Jul. 2004; 58 pp.; In English

Report No.(s): PB2005-102664; No Copyright; Avail: CASI; A04, Hardcopy

A critical literature review regarding high-performance reinforcement for concrete bridge applications was conducted. This included (1) an overview of the corrosion-induced concrete deterioration process, (2) corrosion control alternatives, (3) the utility of corrosion (pitting) resistant alloys for applications in chloride containing environments, (4) a review of the pitting mechanism, and (5) performance of various metallic reinforcement types in aqueous solutions, cementitious embedments, test yard exposures, and actual structures. Specific alloys upon which attention was directed include black steel; MMFX-II; and various grades of ferritic, austenitic, and duplex stainless steels, as both solid and clad bars and in the as-received and pickled conditions. It was determined that the high-performance alloys outperformed black steel from a corrosion resistance standpoint. Unlike the various grades of black steel, however, a relatively wide range of corrosion performance was apparent for the high-performance counterparts depending upon the alloy and surface condition. At the same time, the present approach to materials selection for bridge construction is to identify the reinforcement candidate that will achieve the design life at the least life cycle cost. This, in turn requires that long-term corrosion performance of candidate reinforcement types be known for the anticipated design life of the bridge in question, which can be 75100 years. However, because service history for these materials in this application is limited, the necessary information can only be obtained from accelerated, short-term tests, but there is no reliable correlation between the results from these tests and long-term performance.

NTIS

Bridges; Reinforcing Materials; Corrosion Resistance; Concrete Structures

20050080336 Washington State Univ., Pullman, WA USA

Quantiative and Qualitative Determination of Organics in Water Using Electrospray Ionization Coupled With Ion Mobility Spectrometry

Hill, Herbert H., Jr; Apr. 2003; 9 pp.; In English

Contract(s)/Grant(s): DAAG55-98-1-0107

Report No.(s): AD-A429060; ARO-37349.1-CH; No Copyright; Avail: Defense Technical Information Center (DTIC)

The primary objectives of this research were to determine the capabilities of ESI-IMS for monitoring of aqueous samples containing chemical warfare agents or their subsequent degradation products. Rapid analysis times, excellent sensitivity, and potential portability make IMS an excellent tool for field applications. The ion chemistry for several chemical warfare degradation products were studied both with a prototype instrument and a high-resolution ESI-IMS instrument coupled with a quadrupole mass spectrometer (MS), showing excellent sensitivities for these compounds. Also, the ability to directly monitor water samples without prior sample preparation was shown. A portable ESI-IMS instrument has been designed and constructed. A high resolution ESI-IMS instrument coupled with a time of flight MS was assembled and showed excellent sensitivities for several chemical warfare degradation compounds. Due to the time compatibility of IMS and TOFMS, nine compounds were all resolved in two dimensions (mobility and m/z) within a minute.

DTIC

Chemical Analysis; Chemical Warfare; Ionization; Mobility; Spectrometers; Water

20050080351 New Mexico State Univ., Las Cruces, NM USA

A Chip-Based Capillary Electrophoresis-Contactless Conductivity Microsystem for Fast Measurements of Low-Explosive Ionic Components

Wang, Joseph; Pumera, Martin; Collins, Greg; Opekar, Frantisek; Jelinek, Ivan; Mar. 2002; 5 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0213

Report No.(s): AD-A429087; No Copyright; Avail: CASI; A01, Hardcopy

A miniaturized analytical system for separating and detecting inorganic explosive residues, based on the coupling of a micromachined capillary electrophoresis (CE) chip with a contactless conductivity detector is described. The low electroosmotic flow (EOF) of the poly(methylmethacrylate) (PMMA) chip material facilitates the rapid switching between analyses of cations and anions using the same microchannel and run buffer (and without an EOF modifier), and hence offers rapid (\h1 min) measurement of seven explosive-related cations and anions. Experimental parameters relevant to the separation and detection processes have been optimized. Addition of a l8-crown-6 ether modifier has been used for separating the peaks of co-migrating potassium and ammonium ions. The ionic-explosive microchip system combines the distinct advantages of contactless conductivity detection with the attractive features of plastic CE microchips. The new microsystem

offers great promise for monitoring explosive-related ions at the sample source, with significant advantages of speed/warning, efficiency, cost, or sample size.
DTIC
Chips (Electronics); Electrophoresis; Remote Sensors

20050080404 Boston Univ., Boston, MA USA
Kinetics of Physicochemical Infiltration and Filtration Processes
Redner, Sidney; Feb. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0173
Report No.(s): AD-A429172; ARO-39241-CH; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report outlines progress during the grant period on unsteady fluid flow processes in porous networks, the structure of growing networks, and the applications of statistical mechanics to fundamental non-equilibrium processes. In flow processes a statistical theory for the clogging time of a filter was constructed that successfully accounts for numerical simulations of filtration in porous networks. In related research, a comprehensive theory was developed for the infiltration and breakthrough of a contaminant as it passes through a neutralizer-impregnated porous medium. Finally, a detailed theory was constructed for the dissolution kinetics of a solid medium under action of a reactive acidic fluid whose motion is strongly biased. In an independent area, fundamental theoretical advances about the structure of growing networks was made by applying the rate equations approach. By this formalism, the degree distributions of growing networks, as well as a host of basic geometrical properties were quantified. Finally, new results were obtained about the kinetics of a variety of fundamental non-equilibrium processes, such as the kinetics of traffic clustering, aggregation, annihilation, and fragmentation. The report is divided into the following sections: filtration - clogging time and its distribution, infiltration kinetics, dissolution kinetics, structure of growing networks, cooling of inelastic gases, phase transitions in traffic flows with passing, ballistic annihilation kinetics, stochastic aggregation, travelling wave formulation of fragmentation, and recursive fragmentation processes. A list of 18 publications and 14 conference papers related to this work is included.
DTIC
Contaminants; Filtration; Fluid Flow; Infiltration; Kinetics; Nonequilibrium Flow; Porous Materials

20050080408 Vanderbilt Univ., Nashville, TN USA
Fabrication, Metrology and Modeling of Protective Coatings on Metallic MEMS Components
Weller, Robert A.; Dec. 2003; 21 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0283
Report No.(s): AD-A429177; ARO-39512.9-MS; No Copyright; Avail: Defense Technical Information Center (DTIC)

The original motivation for this work was to develop coating for metallic MEMS components to improve their performance and reliability. During a review of refractory oxides a report came to our attention that indium tin oxide (ITO), well known as the most widely used transparent conductor, is also piezoresistive. Thus, in principle, coating of ITO either alone or in combination with other thin films might be both protective and electrically functional.
DTIC
Fabrication; Indium Compounds; Metrology; Microelectromechanical Systems; Protective Coatings

20050080421 Florida Univ., Gainesville, FL USA
Structure Property Relationships in Liquid Crystalline Thermosets
Douglas, Elliot P.; Apr. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAAD55-98-1-0114
Report No.(s): AD-A429215; ARO-37597.10-CH; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes our work investigating structure property relationships in liquid crystalline thermoset (LCT's). Among the improved properties expected for LCT's compared to conventional thermosets are improved chemical resistance, resistance to environmental changes, and enhanced mechanical properties. The main objective for this work is to understand the relationships among molecular structure, phase transitions, cunning behavior, and properties for these unique materials. The morphology of LCT's can be understood as a complicated interaction between the liquid crystalline order and the network structure, which are both in turn affected by molecular architecture and cure behavior. Relating these structural parameters to the resulting properties will provide the basic structure-property relationships. In particular, LCT's will exhibit behavior that is characteristics of both ordered liquid crystals and highly crosslinked thermosets. We have investigated the synthesis, cure

behavior, thermal stability, mechanical properties and interaction with water.
DTIC
Crystallinity; Liquid Crystals; Plastics; Thermal Stability

20050080436 California Univ., San Diego, La Jolla, CA USA
Chemical Kinetic Characterization of Autoignition and Combustion of Diesel and JP-8
Seshadri, Kalyanasundaram; Apr. 2003; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-1-0259
Report No.(s): AD-A429299; ARO-39886.7-EG; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of the research was to obtain a fundamental understanding of the physical and chemical mechanisms of autoignition and combustion of diesel and JP-8 in non-premixed systems. Diesel and JP-8 are comprised of hundreds of aliphatic and aromatic hydrocarbon compounds. The major components of these fuels are straight chain paraffins, branched chain paraffins, cycloparaffins, aromatics, and alkenes. Detailed chemical kinetic mechanisms that describe combustion of many of the components in diesel and JP-8 are not available and are unlikely to be developed in the near future. As a consequence, it is necessary to develop surrogate fuels. The research was focused on developing the necessary scientific knowledge for developing these surrogate fuels. The experimental part of the research was performed employing the counterflow configuration. The fuels tested were n-heptane, n-decane, n-dodecane, n-hexadecane, cyclohexane, methylcyclohexane, toluene, and o-xylene because they represent the types of fuels in diesel and JP-8. Critical conditions of autoignition and extinction were measured. Flame structures were measured for non-premixed n-heptane flames and n-decane flames. For n-heptane and n-decane flames, numerical calculations were performed using detailed chemistry and the results were compared with experiments.
DTIC
Combustion; Diesel Fuels; Ignition; Jet Engine Fuels; JP-8 Jet Fuel; Reaction Kinetics; Spontaneous Combustion

20050080653 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Organophosphate Intoxication: Present State of Therapy
Bueters, T. J. H.; vanHelden, H. P. M.; October 2004; 43 pp.; In English
Contract(s)/Grant(s): AO3CO3EG; TNO Proj. 014.16559
Report No.(s): TD2004-0079; TNO-PML-2004-A79; Copyright; Avail: Other Sources

Organophosphates (OPs) represent a class of highly toxic compounds that includes nerve agents (somain, sarin, cyclosarin, tabun, VX). In particular nerve agents are some of the most toxic compounds known to man and, as suggested by their name, have pronounced effects on central and peripheral nervous system functioning. OPs irreversibly inhibit acetylcholinesterase (AChE), which results in attenuation of the catalyzed hydrolysis of acetylcholine (ACh) and excessive accumulation of extracellular ACh. This leads to various toxic effects including hypersecretions, convulsions, respiratory distress and death. In many instances the current treatment of OP poisoning appears inadequate, which underscores the need for the development of novel therapeutic strategies. This report reviews the toxicological and neurobehavioral effects of exposure to nerve agents. Furthermore, the limitations of the current therapy of OP poisoning are identified and discussed. New approaches to improve the medical treatment are currently under investigation and will finally be discussed.
Author
Organic Phosphorus Compounds; Intoxication; Therapy

20050080686 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Dual-Flow
Wesseling, V. R. A.; Oldenburg, M.; vanHouwelingen, T.; November 2004; 39 pp.; In Dutch
Contract(s)/Grant(s): A99KL508; TNO Proj. 014.13225
Report No.(s): TD2004-0096; TNO-PLM-2004-A96; Copyright; Avail: Other Sources

A test method was developed for testing the breakthrough concentration of chemical warfare agents through airpermeable, semi-airpermeable and non-airpermeable materials. A suitable solvent in combination with gas chromatography will be used as detection method. This report describes the method and the validation results. The influences of bubbler characteristics, sample conditioning, sampling location on the material, airflow underneath and over the sample, relative humidity, and temperature were tested and reviewed. Also a comparison between the current laid droplet method and Dual-flow method was made.
Author
Chemical Warfare; Drops (Liquids); Permeability; Two Phase Flow; Penetration

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METALS AND METALLIC MATERIALS

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

20050061117 Pennsylvania State Univ., State College, PA, USA
Low Conductive Thermal Barrier Coatings Produced by Ion Beam Assisted EB-PVD with Controlled Porosity, Microstructure Refinement and Alloying Additions for High Temperature Applications
Wolfe, Douglas E.; Singh, Jogender; January 25, 2005; 39 pp.; In English
Contract(s)/Grant(s): NCC3-767; No Copyright; Avail: CASI; A03, Hardcopy

Various advanced Hafnia-based thermal barrier coatings (TBC) were applied on nickel-based superalloy coupons by electron beam physical vapor deposition. In addition, microstructural modifications to the coating material were made in an effort to reduce the thermal conductivity of the coating materials. Various processing parameters and coating system modifications were made in order to deposit the alloyed TBC with the desired microstructure and thus coating performance, some of which include applying coatings at substrate temperatures of 1150 C on both PtAl and CoNiCrAlY bond coated samples, as well as using 8YSZ as a bond layer. In addition, various characterization techniques including thermal cyclic tests, scanning electron microscopy, x-ray diffraction, thermal conductivity, and reflectivity measurements were performed. Although the coating microstructure was never fully optimized due to funding being cut short, significant reductions in thermal conductivity were accomplished through both chemistry changes (composition) and microstructural modifications.
Author
Hafnium Oxides; Thermal Control Coatings; Platinum Alloys; Cobalt Alloys; Nickel Alloys; Microstructure; Heat Resistant Alloys; Ion Beams

20050061216 West Virginia Univ., Morgantown, WV, USA, Connecticut Univ., Storrs, CT, USA
Third Annual Report DE-FG07-97-ER45671 (ID 59925) Modeling of Diffusion of Plutonium in Other Metals and of Gaseous Species in Plutonium-Based Systems
2004; 12 pp.; In English
Report No.(s): DE2004-828401; No Copyright; Avail: Department of Energy Information Bridge

The problem being addressed is to establish standards for temperature conditions under which plutonium, uranium, or neptunium from nuclear wastes permeates steel, with which it is in contact, by diffusion processes. The primary focus is on plutonium because of the greater difficulties created by the peculiarities of face-centered-cubic-stabilized (delta) plutonium (the form used in the technology generating the waste). Temperature is the key controllable diffusion process, i.e., temperature controls the rate of diffusion. The scientific goal of this project is to predict diffusion constants on an ab initio basis, i.e. diffusion distances in specified time at specified temperature for plutonium from plutonium-based waste materials into various steels or technologically-pertinent metallic alloys. This predictive ability will help to provide information relevant to setting temperature standards for maintaining structures, ducts, equipment, or waste-containing vessels until such time as decontamination and decommissioning and/or permanent storage can be carried out. In 2 addition, this knowledge will aid in assessing the depth of penetration that must be dealt with in any surface treatment for decontamination. The scientific steps of the methodology are (1) to recognize the stabilizing mechanism and the electronic structure pertinent to that stabilization for face-centered-cubic (fcc) deltastabilized plutonium, (2) to extract the information needed to perform dynamic simulations from ab initio electronic structure calculations, (3) to perform and report the dynamic simulations predicting the diffusion behavior.
NTIS
Temperature Control; Plutonium; Diffusion; Steels; Radioactive Wastes

20050061262 MSE Technology Applications, Inc., Butte, MT, USA
On-Line Refractory Confirmation
Ford, M. J.; Apr. 2003; In English
Report No.(s): DE2004-824784; No Copyright; Avail: National Technical Information Service (NTIS)

MSE Technology Applications, Inc. (MSE) conducted a test (U.S. Department of Energy (DOE) Award Number DE-FC26-02NT41584) to develop an innovative image recognition system that would monitor refractory surface conditions in a gasification chamber. This technology could provide early detection of internal degradation of the refractory lining without constant operator monitoring. The system would notify the operator of refractory problems by triggering an alarm. The software analyzing this system would send this alarm to the operator when the refractory change exceeds pre-established

criteria. This particular portion of the testing demonstrated the capabilities and limitations of an MSE-designed high-temperature pinhole camera combined with Machine Vision software. This test project explored the capabilities of the pinhole camera and software by demonstrating operating parameters in different test categories.
NTIS
Refractories; On-Line Systems

20050061269 Lawrence Livermore National Lab., Livermore, CA
Effect of Temperature and Electrolyte Composition on the Susceptibility of Alloy 22 to Localized Corrosion. Zambian Experience
Kay, S. D.; Evans, K. J.; Ilevbare, G. O.; 2004; 12 pp.; In English
Report No.(s): DE2004-808030; No Copyright; Avail: Department of Energy Information Bridge
The study of the electrochemical behavior of Alloy 22 has been carried out in various concentrated environments using different sample configurations. Comparisons were made between the electrochemical behaviors of Alloy 22 in concentrated chloride solutions, and in concentrated chloride solutions with nitrate ions (NO(sub 3)(sup -)). In other experiments, the effect of fluoride ions (F(sup -)) was investigated. These comparative studies were performed at various temperatures. The rate of corrosion was found to increase with increase in temperature. The presence of nitrate ions reduced corrosion attack on Alloy 22. F(sup -) was found to be more benign to Alloy 22 compared with chloride ions (Cl(sup -)). However a combination of F(sup -) and Cl(sup -) was found to initiate deeper crevices compared with the only Cl(sup -) in the electrolyte.
NTIS
Electrochemical Corrosion; Alloys; Radioactive Wastes; Electrolytes

20050061327 Nuclear Environment Technology Inst., Daejon, Korea, Republic of
Recycle Experience of Dismantled Cask Handling Crane by Surface Removal Sampling at Kori No. 1
Kim, K. D.; Baeg, C. Y.; Son, J. K.; Kim, H. S.; Ha, J. H.; 2002; 12 pp.; In English
Report No.(s): DE2004-827907; No Copyright; Avail: Department of Energy Information Bridge
The Kori No.1, which began operation in 1978, replaced its cask handling crane in 2000. To prove the safety of recycling and reuse of crane scrap, a particular calculation method for surface contamination was used. Because surface radioactive contamination of steel is limited to a few-microns-thick layer, we can calculate the total (removable and fixed contamination) activity of the sample conservatively by this surface removal sampling means. If we multiply the ratio of total surface and the area of the selected surface by its activity, total activity of the scrap can be estimated. Conservatively, the sampled portion can be used as a representative sample of the scrap. Both the inner and outer part of the scrap was sampled separately, and gamma spectra were analyzed to check whether activation had occurred. Before sampling, the entire surface of the steel is scan surveyed by several kinds of GM and GP detectors. Contaminated parts were segregated, or decontaminated to the background. Almost one sample per one ton of steel was collected. Gamma spectra of 62 samples were analyzed by 100% efficiency HP Ge detector.
NTIS
Contamination; Gamma Ray Spectra; Metal Surfaces

20050070887 Tokyo Denki Univ., Japan
Improvement of Machinability of Aluminum Ceramic
Shirakashi, Takahiro; Yamada, Takahiro; Progress of Machining Technology; December 2004, pp. 68-73; In English; See also 20050070885
Contract(s)/Grant(s): Q03-M02; MOE-14350075; Copyright; Avail: Other Sources
It is very important to control a crack generation and its propagation in defect free machining. In order to easier control of crack and its propagation, a surface energy or a fracture toughness should be increased. A fracture toughness of aluminum ceramic is measured in some kind of environment. The toughness is greatly affected by environment. The new methods to increase the toughness are proposed. A range of defect free machining condition can be expanded by selection of suitable machining fluids and by using the proposed methods. Key words brittle material, ceramic, cutting fluid, brittle fracture, cutting Author
Aluminum; Machining; Ceramics; Fracture Strength

20050070888 Beijing Inst. of Tech., China
Experimental Study on High Speed Face-Milling of MB2 Magnesium Alloy
Zhao, Wenxiang; Wang, Xibin; Long, Zhehai; Pang, Siqin; Progress of Machining Technology; December 2004, pp. 107-110; In English; See also 20050070885; Copyright; Avail: Other Sources

With cutting speed (range from 471 to 2356 m/min), feed per tooth (range from 0.05 to 0.25 mm/z) and depth of cut (range from 0.2 to 3.4 mm), the characteristics of primary cutting forces in high speed dry machining of magnesium alloy are studied, and the high speed cutting deformation mechanism is also discussed in this paper. Through three-factor factorial design and partial regression, the influences of cutting regimes on milling force are observed. The empirical formula of cutting force is established by statistic analysis tools such as residual analysis and least square algorithm. It is concluded that depth of cut and feed per tooth are the main influence factors on primary cutting forces; the main cutting force will begin to decrease with the increase of cutting speed; in specified cutting regimes, the calculation results from the empirical formula are in good agreement with the experimental results.
Author
Magnesium Alloys; Metal Cutting; Milling (Machining)

20050070905 Shimane Inst. for Industrial Technology, Matsue, Japan
The Addition of Aluminum and Magnesium to Gray Cast Iron as a Method of Reducing Cermet Tool Wear in High Speed Cutting
Furuya, Satoshi; Ozoe, Nobuaki; Usuki, Hiroshi; Yamane, Yasuo; Progress of Machining Technology; December 2004, pp. 33-37; In English; See also 20050070885; Copyright; Avail: Other Sources

This study aims to investigate the effect of gray cast iron with nonmetallic inclusions on the tool wear of cermet tools in high-speed cutting. In this research, small quantities of Al and Mg were added to gray cast iron without influencing its mechanical characteristics and castability. When turning the gray cast iron containing Al and Mg at high speed, a protective layer consisting of nonmetallic inclusions of work materials, and traces of Al and Mg built up on the tool flank face and rake face. Furthermore, flank and crater wear was significantly reduced when compared to that resulting from cutting of conventional gray cast iron. This reduction in flank and crater wear was particularly noticeable at a cutting speed of 700m/min.
Author
Cast Alloys; Iron Alloys; Cermets; Metal Cutting; Wear

20050070908 Kyushu Polytechnic Coll., Kitakyushu, Japan
Fabrication Of Ni-W Electroplated Micro Diamond Grinding Tools And Their Application To Grooving In Silicon
Nishihara, Kunio; Sakase, Tadayuki; Progress of Machining Technology; December 2004, pp. 116-121; In English; See also 20050070885; Copyright; Avail: Other Sources

Ni-W electroplated micro diamond grinding tools with cylindrical carbide substrate having a diameter of 100 microns were fabricated in ammonium citrate bath with the intention of improving the grain holding and the tool life. The comparison of these tools with Ni electroplated tools in tool life shows that the former are superior to the latter. The optimum conditions for current density and time of electroplating were obtained from the viewpoint of tool life in grooving of silicon.
Author
Electroplating; Carbides; Machine Tools; Diamonds; Ammonium Compounds; Cylindrical Bodies

20050070909 Ritsumeikan Univ., Shiga, Japan
Fundamental Study Of The Sintering Characteristics Of Functionally Gradient Materials
Tanaka, Takeshi; Kawai, Tatsuya; Progress of Machining Technology; December 2004, pp. 133-138; In English; See also 20050070885; Copyright; Avail: Other Sources

The present paper describes the sintering characteristics of functionally gradient material (hereafter noted as f.g.m.) composed of AIN/HSS and ZrO2Ni, the influences of sintering conditions on their properties, and their applications. It is clarified that both AIN and ZrO2 matrixes successfully fabricated by SPS provide moderate physical and mechanical properties. The Vickers micro hardness of AIN/10wt%HSS compound is larger than that of AIN matrix. The hardness of ZrO2/Ni compound is lesser than that of ZrO2 matrix due to the softness of Ni. In wet cutting and dry cutting conditions, the surface roughness of aluminum alloy cut by both f.g.ms, composed of AIN/HSS and ZrO2Ni was slightly lesser than that cut by a tungsten carbide tool. The necessary forces for cutting by AIN/HSS f.g.m are smaller than those for cutting by ZrO2/Ni f.g.m, and P20. The flank wear of P20 is lesser than that of both AIN/HSS and ZrO2/Ni due to the great hardness of tungsten carbide. However, the wear rates of P20 are larger than those of f.g.m. Keywords functionally gradient material, compound, spark plasma sintering, zirconia/Ni, aluminum nitride/HSS, cutting tool
Author
Sintering; Aluminum Nitrides; Functionally Gradient Materials; Zirconium Oxides; Tungsten Carbides

20050070915 North China Univ. of Technology, Taiyuan, China

Research On Laminated Object Manufacturing Technology For Metal Function Part Based On The Large Thickness Slice

Guo, Ping-Ying; Lu, Chun-Yue; Zhang, Ji-Tang; Progress of Machining Technology; December 2004, pp. 307-311; In English; See also 20050070885; Copyright; Avail: Other Sources

Rapid manufacturing for metal function part is an interested problem in RP/M field at present. Laminated Object Manufacturing is a good method of manufacturing metal function part rapidly. Laminated Object Manufacturing technology for metal function part based on the large thickness slice is put forward in this paper and its composition and applied characteristic is also discussed. Key words laminated object manufacturing, metal function part, large thickness slice
Author

Laminates; Manufacturing; Metal Surfaces

20050070955 OSG Corp., Toyokawa, Japan

High-Speed Cutting Or High Hardness Steel Cutting For End Mills Made Of Cemented Carbide With Ultra Micro Grain

Iwamoto, Koji; Progress of Machining Technology; December 2004, pp. 111-115; In English; See also 20050070885; Copyright; Avail: Other Sources

In this study, tool materials for end milling which have long tool life were examined. In the mold machining, already high-speed machining or highly hardness materials are often applied. In these cases, long life of end mills is expected. Relations of material characteristic and their cutting performance were investigated. Cemented carbide material for end mills is suitable for high-speed cutting or high hardness steel cutting. In general, we know hard materials of end mills have high performance of tool life, but such too hard materials as 93HRA or harder tool materials are easy to occur chipping. By this reason, we could not use super hard materials. I produced end mills made of cemented carbide with ultra micro grain. WC grain size of ultra micro grain cemented carbide is under 0.3gm. These materials have a good balance of toughness and wear resistance. Ultra micro grain cemented carbide end mills have a high performance on tool life for high-speed cutting or milling of hardened steels. The influences of the composition and grain size of cemented carbide on hardness and toughness were examined.
Author

Cutting; Carbides; Milling (Machining); Hardness; Wear Resistance; High Speed

20050070956 Okayama Univ., Japan

Minimizing Process Of Surface Roughness In Grinding With Super-Soft Grade Resinoid Wheel

Ohashi, Kazuhito; Tsukamoto, Shinya; Nakajima, Toshikatsu; Progress of Machining Technology; December 2004, pp. 122-127; In English; See also 20050070885; Copyright; Avail: Other Sources

An improving process of surface roughness in cylindrical plunge grinding with a super-soft grade resinoid wheel is discussed, analyzing the ground surface profile, the topography of acting wheel surface and so on. Minimizing phenomenon of surface roughness, in which surface roughness decreases down to the minimum just after beginning of grinding, occurs remarkably in plunge grinding process with a super-soft grade resinoid wheel. The phenomenon is useful for improving surface roughness by grinding. The number of simultaneously acting cutting edge is obtained by ground surface profile, topography of acting wheel surface and interference wheel arc length. Key words super-soft grade resinoid wheel, surface roughness, ground surface profile, topography of acting wheel surface, minimizing phenomenon of surface roughness, number of simultaneously acting cutting edge
Author

Surface Roughness; Grinding; Cylindrical Bodies; Cutting

20050070960 Nara National Coll of Technology, Nara, Japan

Machinability of Hardened Sintered Steel

Wada, Tadahiro; Gurim Jazyju; Fujiwara, Junsuke; Hanasaki, Shinsaku; Progress of Machining Technology; December 2004, pp. 74-79; In English; See also 20050070885; Copyright; Avail: Other Sources

The tool life in turning of sintered steels becomes shorter than that of melted steels such as carbon steels. The sintered steels are hardened by heat treatments such as quenching for the mass-produced parts which are required for higher strength. As residual strains caused by the heat treatments have bad influences on dimension accuracies of the parts, additional cutting procedure is indispensable. In order to clarify an effective tool material for the cutting of the hardened sintered steels, tool

wear, surface roughness and cutting forces were experimentally investigated. The hardened sintered steel was turned with three kinds of PVD coated cemented carbide tools and four kinds of CBN tools. The main results obtained are as follows: (1) In the PVD coated tools, the wear progress of a Ti(C,N) coated tool was slowest. (2) In the cutting with the Ti(C,N) coated tool, both the surface roughness and the cutting forces were almost constant under cutting speeds from 0.14m/s to 1.67m/s. (3) Among the CBN tools, the wear progress of the CBN tool which has Co based binder was slowest. (4) The mirror finish surface was obtained at the low speed cutting with the CBN tool.
Author
Hardening (Materials); Steels; Sintering; Machining; Metal Cutting; Surface Roughness; Tooling

20050070961 Dijet Industrial Co., Ltd., Osaka, Japan
Compressive Fatigue Characteristics Of Wc-Co Based Alloys
Yamamoto, Tsutomu; Sakagami, Kusuhiko; Progress of Machining Technology; December 2004, pp. 144-149; In English; See also 20050070885; Copyright; Avail: Other Sources

As WC-Co based alloys have excellent wear and deformation resistance due to high hardness, high compressive strength and Young's modulus, they have been widely applied for wear and impact resistance tools or substrate of cutting tools. In this study, the effects of Co content, WC grain size, HIP and coating treatment on compressive fatigue life of WC-(0-1.2)%Cr3C2-(7-20)%Co alloys with different WC grain size were mainly investigated and also discussed with relation to the variation of coercive force of the alloys during fatigue process. The results obtained were as follows: (1) The fatigue life increased with decreasing Co content in the medium and coarse-grain alloys, but it was almost same with no relation to Co content in micrograin alloys. The fatigue life showed an upward tendency with decreasing WC grain size. (2) The effect of HIP treatment on fatigue life was not observed at all. The fatigue life of PVD-coated alloy did not change and that of CVD-coated alloy remarkably decreased, comparing with that of non-coated alloy. (3) The coercive force of medium-grain WC-12mass%Co alloy increased with increasing applied maximum stress and repeated cycle, and it became much larger in the repeated compressive fatigue test than static compressive test. This increase of the coercive force was considered to be equivalent to the degree of toughness deterioration due to fatigue hardening in Co phase during fatigue process. Key words WC-Co based alloys, compressive fatigue, fatigue life, coercive force, fatigue hardening
Author
Compressive Strength; Fatigue Life; Coercivity; Wear Resistance; Grain Size; Hardness

20050070965 Beijing Univ. of Technology, Beijing, China
Development Of TiC Whisker Grinding Wheel
Wei, Yuan-Qian; Wang, Ai-Ling; Zhu, Xi-Jing; Cao, Rui-Xiang; Pan, Jin-Sheng; Hu, Man-Dong; Progress of Machining Technology; December 2004, pp. 139-143; In English; See also 20050070885; Copyright; Avail: Other Sources

To explore a possibility of grinding difficult-to-cut materials such as hardened die-steel SKDII (HRC60) by using high-quality TiC whiskers, a unique TiC whisker grinding wheel was developed, in which the whiskers were aligned normally to the grinding wheel surface. In this paper, grindabilities of TiC whisker grinding wheel are investigated and compared with those of SiC whisker grinding wheel. The investigations have shown that TiC whisker grinding wheel has very high grinding ratio (over 7000) and high efficiency, and that a nanometer level ground surface with roughness values of Ra2.0nm and Ry25nm can be achieved.
Author
Cutting; Surface Roughness; Steels; Alignment; Titanium Carbides

20050070967 Beijing Inst. of Tech., China
Study On Cutting Performance Of Man-Made Diamond For Machining Nonferrous Metal
Zhang, Peng-Fei; Yu, Qi-Xun; Pang, Si-Qin; Lin, Jin; Liu, Xiang-Dong; Progress of Machining Technology; December 2004, pp. 150-153; In English; See also 20050070885; Copyright; Avail: Other Sources

The cutting performance of polycrystal diamond (PCD) for machining nonferrous metal of aluminum and silicon alloy has been experimentally investigated. It is shown that the cutting performance of homemade PCD tool is almost the same as the import tool for machining aluminum silicon alloy, and the homemade PCD tool can fulfill the requirement of manufacture. This result has practical significance for automobile industry to reduce the tool cost. There is also a compare of the cutting performance between thick-film CVD diamond tools (TFD) and cemented carbide when using these two kinds of tools to machine some special nonferrous metal (pure Tungsten and pure Molybdenum) which are generally considered very hard to be processed. There are also some other experiments which have been done to measure the roughness of machined workpiece

surface for cutting four kinds of metal including pure copper, copper alloy and pure titanium by diamond tool and cemented carbide. The data got from the experiments showed that the machining suitable of using diamond tool is better than using cemented carbide. Keywords polycrystal diamond, cemented carbide, nonferrous metal, aluminum silicon alloy, cutting performance
Author
Polycrystals; Diamonds; Machine Tools; Machining; Metal Cutting; Surface Roughness; Nonferrous Metals

20050070969 North China Inst. of Aerospace Engineering, Langfang, China
Manufacturing Process Of Inside-Holding Electroplating Diamond Reamer
Zheng, Guang-Hua; Wang, Chun-Hai; Fu, Jian-Jun; Progress of Machining Technology; December 2004, pp. 154-157; In English; See also 20050070885; Copyright; Avail: Other Sources

With the development of science and technology, diamond reamers are a proper complement to the traditional reamers in cutting field. Nowadays, two kinds of processes such as inside-holding electroplating process and outside-holding electroplating process are used to fabric diamond reamer. A precision inside-holding electroplating diamond reamer is superior to an outside-holding electroplating reamer. However, the inside-holding electroplating process is a little more complicated than the outside-holding electroplating process. Hence, investigations of some technique in inside-holding electroplating process are very necessary so as to successfully guarantee the manufacture of the reamer. In this paper, the main manufacturing process and key techniques of the inside-holding electroplating diamond reamer are presented.
Author
Electroplating; Manufacturing; Diamonds; Cutting

20050070970 Tokushima Univ., Japan
Cermet Tool Failure And Its Control In Machining Line Of Bearing Production
Oyama, Akira; Masuda, Masabiro; Arimura, Masatoshi; Morikawa, Masahiro; Nogami, Teruo; Ogawa, Hitoshi; Progress of Machining Technology; December 2004, pp. 122-132; In English; See also 20050070885; Copyright; Avail: Other Sources

The tool failure of TiC cermet used in the present in machining lines of bearing production has been observed. As a result, it has been known that the thermal cracks due to heating-cooling cycle play an important role in tool life. Therefore, the purpose of this research is to investigate two effects of the surface roughness of the rake face and feed rate on thermal crack in the actual machining line. The smaller surface roughness of the rake face delays the time of the occurrence and reduces the numbers. A slight decrease of feed rate has a good effect on the control of cracks because of the lower cutting temperature. Key words TiC cermet, tool failure, thermal crack, surface roughness, feed rate
Author
Cermets; Cracks; Heating; Surface Roughness; Bearings; Cutting

20050070976 Shimane Univ., Matsue, Japan
Effect Of Cutting Atmosphere On Tool Wear Of Coated Carbide End Mills
Usuki, Hiroshi; Matsumoto, Katsuya; Sato, Kiminon; Furuya, Satoshi; Moriya, Mitsuhiro; Iwata, Kaoru; Sawada, Taisuke; Shima, Nobuhiko; Progress of Machining Technology; December 2004, pp. 181-186; In English; See also 20050070885; Copyright; Avail: Other Sources

This study aims to improve tool life by investigating the effectiveness of the use of high oxygen atmosphere for the reduction of adhesion by generation of oxide. Titanium alloy (Ti-6Al-4V), Inconel 718 and four other kinds of coated carbide end mills were used in this experiment, and the effect of cutting atmosphere on tool wear were investigated by side cutting under the dry cutting condition.From the results obtained, because the adhesion was decreased by the oxidation, the tool life in the high oxygen atmosphere became longest under the dry cutting conditions. Moreover, when the titanium alloy was machined, (TiAl)N and TiSiN recorded the highest wear reduction in the high oxygen atmosphere. The smallest wear was recorded by TiBON. It was observed that machining under the high oxygen atmosphere was effective to demonstrate the performance of the coating tool from which lubricity was given by the oxide generation.
Author
Titanium Alloys; Milling (Machining); Atmospheric Effects; Oxygen; Coatings; Carbides; Cutting; Inconel (Trademark); Heat Resistant Alloys

20050070987 Tokyo Univ., Japan, Tokyo Univ., Japan, Tokyo Univ., Japan, Tokyo Univ., Japan
Proposal Of 5-Body Finishing Technology For Long Tool Life
Progress of Machining Technology; December 2004, pp. 275-280; In English; See also 20050070885; Copyright; Avail: Other Sources

A novel technology is proposed, in which the fifth body is introduced to extend tool life and improve polishing characteristics, based on polymer particle assisted polishing by using carrier particles as micro-pads to accomplish high form accuracy. In this paper, metallic soap particles that are heteromorphic and lipophilic are added into oily slurries in order to enhance dispersion and retention of the carrier particles in tool plate surface, so that the tool plate can be protected from wear of the abrasives. Experiments of polishing oxygen-free copper disks have shown the superior characteristics with the extended lifetime of the tool plate, furthermore the scratches-decreased polished surface with finer roughness as well as higher and stabler removal rate. Key words polishing, oil dispersion medium, carrier particle, metallic soap particles, wear, tool life
Author
Polishing; Wear; Metal Particles; Abrasives; Tools

20050070994 Hyogo Univ. of Teacher Education, Himeji, Japan
Effect of Al-Mn Compound on Mirror Surface Integrity in Ultra-Precision Cutting of Magnesium Alloy
Okuda, Koichi; Takeno, Yoshihisa; Progress of Machining Technology; December 2004, pp. 209-214; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper describes an effect of the microstructure and the intermetallic compounds in magnesium alloys on the mirror surface integrity finished by an ultra-precision diamond cutting. The cutting tests of AZ31, AZ91 were carried out with the ultra-precision turning machine. It is found that Al-Mn compounds segregated in the microstructure of AZ31 play a role as the hard grain and generate the scratches on the finished surface, while (17)Mg(12)Al segregated in the microstructure of AZ91 does not get involved in the generation of scratches. It is confirmed that the scratches dramatically decrease in the cutting of AZ31 with low Mn content.
Author
Magnesium Alloys; Aluminum Alloys; Manganese Alloys; Metal Cutting; Mirrors; Microstructure; Surface Properties

20050071043 National Inst. of Advanced Industrial Science and Technology, Ibaraki, Japan
End Milling of Austenitic Stainless Steel
Fujise, Kenryo; Progress of Machining Technology; December 2004, pp. 22-26; In English; See also 20050070885; Copyright; Avail: Other Sources

Stainless steel is widely used as a popular material not only in many industries but also in the production for daily necessaries. And besides, it is also known well as one of the difficult-to-cut material. In this paper, two kinds of austenitic stainless steels, SUS 304 and SUS 316, were milled using coated carbide end mill and non-coated carbide end mill by side cutting method. Cutting force, AE signal obtained during end milling and tool failure were investigated to examine the effect of coating and the machinability of the stainless steels. Coated carbide end mill shows superior cutting performance. Austenitic stainless steel SUS 304 shows a poor machinability compared with SUS 316 and carbon steel S50C.
Author
Austenitic Stainless Steels; Milling (Machining); Carbides; Metal Cutting

20050071551 Idaho National Engineering and Environmental Lab., Idaho Falls, ID, ADA Technologies, Inc., Englewood, CO, USA
Evaluation of the ADA Technologies' Electro-Decon Process to Remove Radiological Contamination
Pao, J. H.; Demmer, R. L.; Argyle, M. D.; 2003; 11 pp.; In English
Report No.(s): DE2004-827230; No Copyright; Avail: Department of Energy Information Bridge

A surface decontamination system featuring the use of ADA's electrochemical process was tested and evaluated. The process can be flexibly deployed by using an electrolyte delivery system that has been demonstrated to be reliable and effective. Experimental results demonstrate the effectiveness of this system for the surface decontamination of radiologically contaminated stainless steel.
NTIS
Decontamination; Surface Defects; Electrochemistry

20050071622 Department of Energy, Golden, CO, USA
Non-Invasive Estimation of Dissolved Alumina Concentration in Hall Heroult Reduction Cells
Feb. 16, 2004; In English
Report No.(s): DE2004-828148; No Copyright; Avail: National Technical Information Service (NTIS)

The present best practice for the preparation of primary aluminum is by electrolysis of alumina in the traditional

Hall-Heroult reduction cell. The process conditions in the electrolyte of this cell required for the reduction to proceed are sufficiently harsh to have precluded the implementation of in situ sensing of the electrolyte composition, specifically the concentration of the ionized alumina. This report reveals the theoretical basis for a non-invasive method for estimation of the ionized alumina concentration which does not require the use of any sensor in direct contact with the cell electrolyte. The proposed method can in principle be applied with equal efficacy to the so-called drained cathode cell designs and to cells having any anode composition, because only knowledge of the electrolyte conduction behavior is required a priori. For an operating cell, the proposed method requires only readily available electrical measurements and the facilities to process the acquired signals. The proposed method rests on the ability to identify certain characteristics of the transients in the reduction cell terminal voltages caused by the quasiperiodic introduction of alumina. It will be shown that these voltage transients manifest measureable properties, in a statistical sense, that should permit estimation of the ionized alumina concentration with a delay of one alumina feed cycle.
NTIS
Aluminum; Electrolytic Cells; Reduction (Chemistry)

20050080266 Pohang Univ. of Science and Technology, Pohang, Korea, Republic of
High Temperature Deformation Behavior of Ti-6A1-4V Alloy with Widmanstaten Microstructure
Kim, Jeoung H.; Lee, Chong S.; Mar. 2003; 44 pp.; In English
Contract(s)/Grant(s): F6256202P0129
Report No.(s): AD-A428866; AOARD-CSP-024007; No Copyright; Avail: CASI; A03, Hardcopy
This research established a constitutive model for high-temperature deformation of Ti-6Al-4V alloy with a transformed microstructure. It further investigated the morphological (alpha platelet thickness) effect on the high-temperature plastic flow of transformed microstructure in view of inelastic deformation theory.
DTIC
Deformation; High Temperature; Microstructure; Temperature Effects; Titanium Alloys

20050080293 Texas A&M Univ., College Station, TX USA
Pseudoelastic SMA Spring Elements for Passive Vibration Isolation: Part II - Simulations and Experimental Correlations
Lagoudas, Dimitris C.; Khan, Mughees M.; Mayes, John J.; Henderson, Benjamin K.; Jun. 2004; 29 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0196
Report No.(s): AD-A428953; No Copyright; Avail: CASI; A03, Hardcopy
In Part II of this two-part study, system simulations and experimental correlations of a Shape Memory Alloy (SMA) based vibration isolation device (briefly described in Part I) has been presented. This device consists of layers of pre-constrained SMA tubes undergoing pseudoelastic transformations under transverse dynamical loading. In Part II, detailed description of the prototype vibration isolation device, its experimental setup, and actual experimental test results are presented. An extensive parametric study has been conducted on a nonlinear hysteretic dynamical system, representing this vibration isolation device utilizing a physically based simplified SMA model and a Preisach model (an empirical model based on system identification) developed in Part I. Both the physically based simplified SMA model and the modified Preisach model have been utilized to perform experimental correlations with the results obtained from actual testing of the device. Based on the investigations, it has been shown that variable damping and tunable isolation response are major benefits of SMA pseudoelasticity. Correlation of numerical simulations and experimental results has shown that large amplitude displacements causing phase transformations of SMA components present in such a device are necessary for effective reduction in the transmissibility of such dynamical systems. It has also been shown that SMA-based devices can overcome performance tradeoffs inherent in typical softening spring-damper vibration isolation systems. In terms of numerically predicting the experimental results, it has been shown that the Preisach model gave relatively accurate results due to better modeling of the actual SMA tube behavior. However for a generic parametric study, the physically based simplified SMA model has been found to be more useful as it is motivated from the constitutive response of SMAs and hence, could easily incorporate different changes in system conditions.
DTIC
Correlation; Elastic Properties; Hysteresis; Shape Memory Alloys; Simulation; Vibration; Vibration Isolators

20050080435 Army Construction Engineering Research Lab., Champaign, IL USA
Fury: Robotic In-Situ Inspection/Condition Assessment System for Underground Storage Tanks
Marsh, Charles P.; Siddique, Amer; Temple, Brian; Hock, Vincent M.; Robb, Frank; Mar. 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429286; ERDC/CERL-MP-04-1; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Code of Federal Regulations (40 CFR 280-281) required all underground storage tanks (USTs) containing petroleum products to be brought into compliance to prevent environmental contamination through leakage. Replacing all older USTs can, in some cases, be prohibitively expensive. One alternative to requiring that tanks pass a precision tightness test is to retrofit USTs with cathodic protection for continued use. This report introduced a remote, robotic UST condition inspection/assessment system named Fury, developed to meet the need for more cost-effective and reliable tank condition assessment methods. Fury is a robotic crawler that moves inside a UST by means of magnetic wheels. It includes 90-degree transition arms for robot positioning on tank end caps and has a central pivot to allow for full motion of the steering head. The robot is designed to fit through an existing small-diameter pipe, which mitigates invasive tank entry during assessment and allows for non-destructive evaluation. Control of the Fury is accomplished through a tether attached to the rear of the robot. Fury uses ultrasonic transducers on a sensor sled to obtain approximately 90,000 wall thickness measurements per hour at over 95% of cylindrical-wall or end-cap locations. (5 tables, 12 figures, 13 refs.)
DTIC
Corrosion; Inspection; Nondestructive Tests; Petroleum Products; Robotics; Robots; Storage Tanks; Ultrasonics; Underground Storage; Underground Structures

20050080681 Case Western Reserve Univ., Cleveland, OH, USA, Case Western Reserve Univ., Cleveland, OH, USA
Thermodynamic Effect of Platinum Addition to _-NiAl: An Initial Investigation
January 2005; 36 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-850; WBS-22-714-30-05
Report No.(s): NASA/CR-2005-213330; E-14791; No Copyright; Avail: CASI; A03, Hardcopy

An initial investigation was conducted to determine the effect of platinum addition on the activities of aluminum and nickel in beta-NiAl(Pt) over the temperature range 1354 to 1692 K. These measurements were made with a multiple effusion-cell configured mass spectrometer (multi-cell KEMS). The results of this study show that Pt additions act to decreased alpha(Al) and increased the alpha(Ni) in beta-NiAl(Pt) for constant X(sub Ni)/X(sub Al) approx. = 1.13, while at constant X(sub Al) the affect of Pt on Al is greatly reduced. The measured partial enthalpies of mixing indicate Al-atoms have a strong self interaction while Ni- and Pt-atoms in have similar interactions with Al-atoms. Conversely the binding of Ni-atoms in beta-NiAl decreases with Pt addition independent of Al concentration. These initial results prove the technique can be applied to the Ni-Al-Pt system but more activity measurements are required to fully understand the thermodynamics of this system and how Pt additions improved the scaling behavior of nickel-based superalloys. In addition, with the choice of a suitable oxide material for the effusion-cell, the 'closed' isothermal nature of the effusion-cell allows the direct investigation of an alloy-oxide equilibrium which resembles the 'local-equilibrium' description of the metal-scale interface observed during high temperature oxidation. It is proposed that with an Al(l) + Al2O3(s) experimental reference state together with the route measurement of the relative partial-pressures of Al(g) and Al2O(g) allows the activities of O and Al2O3 to be determined along with the activities of Ni and Al. These measurements provide a direct method of investigating the thermodynamics of the metal-scale interface of a TGO-scale.
Author
Nickel Alloys; Aluminum Oxides; Coating; Oxidation Resistance; Thermodynamics; Platinum

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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*.

20050061220 COGEMA, Cedex, France, Commissariat a l'Energie Atomique, Marcoule, France, SGN, Inc., Cedex, France
Development of Vitrification Process and Glass Formulation for Nuclear Waste Conditioning
Petitjean, V.; Fillet, C.; Boen, R.; 2002; 14 pp.; In English
Report No.(s): DE2004-828355; No Copyright; Avail: Department of Energy Information Bridge

The vitrification of high-level waste is the internationally recognized standard to minimize the impact to the environment

resulting from waste disposal as well as to minimize the volume of conditioned waste to be disposed of. COGEMA has been vitrifying high-level waste industrially for over 20 years and is currently operating three commercial vitrification facilities based on a hot metal crucible technology, with outstanding records of safety, reliability and product quality. To further increase the performance of vitrification facilities, CEA and COGEMA have been developing the cold crucible melter technology since the beginning of the 1980s. This type of melter is characterized by a virtually unlimited equipment service life and a great flexibility in dealing with various types of waste and allowing development of high temperature matrices.
NTIS
Radioactive Wastes; Matrix Materials; Glass

20050061235 Swedish Defence Research Establishment, Linkoeping
Isostatic Pressing Carbon Fibre Composites
Savage, S. J.; Larsson, F.; Svensson, L.; Dec. 2003; 16 pp.; In English
Report No.(s): PB2005-101928; FOI-R-1122-SE; No Copyright; Avail: CASI; A03, Hardcopy
This report documents the experiments made and results obtained in a study to investigate the effects of hardening epoxy-carbon fiber composites under hydrostatic pressure of 100 bar. A method has been developed for hardening fiber composites under high pressures, and the method has been successfully applied to processing small samples. These samples have been mechanically tested and compared to similar materials hardened under conventional pressures. High-pressure hardened materials show reduced porosity and lower levels of inter-laminar matrix. The inter-laminar shear strength (ILSS) is only slightly improved, but it is noteworthy that scatter was reduced by 50%. However, an insufficient number of samples were tested.
NTIS
Epoxy Matrix Composites; Isostatic Pressure; Carbon Fibers

20050061341 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Opaque Minerals and the Origin of Bishunpur (LL3.1) Fine-grained Chondrule Rims
Lauretta, D. S.; Buseck, P. R.; Meteoritics and Planetary Science; 2001; Volume 36, No. A110; 2 pp.; In English; 64th Ann. Mtg. Meteoritical Soc., Sep. 2001, Rome, Italy
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Chondrites; Chondrule; Minerals

20050061342 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fine-grained Rim Mineralogy of the Cold Bokkeveld CM Chondrite by Transmission Electron Microscopy
Zega, T. J.; Buseck, P. R.; Meteoritics and Planetary Science; 2001; Volume 36, No. A230-A231; 2 pp.; In English; 64th Ann. Mtg. Meteoritical Soc., Sep. 2001, Rome, Italy
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Mineralogy; Cold Bokkeveld Meteorite; Chondrites

20050061345 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evidence That Polycyclic Aromatic Hydrocarbons in Two Carbonaceous Chondrites Predate Parent Body Formation
Plows, F. L.; Elsila, J. E.; Zare, R. N.; Buseck, P. R.; Geochim. Cosmochim. Acta 67; 2003; Volume 67, pp. 1429-1436; In English
Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources
No abstract available
Polycyclic Aromatic Hydrocarbons; Carbonaceous Chondrites; Minerals; Mineralogy

20050070906 Tokyo Denki Univ., Japan
Control of Fracture Toughness of Glass Surface for Defect-Free Machining
Shirakashi, Takahiro; Goto, Takashi; Progress of Machining Technology; December 2004, pp. 62-67; In English; See also 20050070885
Contract(s)/Grant(s): Q03M-02; (B2)14350075; Copyright; Avail: Other Sources
An effect of cutting fluids on fracture stress of soda-lime glass is discussed. In water the stress is greatly decreased and

many uncontrollable cracks are easily generated and propagate. In order to obtain a defect free surface in machining of glass, the generation and propagation should be controlled or restrained. Since the generation is greatly affected by a surface energy or a fracture toughness of surface region, some increasing methods of the toughness are proposed. Proposed methods can increase the toughness.
Author
Fracture Strength; Glass; Machining; Lubricants

20050070998 Huaqiao Univ., Quanzhou, China
Thermal Characteristics in Surface Grinding of Engineering Ceramics
Shen, Jian-Yun; Xu, Xi-Peng; Progress of Machining Technology; December 2004, pp. 248-253; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-E0210025; Proj. 2003H030; Copyright; Avail: Other Sources

In the present study, two typical engineering ceramics were ground with a resin-bonded diamond wheel on a precision surface grinder. Grinding temperatures under different machining conditions were measured using a sandwiched foil thermocouple. According to the measured spindle power and the grinding temperatures generated at the wheel-workpiece contact zone, the effects of operating parameters on the temperatures were discussed. Based on the theoretic analysis of the thermal model in surface grinding of engineering ceramics, the characteristics of temperatures and energy partition were analyzed. It is shown that temperature rise in the workpiece and energy partition are directly related to the mechanisms of material removal and the thermal characteristics of diamond wheel and workpieces.
Author
Grinding (Material Removal); Ceramics; Surface Finishing; Temperature Measurement

20050071038 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Development of Ceramic Sliding Bearing
Yang, Helai; Ri. Bingwei; Shi, Jin; Progress of Machining Technology; December 2004, pp. 1007-1011; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper presents a method of manufacturing sliding bearing by using ceramic material instead of metal. It makes a stress analysis and the structural design of ceramic bushing. Compared with traditional bushing, ceramic sliding bearing has many merits. For example, it only needs a simple manufacture process and it can be suited to such work conditions as high temperature, high speed, or acid or alkali chemical corrosion; Furthermore, ceramic sliding bearing has the self-lubricating property. The successful application in the auto gas engine connecting rod bushing proves that ceramic sliding bearing can replace A-alloy bushing and meet many practical applications.
Author
Ceramics; Bearings; Bushings; Stress Analysis; Structural Design

20050071106 Cleveland State Univ., Cleveland, OH, USA
Deposition and Characterization of Thin Films on Metallic Substrates
Gatica, Jorge E.; [2005]; 5 pp.; In English
Contract(s)/Grant(s): NCC3-1095
Report No.(s): CSU-0220-0620-10-GATIC20; No Copyright; Avail: CASI; A01, Hardcopy

A CVD method was successfully developed to produce conversion coatings on aluminum alloys surfaces with reproducible results with a variety of precursors. A well defined protocol to prepare the precursor solutions formulated in a previous research was extended to other additives. It was demonstrated that solutions prepared following such a protocol could be used to systematically generate protective coatings onto aluminum surfaces. Experiments with a variety of formulations revealed that a refined deposition protocol yields reproducible conversion coatings of controlled composition. A preliminary correlation between solution formulations and successful precursors was derived. Coatings were tested for adhesion properties enhancement for commercial paints. A standard testing method was followed and clear trends were identified. Only one precursors was tested systematically. Anticipated work on other precursors should allow a better characterization of the effect of intermetallics on the production of conversion/protective coatings on metals and ceramics. The significance of this work was the practical demonstration that chemical vapor deposition (CVD) techniques can be used to systematically generate protective/conversion coating on non-ferrous surfaces. In order to become an effective approach to replace chromate-based pre- treatment processes, namely in the aerospace or automobile industry, the process parameters must be defined more precisely. Moreover, the feasibility of scale-up designs necessitates a more comprehensive characterization of the fluid flow,

transport phenomena, and chemical kinetics interacting in the process. Kinetic characterization showed a significantly different effect of magnesium-based precursors when compared to iron-based precursors. Future work will concentrate on refining the process through computer simulations and further experimental studies on the effect of other transition metals to induce deposition of conversion/protective films on aluminum and other metallic substrates.
Derived from text
Deposition; Thin Films; Metals; Substrates; Technology Assessment; Computerized Simulation; Protective Coatings

20050080268 Army Construction Engineering Research Lab., Champaign, IL USA
Performance Problems with Group II Hydro-Cracked Turbine Oils in Corps of Engineers Hydropower Facilities
Micetic, John S.; Beitelman, Alfred D.; Dec. 2004; 34 pp.; In English
Report No.(s): AD-A428907; ERDC/CERL TR-04-28; No Copyright; Avail: CASI; A03, Hardcopy

The Corps of Engineers has historically used solvent-refined napthenic-type base oils (Group I) for lubricating hydroelectric turbines and associated governor systems. Products now being supplied by the lubrication industry for the same purpose are based on hydro-cracked paraffinic oils (Group II). While these Group II products are advertised to have superior properties for use in gas and steam turbines, they have been reported to result in foaming and sludge formation when used in hydroelectric turbines. A survey of Corps of Engineers hydro-power facilities was conducted to determine the extent of such problems. In-service evaluations were conducted to more clearly define the problem. Purpose-designed oil filtration and warming devices were installed at one Corps powerhouse to determine whether foaming and sludge formation could be prevented when using Group II oils. Initial results were positive, and four modified filtration/warming systems were subsequently installed to compare performance and refine technical specifications for a recommended system.
DTIC
Engineers; Hydroelectricity; Lubricating Oils; Oils; Turbines

20050080337 Army Construction Engineering Research Lab., Champaign, IL USA
Field Evaluation of Self-Lubricated Mechanical Components for Civil Works Navigation Structures
Race, Timothy D.; Kumar, Ashok; Stephenson, L. D.; Jun. 2004; 173 pp.; In English
Report No.(s): AD-A429062; ERDC/CERL-SR-04-8; No Copyright; Avail: CASI; A08, Hardcopy

It is operationally and environmentally desirable to replace greased bronze bushings used in navigation lock machinery with self- lubricating bushings. Bronze bushings must be greased manually or with automatic lubricating machines. Grease lines are subject to damage from ice and debris. If the grease line breaks, the lubricating system fails, which may lead to component failure and delays in navigation. Introduction of grease into the riverine environment is also a concern. The Corps of Engineers has been using self-lubricating bushings in navigation locks for the past 20 years. The purpose of this study was to evaluate mechanical properties and durability of emerging advanced self-lubricating bushing/bearing materials in the laboratory and under field conditions, and to provide additional knowledge, needed guidelines, and standard specifications for the proper selection and use of self-lubricating bushing materials for locks based on local environmental conditions and applications. The results of accelerated testing of quarter-scale model self-lubricating pintle bushings in simulated river are also reported.
DTIC
Evaluation; Navigation; Self Lubrication; System Effectiveness

20050080341 Naval Undersea Warfare Center, Newport, RI USA
Effects of Coupled Biaxial Tension and Shear Stresses on Decrimping Behavior in Pressurized Woven Fabrics
Cavallaro, Paul V.; Sadegh, Ali M.; Quigley, Claudia J.; Johnson, Arthur R.; Oct. 2004; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429070; NUWC-NPT-TR-11571; No Copyright; Avail: Defense Technical Information Center (DTIC)

Tension structures continue to be of increasing importance to military applications requiring both minimum weight, small packing volumes, and enhanced deployment operations. Present design methods for inflated fabric structures, however, are not well established. Analytical tools required to efficiently design these structures lag behind those for conventional structures and materials-partly because of nonlinearities resulting from changes in fabric architecture upon loading. In particular, constitutive relationships must be developed to establish the pressure-dependence and coupling effects of biaxial tension and shear loads. Through analysis and experiment, this study addresses the changes in fabric architecture and, more specifically, the combined effects of biaxial tension, shear, and crimp interchange on the global behavior of woven fabrics. A novel fixture for use in

experimental testing of fabrics subjected to combined biaxial tension and shear loads is introduced in this report.
DTIC
Axial Stress; Fabrics; Shear Stress

20050080354 Nebraska Univ., Lincoln, NE USA
Fatigue Fracture Analysis and Development of Fundamentals of Predictive NDE of Adhesive Composite Joints
Dzenis, Y. A.; Jan. 2003; 8 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0124
Report No.(s): AD-A429092; AFRL-SR-AR-TR-04-0638; No Copyright; Avail: CASI; A02, Hardcopy

The objectives of this project are to study durability and damage and fracture development in adhesive composite joints for aerospace structural applications and to develop methods of their intelligent nondestructive evaluations and life prediction. In the third reporting period, the focus was on the development of robust methods of quantitative nondestructive evaluation of crack length and loading mode mixity needed for life prediction in conjunction with the previously developed models of fatigue fracture in joints. Methods of vibrational spectroscopy, acousto-ultrasonics, and acoustic emission location analysis were evaluated experimentally. Dynamic models of wave propagation were developed and used for improved data reduction. A new method of through-thickness interrogation was developed and studied. Specimens with embedded sensors were manufactured and tested. Work has continued on the evaluation of the new composite provided by AFRL. New analytic models were developed for advanced fracture analysis of advanced laminated composites and joints.
DTIC
Acoustic Emission; Adhesive Bonding; Fracturing; Joints (Junctions); Nondestructive Tests; Predictions

20050080390 Air Force Research Lab., Tyndall AFB, FL USA
Blast-Resistant Window Concepts
Strickland, William S.; Anderson, Mark; Dover, Dov; Jul. 2003; 11 pp.; In English
Contract(s)/Grant(s): F08637-98-C-6001
Report No.(s): AD-A429145; AFRL-ML-TY-TP-2003-4532; No Copyright; Avail: CASI; A03, Hardcopy

Terrorist bombs threaten American civilians and military personnel both at home and abroad. Analysis of data from previous terror attacks indicates the largest number of injuries result from projected glass shards from shattered windows and facades. Three key issues have led to increased interest in new window materials as well as changes in building design codes: (1) actual terror attacks, (2) the threat of future terror attacks, and (3) monetary losses due to hurricanes. New protective products include a wide variation of films and laminated glasses for retrofit and replacement. Air Force Research Laboratory (AFRL) research has shown that these protective films will reduce the fragmentation of the enclosed glass. However, protective films that are not anchored will not provide retention of the film/glass system under the severe blast loadings expected from terror bombs. This paper introduces the Flex window, a patent-pending blast-resistant window developed at AFRL, along with key design concepts. In addition, the paper presents results from actual blast tests of the Flex window. Tabular data and photo-documentation is used to illustrate the ability of the Flex window to handle blast pressures a full order of magnitude greater than the typical commercial 'blast proof' window. New AFRL methods for modeling both exterior and interior loading functions are presented. In addition, possible response modes are discussed based on observations of high-speed video recordings. (24 figures, 7 refs.)
DTIC
Blast Loads; Fragmentation; Glass; Laminates; Polymeric Films

20050080409 Minnesota Univ., Minneapolis, MN USA
Lamellar Microstructure via Polymer Melt Processing
Macosko, Christopher W.; Hooper, Russell W.; Zhao, Rui; Sep. 2002; 13 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0337
Report No.(s): AD-A429178; No Copyright; Avail: Defense Technical Information Center (DTIC)

Lamellar microstructures can provide excellent control of polymer permeability. For example, they can stop toxic organic vapors yet transmit water vapor, be produced economically, and provide increased resistance to mechanical impact. However, the methods used to create and stabilize lamellar blends are not well understood. The key to creating lamella during melt blending is understanding the transient deformation of viscous and viscoelastic drops. In this research, the authors sheared polymer drops to very large deformation and measured their transient dimensions. Using fluorescent labeling and confocal microscopy, they showed how diblock co-polymers adsorbed on drop surfaces are convected to drop edges where they can

lower interfacial tension. Drops deformed further with than without block co-polymer and generated more lamellar microstructures. At high stress, slip was observed between immiscible polymer surfaces. Slip appears to be caused by reduced chain entanglement, which generates a thin low-viscosity region in the interface. Block co-polymer can eliminate this slip. Drop deformation breakup and coalescence were modeled with new adaptive 3D finite element methods. Calculations compared well to experiments and gave insight into observation of drop widening for low-viscosity drops. The effect of block co-polymer on interfacial tension was included in the model and predicted the role of block co-polymer in suppressing coalescence. The report includes a list of 6 journal articles, 5 conference paper preprints, 10 meeting papers, 2 manuscripts, and 9 reports submitted to ARO. Two abstracts are appended: 'Drop Dynamics in Polymer Processing Flows,' by Russell W. Hooper, and 'Multilayer Coextrusion Reveals Interfacial Dynamics in Polymer Blending,' by Rui Zhao.
DTIC
Block Copolymers; Deformation; Microstructure; Mixtures; Viscoelasticity; Viscosity

20050080419 Akron Univ., Akron, OH USA
Nanomechanical Study of Model Pressure Sensitive Adhesives by Scanning Probe Microscopy
Foster, Mark D.; Moon, Seung-ho; Jun. 2002; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-1-0247
Report No.(s): AD-A429212; 39791-MS; No Copyright; Avail: Defense Technical Information Center (DTIC)

The overall objective is to connect the near surface behavior of a model pressure sensitive adhesive with its macroscopic adhesive performance. Work with a new tackifier suggested that for complex commercial tackifiers the mixture of species in the tackifier may benefit miscibility. When miscibility is impaired, aging phenomena become more prominent. Force-distance measurements made at different frequencies can reveal viscoelasticity effects in such adhesives, but the frequency range that can be studied is limited. X-modulation is an excellent technique for probing differences in mechanical properties of adhesive surfaces. For example, changes due to enrichment of the surface by a lower molecular weight species can be detected. However, a characterization protocol combining X-modulation with a force-distance measurement is superior, yielding better reproducibility, higher precision, and more information in one experiment. Using contact mechanics and simplifying assumptions, estimates of modulus at the surface have been made. The new protocol was also demonstrated by characterizing changes in surface behavior with humidity. Humidity effects were most pronounced with the aged model adhesive that we had already shown to have the most strongly adhesive surface of the blends of various tackifier composition. The observed changes with humidity are consistent with the contention that the surface is enriched in tackifier.
DTIC
Adhesives; Microscopy; Nanotechnology; Pressure Sensors; Scanners; Sensitivity

20050080589 Naval Undersea Warfare Center, Newport, RI USA
A Method of Fabricating a Fibrous Structure for Use in Electrochemical Applications
Medeiros, Maria G., Inventor; May 2004; 16 pp.; In English
Report No.(s): AD-D020178; No Copyright; Avail: CASI; A03, Hardcopy

A method is provided for the fabrication of a fibrous structure. Fibers are deposited in a hopper connected to an electrode. A mesh covers the hopper opening and the hopper is inverted and suspended over an adhesive coated substrate. An electric field is generated between the hopper and the substrate while the hopper is simultaneously shaken. As a result, fibers fall through the mesh, aligned along the electric field lines, travel through the electric field and are coupled on one end thereof to the adhesive.
DTIC
Electric Fields; Electrochemistry; Fabrication

20050080710 NASA Glenn Research Center, Cleveland, OH, USA
Boron Nitride Nanotubes for Engineering Applications
Hurst, Janet; Hull, David; Gorican, Daniel; January 2005; 8 pp.; In English; 29th International Conference on Advanced Ceramics and Composites, 23-28 Jan. 2005, Cocoa Beach, FL, USA
Contract(s)/Grant(s): WBS-22-066-30-04; No Copyright; Avail: CASI; A02, Hardcopy

Boron nitride nanotubes (BNNT) are of significant interest to the scientific and technical communities for many of the same reasons that carbon nanotubes (CNT) have attracted wide attention. Both materials have potentially unique and important properties for structural and electronic applications. However of even more consequence than their similarities may be the complementary differences between carbon and boron nitride nanotubes While BNNT possess a very high modulus similar

to CNT, they also possess superior chemical and thermal stability. Additionally, BNNT have more uniform electronic properties, with a uniform band gap of 5.5 eV while CNT vary from semi-conductive to highly conductive behavior. Boron nitride nanotubes have been synthesized both in the literature and at NASA Glenn Research Center, by a variety of methods such as chemical vapor deposition, arc discharge and reactive milling. Consistent large scale production of a reliable product has proven difficult. Progress in the reproducible synthesis of 1-2 gram sized batches of boron nitride nanotubes will be discussed as well as potential uses for this unique material.
Author
Boron Nitrides; Nanotubes; Microstructure; Synthesis (Chemistry)

20050080714 NASA Glenn Research Center, Cleveland, OH, USA
High T(sub g) Polymides for Resin Transfer Molding
Chuang, Kathy C.; Criss, Jim M., Jr.; Mintz, Eric A.; Shonkwiler, Brian; Scheiman, Daniel A.; Nguyen, Baochau; McCorkle, Linda S.; Hardy-Green, DeNise; January 2005; 10 pp.; In English; ISSE 2005 Symposium and Exhibition, 1-5 May 20055, Long Beach, CA, USA
Contract(s)/Grant(s): WBS-22-714-30-01; Copyright; Avail: CASI; A02, Hardcopy

A series of new polyimide resins with low melt viscosities and high glass transition temperatures (T(sub g)'s) of 340-350 C were developed for resin transfer molding (RTM) applications. The viscosities of these polyimide resins, based on 2,3,3'4'-Biphenyltetracarboxylic Dianhydride (a-BPDA), are in the range of 10-30 poise. The composites were fabricated successfully at 260-280 C with a pot life of 30-60 minutes by the RTM process. The viscosity profiles of the polyimide resins and the mechanical properties of the polyimide carbon fiber composites will be discussed.
Author
Polyimide Resins; Resin Transfer Molding; Glass Transition Temperature; Synthesis (Chemistry)

28
PROPELLANTS AND FUELS

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

20050071634 Physics and Electronics Lab. TNO, The Hague, Netherlands
TNO-support to TMD-exercises Joint Project Optic Windmill (1998-2004) and Cannon Cloud (2002)
Vierveijzer, P.; Stoop, M. J.; October 2004; 45 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/753; TNO Proj. 015.31132
Report No.(s): FEL-04-A143; TD-2004-0174; Copyright; Avail: Other Sources

This report represents the TNO-support to JPOW from 1998 to 2004. In this exercise the focus is on operator training in Theatre Air And Missile Defence and development of the TAMD-concept. TNO simulated air defence capabilities for the Netherlands armed forces. TNO simulated RNLAF PATRIOT (JPOW 4-8), RNLN ADCF and RNLA SHORAD. In 2002 TNO also supported the RNLAF during exercise CC-02/COW-1. Until JPOW-7 TNO used the simulation model EADSIM. In 2003 TNO developed J-ROADS to simulate all weapon systems. In 2003 J-ROADS was used during the High Level Integrated Missile Defence Seminar and in 2004 during JPOW-8. Because of the simulation of future capabilities the RNLAF, RNLA and RNLN were able to participate in JPOW. This contributed to the exercise objectives of JPOW as a Test bed for new TAMD-systems, doctrines and TTP's, interconnectivity and interoperability. POW has evolved from a small-scale exercise to a world leading TMD-exercise. TNO-support also evolved from simulating RNLN to the simulation support for all armed forces. Through the support during JPOW 3-8, CC-02/COW-1 and the High Level Integrated Missile Defence Seminar and the development of J-ROADS TNO has proven to be a worthy partner for the armed forces in future TAMD/EAD exercises.
Author
Air Defense; Guns (Ordnance); Missile Defense; Netherlands

20050071640 Physics and Electronics Lab. TNO, The Hague, Netherlands
CEP Performance Study of a Gun Launched Novel Munition
Ruizemaar, M. G. A.; October 2004; 35 pp.; In English
Contract(s)/Grant(s): TNO Proj. 015.33000
Report No.(s): FEL-03-A236; TD-2003-0102; Copyright; Avail: Other Sources

Future Gun Launched Novel Munitions (GLNM) will be equipped an inertial navigation system (INS), combined with satellite navigation (GPS). The performance of INS-only guided GLNM is expected to decrease, depending on target distance. The performance of INS/GPS guided GLNM is expected to be high. The GPS system can be jammed, in which case the performance of the GLNM is expected to decrease. A study has been performed on the performance of INS-only and INS/GPS guided GLNM. Also the performance of the GLNM in the case of failure of GPS information has been studied. It was found that in the case of INS/GPS guidance, the Circular Error Propable (CEP) increases up to 7 m at the maximum target distance of 170 km. In the case of GPS failure during the last 50 to 100 seconds, the CEP drastically increases. The CEP increase can partially be reduced by implementing special filters. The realization of these filters was not part of the study.
Author
Error Analysis; Incendiary Ammunition; Ballistics; Global Positioning System; Gun Launchers

20050080290 Pennsylvania State Univ., University Park, PA USA
Liquid-Propellant Rocket Engine Injector Dynamics and Combustion Processes at Supercritical Conditions
Yang, Vigor; Nov. 2004; 251 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0114
Report No.(s): AD-A428947; AFRL-SR-AR-TR-05-0001; No Copyright; Avail: CASI; A12, Hardcopy

The present AFOSR project focuses on the theoretical modeling and numerical simulation of liquid-propellant rocket engine injector flow and combustion dynamics. Emphasis is placed on cryogenic propellants in both shear and swirl co-axial injectors at supercritical conditions. The formulation is based on the full conservation equations in three dimensions, and accommodates variable properties and finite-rate chemical kinetics. Full account is taken of various high-pressure phenomena such as thermodynamic non- idealities and transport anomalies commonly observed in the transcritical regime. Furthermore, an efficient numerical framework utilizing state-of-the-art computer software and hardware technologies is implemented, such that sweeping calculations can be conducted within a realistic time frame. Various fundamental physiochemical mechanisms associated with cryogenic propellant injection, mixing, and combustion are studied systematically. Results have not only enhanced basic understanding of the subject problem, but also established a quantitative basis to identify and prioritize the key design parameters and flow variables that exert strong influences on the injector behavior in different environments.
DTIC
Combustion Physics; Cryogenic Rocket Propellants; Fuel Injection; Injectors; Liquid Propellant Rocket Engines

20050080665 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Characterisation of Detonating Cord: Numerical Simulations and Additional Testing
Boluijt, A. G.; Verbeek, H. J.; November 2004; 25 pp.; In Dutch
Contract(s)/Grant(s): A03KL4KT; TNO Proj. 014.15399
Report No.(s): TD2004-0094; TNO-PML-2004-A94; Copyright; Avail: Other Sources

Following problems with the new detonating cord DBS 92-1, research has been done to find differences between the old and the new detonating cord. The shockwave patterns of these detonating cords were measured and in this report a model is developed to calculate the radial shockwave velocity and pressure from these measurements. With numerical simulations different parameters of the detonating cord are varied, such as mass explosive per meter detonating cord, density of the explosive, diameter of the cord and material of the (mantel). With the card gap test three lots of detonating cord are tested and compared.
Author
Explosive Devices; Cordage; Mathematical Models; Detonation

29
SPACE PROCESSING

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

20050070814 Houston Univ., TX, USA
Spatio-Temporal Step Patterns During Crystal Growth in a Transport Controlled System
Gliko, O.; Vekilov, Peter G.; Journal of Physical Chemistry; 2002; Volume 106, pp. 11800-11804; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources

No abstract available
Crystal Growth; Protein Crystal Growth

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*.

20050061121 NASA Kennedy Space Center, Cocoa Beach, FL, USA
A Shape Memory Alloy Based Cryogenic Thermal Conduction Switch
Notardonato, W. U.; Krishnan, V. B.; Singh, J. D.; Woodruff, T. R.; Vaidyanathan, R.; [2005]; 8 pp.; In English
Contract(s)/Grant(s): NAG10-323; No Copyright; Avail: CASI; A02, Hardcopy

Shape memory alloys (SMAs) can produce large strains when deformed (e.g., up to 8%). Heating results in a phase transformation and associated recovery of all the accumulated strain. This strain recovery can occur against large forces, resulting in their use as actuators. Thus an SMA element can integrate both sensory and actuation functions, by inherently sensing a change in temperature and actuating by undergoing a shape change as a result of a temperature-induced phase transformation. Two aspects of our work on cryogenic SMAs are addressed here. First - a shape memory alloy based cryogenic thermal conduction switch for operation between dewars of liquid methane and liquid oxygen in a common bulkhead arrangement is discussed. Such a switch integrates the sensor element and the actuator element and can be used to create a variable thermal sink to other cryogenic tanks for liquefaction, densification, and zero boil-off systems for advanced spaceport applications. Second - fabrication via arc-melting and subsequent materials testing of SMAs with cryogenic transformation temperatures for use in the aforementioned switch is discussed.
Author
Shape Memory Alloys; Switches; Cryogenic Equipment

20050070732 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia
Journal of Aerospace Technology, Volume 1, No.2
December 2003; ISSN 1412-8063; 51 pp.; In Malay-Indonesian; See also 20050070733 - 20050070738; Copyright; Avail: Other Sources

The following reports from the Journal of Aerospace Technology, Volume 1, No. 2, are presented: TERBANG ROKET RX-250-LPN. The effect of non-streamlined and non symmetrical erection of flap on flying prestige rocket RX 250 LPN; The calculation of critical load on plastic structure by using Southwell Method.; The effect of temperature system on figures of merit on earth station Pita s and Pita x station; Test of preparation of pol1 Metil Metaclirat (PMMA); The initial preparation of Satellite Image Communication System processing at LAPAN Tubsat; and The network data of communication at Real Time for monitoring of movement of jets at Jabotobek and Kepulauan Seribu.
Derived from text
Aerospace Engineering; Satellite Imagery; Data Transmission

20050070964 Forestry Univ., Beijing, China
Elliptic Delamination of Hexit Zone in Carbon Fiber-reinforced Plastics Caused by Drilling
Zhang, Houjiang; Chen, Wuyi; Fan, Rui; Chen, Dingchang; Progress of Machining Technology; December 2004, pp. 96-101; In English; See also 20050070885
Contract(s)/Grant(s): ASF-95G51089; Copyright; Avail: Other Sources

Delamination of hole exit zone in carbon fibre-reinforced plastics is the most severer section in whole hole zone existing delamination defect caused by drilling. Main reason for causing the delamination of hole exit zone is the opening mode (Mode 1) fracture in interplies which due to thrust force. Uncut layers in front of drill is called remaining layer in this paper, and its distribution of stiffness is the key factor to determine the delamination shapes of the interplies. As a result, based on analyzing the distribution of stiffness of the remaining layer, forming mechanism of elliptic delamination of hole exit zone in multi-directional carbon fiber-reinforced plastics caused by drilling was presented theoretically. On the other hand, orientation producing maximum delamination defect is as same as direction with maximum stiffness on the remaining layer. So based on determination of maximum stiffness orientation of the remaining layer, calculating method of major axis angle of the elliptic delamination was established.
Author
Holes (Mechanics); Delaminating; Ellipses; Carbon Fiber Reinforced Plastics; Drilling

20050080432 Defence Science and Technology Organisation, Victoria, Australia

Effect of Sonic Thermographic Inspection on Fatigue Crack Growth in an Al Alloy

Tsoi, Kelly A.; Rajic, Nik; Oct. 2004; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429283; DSTO-TN-0584; DODA-AR-013-213; No Copyright; Avail: Defense Technical Information Center (DTIC)

Sonic thermography has recently emerged as an important inspection technique capable of resolving inspection problems that contemporary methods have struggled with, such as tightly closed cracks in metallic structures and kissing bonds in composite repairs. The technique uses elastic waves injected by an acoustic horn resonating at typically either 20 or 40 kHz, which often excites lateral motion at the surfaces of a defect. This motion induces frictional heating and in turn a thermal indication, which can often be detected with sensitive thermal imaging equipment. Although shown to be quite useful in detecting many types of structural defects, several issues require close investigation and perhaps most critical of these is whether the technique is indeed nondestructive. No published work could be found that examines the impact of high intensity insonification, in the context of nondestructive inspection, on the fatigue crack growth characteristics of structural metals. This is despite an accepted understanding that thermal signatures produced during the intense acoustic excitation can evolve from a mechanically irreversible change of state. An experimental study was undertaken to examine the impact of repeated high intensity insonification on the rate of crack growth in Al7075 coupon specimens subject to mechanical tensile testing. Under a representative inspection regime no evidence was found of an accelerated or otherwise altered rate of crack growth compared to that measured for a benchmark group. It tentatively suggests that the technique is structurally benign when applied to cracked Al7075 components. (1 table, 7 figures, 11 refs.)

DTIC

Acoustic Fatigue; Acoustic Velocity; Aluminum Alloys; Crack Propagation; Damage Assessment; Elastic Waves; Fatigue (Materials); Inspection; Nondestructive Tests; Thermography

20050080590 Naval Undersea Warfare Center, Newport, RI USA

An Improved System and Apparatus for Measuring Displacements in Electro-Active Materials

Carreiro, Louis G., Inventor; Reinhart, Lawrence J., Inventor; Aug. 2004; 18 pp.; In English

Report No.(s): AD-D020179; No Copyright; Avail: CASI; A03, Hardcopy

A specialized containment cell with optically transparent apertures, in conjunction with a laser interferometer system provides the means for non-contact displacement measurements of electro-active (piezoelectric and electrostrictive) materials to be performed under controlled conditions of pressure, temperature and applied voltage. A sample of electro-active material is placed inside the cell. Electrical connections are made from a high voltage power source to the sample through the cell. Thermoelectric heaters/coolers and a cooling water heat sink built into the cell control the temperature of the sample. The cell is flooded with a dielectric oil pressurizing the interior of the cell to a desired pressure. The cell is optically aligned to the interferometer, and with the cell heated to the proper temperature, a voltage is applied to the sample as the interferometer measures the displacement of the sample.

DTIC

Displacement

20050080591 Naval Undersea Warfare Center, Newport, RI USA

A System and Apparatus for Measuring Displacements in Electro-Active Materials

Carreiro, Louis G., Inventor; Reinhart, Lawrence J., Inventor; Aug. 2004; 15 pp.; In English

Report No.(s): AD-D020180; No Copyright; Avail: CASI; A03, Hardcopy

A device designed to apply uniaxial pressure to the surface of an electro-active material while simultaneously applying a current to the material under controlled temperature conditions and then measuring the displacement of the material by means of a laser interferometer. The device involves a housing with a chamber in which a sample of material is secured. The chamber has an aperture with a quartz window that allows the laser beam from the interferometer to pass. The sample is connected to electrodes and the chamber is filled with dielectric oil that applies the uniaxial pressure to one side of the sample. The device is placed onto a thermal control system. When the appropriate thermal and pressure conditions are established, current is applied to the sample and the interferometer measures the displacement.

DTIC

Displacement; Interferometers

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*.

20050061167 National Inst. of Information and Communications Technology, Tokyo, Japan

Plan of Experiments: Plan of Experiments for Mobile Satellite Communications and Broadcasting

Taira, Shinichi; Hamamoto, Naokazu; Yoshimoto, Shigetoshi; Hama, Shinichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 261-267; In English; See also 20050061163; Copyright; Avail: Other Sources

Mobile satellite communications and broadcasting experiments using the Engineering Test Satellite VIII are planned. The experimental plan has two categories. One is a fundamental experiment which will be carried out by National Space Development Agency of Japan, Nippon Telegraph and Telephone Corporation and Communications Research Laboratory. These organizations have been developing the Engineering Test Satellite VIII. The other is application experiments which will be conducted by several selected organizations. The Communications Research Laboratory's experimental plan includes evaluating the performances of the onboard equipment, the earth station, and the mobile satellite communications and broadcasting system.

Author

Engineering Test Satellites; Satellite Communication; Broadcasting; Experiment Design

20050061171 National Inst. of Information and Communications Technology, Japan

Development of Earth Stations: Ka-band Feeder-link Earth Station

Yamamoto, Shinichi; Noriaki, Obara; Ohashi, Hajime; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 127-135; In English; See also 20050061163; Copyright; Avail: Other Sources

Engineering Test Satellite VIII (ETS-VIII) is schedule to be launched in the summer of 2004. The Communications Research laboratory (CRL) is planning various mobile satellite communication experiment using On-Board Processor, On-Board Packet Switch, etc. which were carried in the satellite, and the satellite broadcasting experiment. A Ka-band feeder-link earth station is installed in the Kashima Space Research Center, forms a feeder-link in the communication and the broadcast experiment between ETS-VIII, and carry out the central role of an experiment. This paper describes the outlook of a Ka-band feeder-link earth station and the electrical characteristic.

Author

Satellite Communication; Engineering Test Satellites; Broadcasting; Extremely High Frequencies

20050061174 National Inst. of Information and Communications Technology, Japan

Portable S-band Terminal for ETS-VIII Communication Experiments

Hama, Shin-Ichia; Miyoshi, Takashi; Shigeta, Tsutomu; Kozono, Shin-Ichi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 235-241; In English; See also 20050061163; Copyright; Avail: Other Sources

The National Space Development Agency in Japan (Japan Aerospace Exploration Agency has developed test models of S-band portable terminal to conduct experiments such as large deployable reflector (LDR) antenna pattern measurement experiments. These test models work as through repeaters and have a TCP/IP accelerator to compensate the decrease of the TCP/IP throughput caused in a satellite link. Practical models will be manufactured in FY 2003 based on the test model.

Author

Large Deployable Reflector; Reflector Antennas; Superhigh Frequencies; Ultrahigh Frequencies; Portable Equipment

20050061177 National Inst. of Information and Communications Technology, Tokyo, Japan

Overview of the Engineering Test Satellite VIII (ETS-VIII) Project

Hamamoto, Naokazu; Imae, Michito; Yoshimoto, Shigetoshi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 3-11; In English; See also 20050061163; Copyright; Avail: Other Sources

The Engineering Test Satellite VIII (ETS-VIII) project started from a conceptual design for a mobile satellite communications and broadcasting system produced by the Ministry of Post and Telecommunications in 1992. The aim of this

project is to develop fundamental technologies for mobile satellite handheld phone services and digital sound broadcasting services using the S-band frequency. To develop the required technology in Japan, the Japan Aerospace Exploration Agency (JAXA), the Communications Research Laboratory (CRL), and other organizations have collaborated to develop a large satellite bus, large scale deployable reflectors, a phased array antenna feed system, onboard signal switching equipment for voice and data communications, a high-accuracy positioning system, and so on. The development of the onboard components is almost complete and a ground test of the satellite system is being conducted at JAXA's Tukuba Space Center in preparation for launching the satellite in 2004. This report presents an overview of the history of the ETS-VIII project, the organizational structure, and the in-orbit experiments.
Author
Test Vehicles; Communication Satellites; Mobile Communication Systems; Ground Tests; Data Transmission

20050061190 National Inst. of Information and Communications Technology, Tokyo, Japan
Parabolic Reflector Antenna Mounted Inside Folding Case
Jang, Jae-Hyeuk; Hamamoto, Naokazu; Tanaka, Masato; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 183-189; In English; See also 20050061163; Copyright; Avail: Other Sources

We developed a folding parabolic reflector antenna for a portable earth station to conduct high speed data communication experiments on the Engineering Test Satellite VIII (ETS-VIII). This antenna is mounted inside a thin folding case, designed to be the antenna carrier, and can easily be folded and unfolded because the reflector is made of a flexible reflector material. We performed experiments to verify the electrical performance of the antenna. Even though the antenna has a flexible reflector, the experimental results show that the expected antenna performance can be achieved for the communication experiments for the ETS-VIII satellite.
Author
Parabolic Reflectors; Satellite Communication; Reflector Antennas; Data Transmission

20050061194 National Inst. of Information and Communications Technology, Japan
Coded Modulation Equipment with Unequal Error Protection
Li, Huan-Bang; Ohkawa, Mitsugu; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 219-224; In English; See also 20050061163; Copyright; Avail: Other Sources

We have developed a prototype modem in preparatian for the mobile satellite communi- cation experiments using the Engineering Test Satellite VIII-type (ITS-VIII). The developed modem uses a technique called multiple block coded modulation, which provides unequal error protection among the data bits to be transmitted. This modem is suited for applications where a part of the total data bits is more sensitive to channel errors and thus needs stronger protection than the other data bits do. The principle and the structure of this prototype modern are described. Computer simulation and laboratory measuring results are presented.
Author
Frequency Modulation; Modems; Prototypes

20050061198 Ministry of Posts and Telecommunications, Tokyo, Japan
Concluding Remarks
Yoshino, Taizah; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 279; In English; See also 20050061163; Copyright; Avail: Other Sources

The Communications Research Laboratory has continued to play an active role in the development of Japan s Engineering Test Satellite series, and has contributed to the establishment of a number of future satellite technologies. The Engineering Test Satellite VI11 (ETV-VIII), scheduled for launch in FY 2004, will be used to conduct mobile multi- media communications experiments utilizing the potential of satellite communications. Moreover. basic experiments to establish satellite positioning technologies will be per- formed using an onboard atomic clock. The ETS-VI11 is a large satellite to fulfill the requirements governing direct-link mobile communications between the satellite and portable hand-held terminals. Each of the two deployable antennas (one for transmission and the other for reception) measures nearly 19 m by 17 m, comparable in size to antennas installed in ground-based base stations. Weighing approximately 3 tons in total in the initial stages of geostationary orbit. the ETS- VI11 will be one of the largest geostationary satellites in space.
Derived from text
Mobile Communication Systems; Satellite Communication; Engineering Test Satellites; Ground Stations

20050061246 Swedish Defence Research Establishment, Linkoeping, Sweden
Communication Channel in Urban Environments Description of the MIMO Concept and the RUSK Channel Sounder
Waem, A.; Lundborg, B.; Eriksson, G.; Alexandersson, M.; Mar. 2004; In Swedish
Report No.(s): PB2005-101246; FOI-R-1200-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Military operations in the future will probably to an increasing extent be performed in urban environments. The radio systems used must be robust and independent of a permanent infrastructure. This also includes the communication systems for civil authorities within the total defense. To meet the need of new knowledge regarding radio wave propagation in urban environments, cooperation with Lund University, LTH, has been initiated. This concerns above all radio channel measurements with a MIMO (Multiple Input-Multiple Output) Channel Sounder. With this measurement system the radio channel can be characterized in three different frequency bands that will be significant for future military and public radio systems. The measurement results can be used to build and verify channel models for radio systems with advanced antenna rays.
NTIS
Telecommunication; Channels (Data Transmission); Radio Transmission; Radio Waves

20050061247 Swedish Defence Research Establishment, Linkoeping, Sweden
Communication at Urban Warfare Radio and Laser
Waem, A.; Jhohansson, P.; Pettersson, M.; Jun. 2004; In Swedish
Report No.(s): PB2005-101252; No Copyright; Avail: National Technical Information Service (NTIS)

Urban warfare is nothing new but the view of it has changed. The material and doctrines are not adapted to urban environments which will influence both the soldiers and the tactics. Efficient command and control demand communication with all kinds of units. There are, today, several different types of sensors in use but their information are not available to everybody who might need it. The communication network and the sensors are not integrated. In the future, small, simple cooperated sensors scattered in the terrain will form one advanced sensor. But the realization demands a fully integrated communication network. The high speed in urban warfare requires new demands on information and intelligence. It is therefore important that the information immediately reach the combat unit in the area. When sensors and unmanned vehicles are introduced at a tactical part in an operation, it is important that also their information, without delays, reach the unit.
NTIS
Communication Networks; Command and Control; Lasers

20050061249 Department of the Army, Washington, DC, USA
Space Warriors: The Army Space Support Team (Revised)
Walker, J.; Hooper, J. T.; Jul. 2003; In English
Report No.(s): PB2005-100675; No Copyright; Avail: National Technical Information Service (NTIS)

In the period from 1986 to 1998, the Army experimented with a number of concepts and programs for providing space support to tactical commanders. During this period, the focus of Army efforts shifted from space systems demonstrations, to deployment support, to space analytic services. The Army Space Support Team (ARSST) spearheaded these efforts to utilize space capabilities in support of the war fighter. As the military space environment continues to evolve and the Army adapts to new and emerging Army requirements, the ARSST will continue to play in indispensable role in translating space capabilities into war fighting tools and knowledge.
NTIS
Military Operations; Support Systems; Aerospace Systems

20050061292 Swedish Defence Research Establishment, Linkoeping, Sweden
Integrating Scientific Disciplines for Automated Command Support in High-Risk Missions
Worm, Arne; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 2-1 - 2-13; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In military operations and emergency management, operators and commanders must rely on distributed and automated systems for safe and effective mission accomplishment. Commanders and other decision makers must manage true real time system properties at all levels; individual operators, stand-alone technical systems, higher-order integrated human-machine systems and joint operations forces alike. In these high-risk, dynamical circumstances, management and utilisation of automated command support can rapidly become an unmanageable endeavour. Coping with automation issues in command

and control is a challenge for practitioners and researchers. New results, new measurement techniques and new methodological advances facilitate a more accurate and deeper understanding, generating new and updated models. This in turn generates theoretical advances. This paper reports on research from which the results led to a breakthrough: An integrated approach to information-centred systems analysis to support automation research and development in command and control. Author

Automatic Control; Command and Control; Man Machine Systems; Systems Integration

20050070735 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The Effect of Temperature System on Figures of Merit on Earth Station Pita s and Pita x Station

Surjo, Achmadi; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 15-21; In English; See also 20050070732; Copyright; Avail: Other Sources

One of the very important in a satellite communications system is the figure of merit , for space segment as well as for the ground segment. The parameter which will be discussed in this paw is the figure of merit of a ground station of S band and X band for remote sensing system application. The parameters which influences it are antenna gain and temperature of system. The antenna which will be used is parabola antenna whose magnitude gain depends on diameter and efficiency of reflector. While the elevations angle and rain conditions will influence the system temperature. At time operation activity the ground station antenna moves to track the desired satellite, so the elevation angle changes as well as the azimuth angle. On S band system influence of rain can be ignored, while on the X band the influence needs to be considered. From the analysis conducted at 0.1 time percentage, the result is influence of rain to the figure of merit is necessary to be estimated.
Author

Figure of Merit; Temperature Effects; Ground Stations; Remote Sensing; Ultrahigh Frequencies

20050070737 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The Initial Preparation of Satellite Image Communication System Processing at LAPAN TUBSAT

Suwarjo, Minto; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 33-39; In Malay-Indonesian; See also 20050070732; Copyright; Avail: Other Sources

The LAPAN-TUBSAT is a joint reseaverd between LAPAN and Technical University of Berlin for image processing application. The satellite will be built in with half-duplex transmission system, with uplink frequency is UHF-band 435.075 Mhz in minimum data rate 1200 bps, while the downlink frequency is S-band 2.2 GHz use data rate 38400 bps. The uplink frequency will functioned for command and downlink frequencies for telemetry data and image data. The main communication payload consists of transmitter and antenna S-band, transceiver and antenna UHF-band, two cameras with resolution 50 mm and 1000 mm with PAL standard, data and video multiplexes, on-board data handling and power control unit The ground station consists of TT&C operates in UHF-band and ground receiver processing operates in S-band frequency. The minimum image signal quality received is 45 dB for BER 10(exp -6).
Author

Satellite Imagery; Image Processing; Satellite Communication; Video Data; Data Transmission

20050071563 National Highway Traffic Safety Administration, Washington, DC, USA

Effects of Practice on Interface from an Auditory Task While Driving: A Simulation Study

Shinar, D.; Tractinsky, N.; Oct. 2004; In English

Report No.(s): PB2005-102700; No Copyright; Avail: National Technical Information Service (NTIS)

Experimental research on the effects of cellular phone conversations on driving indicates that the phone task interferes with many driving-related functions, especially with older drivers. Limitations of past research have been that (1) the dual task conditions were not repeated in order to test for learning, (2) the phone tasks were not representative of real conversations, and (3) most often both the driving task and the phone task were experimenter-paced. In the real-driving environment, drivers learn to time-share various tasks, they can pace their driving to accommodate the demands of the phone conversation, and can even partially pace the phone conversation to accommodate the driving demands. The present study was designed to better simulate real driving conditions by providing a simulated driving task with repeated experiences of simulated driving and talking and two different phone tasks with different proximities to real conversations. In the course of five sessions of driving and using the phone, there was a learning effect on most of the driving measures.
NTIS

Auditory Tasks; Simulation; Telephones; Automobiles

20050071571 Swedish Defence Research Establishment, Linkoeping
Analysis of Flexible Microwave Systems. Status Report 2004-06-30
Alm, A.; Erickson, R.; Nelander, A.; Jun. 2004; In Swedish; In English
Report No.(s): PB2005-101255; FOI-R-1252-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the current status of the project activity Analysis of Flexible Microwave Systems within the project MIRA Array Antennas and Programmable Microwave Systems. The report describes some of the technical and functional prerequisites necessary to integrate a multitude of RF-functions in a single multifunction microwave system. It focuses on reconnaissance and data link communication functions. Typical requirements on bandwidth, frequency range, dynamic range, noise factor and radiated power are illustrated but requirements on cooling, power supply, volume, weight and environmental conditions are not included. The report is intended to form a basis for the continued studies of concepts and technological solutions for systems, RF-electronic and conformal antennas for flexible microwave systems.
NTIS
Radar Antennas; Microwave Equipment

20050071618 Swedish Defence Research Establishment, Linkoeping, Sweden
Security Aspects of Mobile and ad-hoc Networks
Schotanus, H. A.; Verkoelen, C. A. A.; Hansson, E.; Genik, L.; Salmanian, M.; Jan. 2004; 286 pp.; In English
Report No.(s): PB2005-101934; FOI-R-1161-SE; No Copyright; Avail: CASI; A13, Hardcopy

This document is the outcome of a year-long collaboration between scientists from DRDC Ottawa (Canada), TNO FEL (the Netherlands), and FOI (Sweden) exploring the security of mobile ad hoc networks. All nations agreed on a tactical, peacekeeping scenario that was manageable for the purpose of the project. Critical communication links were identified in order to have the scenario analyzed with unique link characteristics. The team collected, surveyed, and analyzed national wireless military standards and systems with open standards throughout all layers of the OSI reference model. The analysis, which included a security review according to a team prepared security criteria, highlighted candidate systems and standards for the designated links. The analysis of the candidate open standards also identified weaknesses and a number of potential research topics.
NTIS
Communication Networks; Warning Systems; Security

20050071631 Arizona Dept. of Transportation, Phoenix, AZ, USA
Transportation Communications Interoperability: Phase 1 - Needs Assessment
Wendtland, M.; Tannehill, R.; Schroeder, M.; Kolcz, A.; Aug. 2004; 196 pp.; In English
Report No.(s): PB2005-102510; No Copyright; Avail: CASI; A09, Hardcopy

ADOT's ability to successfully fulfil its responsibilities for highway maintenance and construction, event traffic management, incident response, and regional security depends on reliable radio communications among its field units and with partner agencies. This needs assessment research represents an initial step in a comprehensive ADOT program aimed at improving statewide radio communications interoperability internally and with ADOT's various partner agencies.
NTIS
Radio Communication; Transportation

20050080264 Technische Hogeschool, Delft, Netherlands
Proceedings of the Siberian Polarization Workshop (SibPol 2004) (3rd) held 7-9 September 2004 in Surgut, Russia
Nov. 2004; 252 pp.; In English
Contract(s)/Grant(s): FA8655-04-1-5101
Report No.(s): AD-A428672; No Copyright; Avail: CASI; A12, Hardcopy

This document contains the Final Proceedings for the Third Siberian Polarization Workshop (Sibpol 2004), which was held on 7-9 September 2004. The workshop's 34 papers focused on the following topics: (1) polarization of electromagnetic waves at reflection and scattering by complex objects; (2) vector processing of optical signals; (3) polarization characteristics of signals in radar, radio navigation, and communication systems; and (4) polarization radar. A partial listing of titles follows: Dual Polarized Patch Antenna for Branch Correlation Measurements in an Indoor Raleigh Fading Channel utilizing Polarization Diversity; Polarization Effects in Nonlinear Radar; Recent Advances in Fully Polarimetric POL-DIFF-in-SAR Sensing and Imaging with Applications to Geodynamic Stress-Change Monitoring; Polarization Bistable Optical Devices; User Collusion for Joint Utilization of Electromagnetic Frequency Bands in Radar Remote Sensing: Frequency Allocation,

Interference Reduction and Security Threat Mitigation; UWB Radio Polarimetry; Joint Estimation of Coordinate and Polarization Parameters of Radar Objects; Experimental Researches of Polarization Characteristics of Clouds and Precipitation; Laser Polarization Sounding of High-Level Clouds; Modelling Results of Complex Objects Backscattering; Experimental Investigations of Polarization Structure of Backward and Sideward Radiation of Scanning Antenna; Characteristics of Sideward Radiation of Reflector Antennas; Accuracy Estimation of Rain Intensity Measurement by Radar Techniques; Increase of S/N Ratio Due to Adaptive Control of HF Waves Polarization under Transmitting Discrete Information; Radar Characteristics and Polarization Structure Peculiarities of EM Field Scattered by Some Radar Targets and EM Wave Scattering Control Devices; Optical Polarization Bistable Element Based on Faraday Cell; Intracavity Faraday Rotation; Polarization Modulator of He-Ne Laser Radiation; Location Sounding of Snow Covers.
DTIC
Backscattering; Conferences; Electromagnetic Scattering; Radar Targets; Russian Federation; Search Radar; Vector Analysis; Wave Reflection

20050080313 Army Command and General Staff Coll., Fort Leavenworth, KS USA
For Want of a Nail: An Assessment of Global Positioning System Satellite Replenishment
Hook, David E.; May 2004; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A428995; No Copyright; Avail: Defense Technical Information Center (DTIC)

Despite its vital importance to the welfare and security of the nation, the Global Positioning System (GPS) constellation is populated with numerous satellites operating well beyond their design life. These aging satellites are more likely to malfunction, which can reduce service coverage, degrade accuracy, and in some cases, transmit dangerously inaccurate data. The Air Force currently subscribes to a launch to sustain (LTS) GPS satellite replenishment strategy. Under this strategy, new satellites are launched only after a satellite failure or just prior to a failure. The purpose of this monograph is to investigate whether the Air Force should forgo its LTS replenishment strategy in favor of a more aggressive launch to augment (LTA) strategy in order to proactively replace high-risk satellites and to accelerate modernization timelines. It will be shown that the explosive growth of GPS over the past fifteen years has outpaced the Air Force's strategy on satellite replenishment. The growing importance of GPS must be matched with a progressive replenishment strategy that sustains its reliability and improves its utility for military, civil, and commercial users. The LTS strategy has placed a disproportionate emphasis on operational efficiency at the expense of operational effectiveness and has impaired the timely insertion of critical new capabilities into the constellation. A LTA strategy would help to reverse this trend.
DTIC
Global Positioning System; Replenishment; Satellite Constellations

20050080331 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Special Forces Command and Control in Afghanistan
Rhyne, Richard G.; Jun. 2004; 70 pp.; In English
Report No.(s): AD-A429053; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study is to examine the nature of the command and control relationship between Special Forces and conventional forces. The author examines how Special Forces and conventional forces worked together in the past in Vietnam, Panama, Somalia, Haiti, Bosnia-Herzegovina, and Operations Desert Storm and Desert Shield. The primary case study presented and discussed is the integration of Special Forces and conventional forces in Afghanistan during Operation Enduring Freedom. Operation Enduring Freedom in serves as a case study in practice and doctrinal application. (2 figures, 62 refs.)
DTIC
Afghanistan; Command and Control; Military Operations; Warfare

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*.

20050061143 University of Central Florida, Orlando, FL, USA
A Shape-Memory Alloy Thermal Conduction Switch for Use at Cryogenic Temperatures
Vaidyanathan, Raj; [2004]; 22 pp.; In English
Contract(s)/Grant(s): NAG10-323; No Copyright; Avail: CASI; A03, Hardcopy

The following summarizes the activities performed under NASA grant NAG10-323 from September 1, 2002 through September 30, 2004 at the. University of Central Florida. A version of this has already been submitted for publication in the international journal Swart Materials and Structures in December 2004. Additionally, a version of this has already appeared in print in Advances in Cryogenic Engineering, American Institute of Physics, (2004) 50A 26-3; in an article entitled 'A Shape Memory Alloy Based Cryogenic Thermal Conduction Switch' by V.B. Krishnan. J.D. Singh. T.R. Woodruff. W.U. Notardonato and R. Vaidyanathan (article is attached at the end of this report).
Derived from text
Conductive Heat Transfer; Cryogenic Temperature

20050061210 Interior Dept., Washington, DC, Geological Survey, Reston, VA, Illinois Univ., Urbana-Champaign, IL, USA
Enhancements to and Characterization of the Very Early Time Electromagnetic (VETEM) Prototype Instrument and Applications to Shallow Subsurface Imaging at Sites in the DOE Complex
Wright, D. L.; Chew, W. C.; 2004; In English
Report No.(s): DE2004-828612; No Copyright; Avail: National Technical Information Service (NTIS)

Tests in July, 1998, of an improved version of the prototype VETEM system demonstrated improved depth of investigation at the Cold Test Pit (CTP) at the Idaho National Environmental and Engineering Laboratory (INEEL). The improved depth of investigation is due primarily to the development of larger loop antennas and a new transmitter capable of driving up to 30 times more current than the original transmitter into the larger loop. An overlapped antenna configuration was tried and proved effective in detecting buried objects. New display software allows us, for the first time, to generate areal time-slice displays of our data in the field for fast qualitative evaluation. Comparisons of results using two different antenna configurations over the Large Object Pit portion of the CTP show generally good agreement, but show an apparent position offset of the two data sets from each other. The test over the Calibration Cell portion of the CTP using the overlapped antenna configuration successfully located most of the indicated targets in the cell. Results over both portions of the CTP suggest that the indicated locations of some of the buried objects may not be completely accurate. New antenna and 3D forward modeling codes run using an input waveform, antenna size and configuration, and system bandwidth matching those of the VETEM system produce waveforms and show sensitivities similar to those seen in recorded field data.
NTIS
Waste Management; Environmental Engineering; Imaging Techniques

20050070980 Huazhong Univ. of Science and Technology, Wuhan, China
Study on Nanoimprint Lithography with High Precision Alignment
Huang, Rong-Jie; Fan, Xi-Qiu; Lu, Zhi-Wen; Wang, Lin-Hong; Progress of Machining Technology; December 2004, pp. 197-202; In English; See also 20050070885; Copyright; Avail: Other Sources

Because of its capability to replicate nanostructures repeatedly in a large area with high resolution and fine uniformity, Nanoimprint lithography (NIL) has been recognized as a potential approach to fabricate sub-100 nm patterns with high throughput and low cost. However, to obtain high-resolution features in multilevel or step nanoimprint process, high precision alignment is indispensable. This paper presents a homemade nanoimprint lithography prototype with a high precision alignment system, which adopts both macro and micro actuators to achieve coarse and fine alignment, and alignment position is detected by means of moire interferometry. Linear motors with 300 mm travel range and 0.1 micron step resolution, and piezoelectric translators with 50 micron travel range and 0.1 nm step resolution are used as macro and micro actuators respectively. The accuracy of 10 nm repeatable alignment within the working range of 200mm 200mm can be reached. Finally, hot embossing lithography, one typical NIL technology is depicted detailedly by taking nanoscale gratings fabrication as an example. High resolution and fine fidelity of printing results demonstrate NIL's potential applications in manufacturing integrated circuits, optical, chemical, and biological nanostructures or micro-devices.
Author
Lithography; Nanofabrication; Precision; Alignment

20050070988 Beijing Univ. of Tech., Beijing, China
Research On Technology Of Wire Electrical Discharge Machining With A Rotator Wire Electrode
Fu, Sheng; Shi, Zhaoyao; Xu, Zhongsi; Progress of Machining Technology; December 2004, pp. 302-306; In English; See also 20050070885; Copyright; Avail: Other Sources

The wire electrical discharge machining with a rotary wire electrode is a new technology of WEDM, which can realize high machining quality as WEDM-LS and low price and operation cost as WEDM-HS. The machining mechanism of WEDM

with a rotary wire electrode is researched in this paper. The main reasons of improving machining quality by WEDM with a rotary wire electrode are that on the one hand an inertia force effect of high speed rotation makes the stiffness of the wire stronger and the stability of the wire in space better and the vibration of the wire less, on the other hand the wire electrode of high-speed rotation has the effects of both cutting and grinding.
Author
Machining; Wire; Rotary Stability; Deflection; Electric Discharges

20050070990 Guangdong Univ. of Tech., Guangzhou, China
Three-Dimensional Electrochemical Generating Micromachining
Guo, Zhongning; Han, Guihai; Progress of Machining Technology; December 2004, pp. 312-317; In English; See also 20050070885
Contract(s)/Grant(s): NSF-020144; Copyright; Avail: Other Sources

This paper presents a new method for three-dimensional microstructure machining, electrochemical generating micromachining (EGMM). In electrochemical machining, with the application of ultrashort voltage pulses between the tool electrode and the workpiece, the physical and chemical performance in the inter-electrode gap is greatly improved, making the distance between two electrodes reduced to micrometer or submicrometer. As a result, the concentrative dissolution of anodic is increased and the higher precision in ECM can be obtained. Fabricating a universal micro tool electrode on-line and driving it along a defined trajectory of the workpiece surface within a extremely close working space, a 3D microstructure with complex shapes will be machined successfully. A new device was designed to realize the EGMM process, which possesses the five axis with three sliding degrees and two revolving degrees, driven by step motors. It is able to accomplish the shaping of tool electrode and produce a 3D workpiece with high precision. Keywords electrochemical micromachining, generating machining, on-line tool fabrication
Author
Electrochemical Machining; Microstructure; Anodes; Fabrication

20050070991 Nanjing Agricultural Univ., China
Study On The Technology Of Precision Electrochemical Contour Evolution Machining Of Integral Impellers
Kang, Min; Xu, Jia-Wen; Progress of Machining Technology; December 2004, pp. 318-323; In English; See also 20050070885; Copyright; Avail: Other Sources

Numerical Controlled Electrochemical Contour Evolution Machining technology is one of the most important development trend in the unconventional machining field. It not only has the advantages of conventional electrochemical machining, but also has the advantages of numerical controlled machining, and ideally suited to the machining of complex shaped components made of high strength, heat-resistant alloys. In this paper, the NC-ECCEM method was simply described, and the equipment and tool-electrode for precision NC-ECCEM of the integral impeller's blades were introduced. The method of determination of the movement path of the tool-electrode relative to the workpiece and the programming method were presented. In order to evaluate the precision NC-ECCEM method, the experiments for machining one kind of small size integral impeller's blade surfaces by use of the kind of new tool-electrode with rectangle section were carried out. Experimental results showed that the method of precision NC-ECCEM of the integral impeller's blade surfaces can reach higher machining accuracy and good surface quality.
Author
Electrochemical Machining; Contours; Heat Resistant Alloys; High Strength Alloys; Electrodes

20050070993 Toyama Univ., Toyama, Japan
Three Dimensional Nano Fabrication Of Single Crystal Silicon By Focused Ion Beam And Subsequent Wet Chemical Etching
Kawasegi, Noritaka; Morita, Norboru; Yamada, Shigeru; Takano, Noboru; Oyama, Tatsuo; Ashida, Kiwamu; Taniguchi, Jun; Miyamoto, Iwao; Progress of Machining Technology; December 2004, pp. 330-335; In English; See also 20050070885; Copyright; Avail: Other Sources

This study aims to fabricate three dimensional nanostructures of single crystal silicon by focused ion beam (FIB) process and subsequent wet chemical etching. Irradiated area by FIB acts as a mask against KOH solution, and consequently protruding nanostructures having several hundreds of nanometers in height can be fabricated through etch process. In order to control the height of nanostructures, the dependence of the masking effect on FIB irradiating conditions are studied under various parameters. As a result, it is found that the masking effect can be controlled by FIB irradiating conditions such as dose,

accelerate voltage and dot pitch. Finally, three dimensional nanostructures can be fabricated based on these results, which indicates a possibility of industrial application as a novel three dimensional nanofabrication process.
Author
Ion Beams; Etching; Nanofabrication; Single Crystals; Silicon; Potassium Hydroxides; Nanostructures (Devices)

20050071002 Institute of Physical and Chemical Research, Saitama, Japan
Color Finishing Of Titanium Alloy Using A New Electrical Grinding Technique
Katahira, Kazutoshi; Ohmori, Hitoshi; Mizutani, Masayoshi; Komotori, Jun; Progress of Machining Technology; December 2004, pp. 324-329; In English; See also 20050070885; Copyright; Avail: Other Sources

Titanium alloy is usually colored by coating or painting after finishing. Beyond that, however, if a stable oxide film can be successfully and efficiently generated on the surface at the time of grinding and polishing as part of surface processing, the surface properties of the processed workpiece will be greatly improved. This will also streamline surface treatment and allow for significant savings in energy and procedures. This study proposes an electrochemical processing system that organizes the thickness and structure of an oxide film generated on the processed surface by applying a direct current of extremely short pulses to the workpiece being ground. The authors focused specifically on the color of the oxide film generated on the processed surface as a result of optical interference, and studied closely the mechanism and control of this color finishing process conditions.
Author
Metal Grinding; Surface Properties; Oxide Films; Titanium Alloys; Metal Finishing; Color

20050071029 North China Univ. of Science and Technology, Taiyuan, China
The Precision Motion Control Based on Motion Controller
Wu, Shu-Qin; Progress of Machining Technology; December 2004, pp. 656-659; In English; See also 20050070885; Copyright; Avail: Other Sources

Several open NC system models are enumerated, a kind of open NC system that is PC-based motion controller is further analyzed. This paper also research detailed on one of its support technology, network communication. Using VC++ programming language, the network communication program on Win Socket was developed. The research of application of Kollmorgen's motion controller is completed, the approach is supplied that can be referenced by other similar research.
Author
Motion; Control Equipment; Controllers

20050071587 Lawrence Livermore National Lab., Livermore, CA
Projected Response of Typical Detonators to Electrostatic Discharge (ESD) Environments
Wilson, M. J.; Dec. 20, 2002; In English
Report No.(s): DE2004-15003275; UCRL-ID-145642; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this discussion is to indicate the threshold values for low-order detonator response by using first principles applied to pin-to-pin configurations and associated limits in pin-to-case scenarios. In addition an attempt to define the electrical environment by first principles is shown to be inadequate and indicates the need to define the electrical insult by reasonable standards. A comparison of two accepted electrical models and a combination of the extreme reported levels from both standards are used to establish an extreme set of parameters for a safety assessment. A simplification of the critical electrical insult easily defined electrical dimensions of action integral. Action integral and the and gas phases of the material used for detonator bridge wires. The resulting material phases are directly related to detonator response thresholds.
NTIS
Detonators; Electrostatics

20050080294 Yale Univ., New Haven, CT USA
Analytical Tools for Real-Time Delta-Sigma Multibeam Processing
Rokhlin, Vladimir; Dec. 2004; 128 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0364
Report No.(s): AD-A428954; RR-1196; RR-1251; No Copyright; Avail: CASI; A07, Hardcopy

We apply the theory of band-limited functions and related technlques to two aspects of ReaI-Time Delta-Sigma Multibeam Processing: the design of complicated antenna patterns and the improvement of delta-sigma algorithms in environments involving multiple transducers. We also apply modern fast electromagnetic modeling techniques to the

simulation of antenna arrays, which is a critical step in the design of large-scale tightly packed structures.
DTIC
Beamforming; Frequencies; Real Time Operation

20050080298 Naval Research Lab., Washington, DC USA
Design of a Ka-Band Gyro-TWT for Radar Applications
Nguyen, Khanh T.; Calame, Jeffrey P.; Pershing, Dean E.; Danly, Bruce G.; Garven, Morag; Jan. 2001; 8 pp.; In English
Report No.(s): AD-A428969; No Copyright; Avail: CASI; A02, Hardcopy

The design of a Ka-band gyrotron traveling wave tube (TWT) amplifier capable of operating over a wide range of peak powers and bandwidths is presented. The amplifier operates in the TE11 mode at the fundamental cyclotron harmonic. Instantaneous bandwidths in the range of 2.5 to 3.9 GHz (at 1 dB below saturation) with corresponding peak powers between 92.2 and 57.9 kW can be achieved by simply adjusting the mod-anode voltage of the electron gun. The corresponding gains range from 57.1 to 36.0 dB. The design performance is obtained with a high quality, 6 A, 70 kV electron beam generated with a double-anode magnetron injection gun. This wide range performance capability in the design is achieved via the use of the distributed loss approach in the interacting circuit, which also guarantees zero-drive stability. A diffractive loading scheme is employed in the lossy section of the circuit to ensure high average power operation of the amplifier.
DTIC
Cyclotron Resonance Devices; Extremely High Frequencies; Gyroscopes; Traveling Wave Tubes

20050080299 Naval Research Lab., Washington, DC USA
Higher Order Mode Excitations in Gyro-Amplifiers
Nguyen, Khanh T.; Calame, Jeffrey P.; Danly, Bruce G.; Levush, Baruch; Garven, Morag; May 2001; 7 pp.; In English
Report No.(s): AD-A428970; No Copyright; Avail: CASI; A02, Hardcopy

In gyro-devices, a nonlinear output taper is often employed as the transition from the near cutoff radius of the interaction circuit to a much larger output waveguide. The tapers are usually designed to avoid passive mode conversion, and thus do not consider the effect of a bunched beam. However, recent simulations with the self-consistent MAGY code Botton et aL, IEEE Trans. Plasma Sci. 26, 882 (1998) indicate that higher order mode interactions with the bunched electron beam can substantially compromise the mode purity of the rf output. The interaction in the taper region is traveling wave in nature, and is strongly dependent on the residual beam bunching characteristics resulting from the upstream operating mode interaction. An experiment has been performed to quantify the rf output mode content from a Ka-band gyroklystron. The agreement between salient theoretical and measured rf output characteristics confirms the existence of higher order mode excitation in output tapers as predicted by theory.
DTIC
Cyclotron Resonance Devices; Electron Beams; Excitation; Gyroscopes; Tapering

20050080300 Naval Research Lab., Washington, DC USA
A Gyrotron-Traveling-Wave Tube Amplifier Experiment with a Ceramic Loaded Interaction Region
Garven, Morag; Calame, Jeffrey P.; Danly, Bruce G.; Nguyen, Khanh T.; Levush, Baruch; Jun. 2002; 9 pp.; In English
Report No.(s): AD-A428971; No Copyright; Avail: CASI; A02, Hardcopy

The design and experimental study of a 35-GHz gyrotron-traveling-wave tube (gyro-TWT) amplifier operating in the circular TE01 mode at the fundamental cyclotron harmonic are presented. The interaction circuit in this experiment consisted of a new type of ceramic loading that provided the required loss for stable operation. A saturated peak power of 137 kW was measured at 34.1 GHz, corresponding to a saturated gain of 47.0 dB and an efficiency of 17%, with a -3-dB bandwidth of 1.11 GHz (3.3%). Peak output powers in the range of 102.1 to 148.6kW with -3-dB bandwidths of 1.26 and 0.94 GHz, respectively, were measured by varying the operating parameters. The gyro-TWT was found to be zero-drive stable at these operating points, demonstrating that ceramic loading is a highly effective means of suppressing spurious oscillations in gyro-TWTs. This type of ceramic loading has the added advantage of being compatible with high average power operation.
DTIC
Ceramics; Cyclotron Resonance Devices; Traveling Wave Amplifiers; Traveling Wave Tubes

20050080301 Naval Research Lab., Washington, DC USA
A TE11 Ka-Band Gyro-TWT Amplifier with High-Average Power Compatible Distributed Loss
Pershing, Dean E.; Nguyen, Khanh T.; Calame, Jeffrey P.; Danly, Bruce G.; Levush, Baruch; Jun. 2004; 10 pp.; In English
Report No.(s): AD-A428972; No Copyright; Avail: CASI; A02, Hardcopy

Current amplifier research at the Naval Research Laboratory Vacuum Electronics Branch emphasizes techniques to extend the bandwidth and average power capability of gyro devices for millimeter wave radar applications. This paper will discuss the implementation of a wideband high-gain gyro-traveling wave tube amplifier design, with a measured peak output power of 78 kW, gain ^60 dB, and a 3-dB bandwidth of 4.2 GHz (12%) at 52 kW in Ka-band. The 3-dB saturated bandwidth at 70 kW is 6 GHz (17%), which is also the instantaneous bandwidth with appropriately tailored input power (e.g., gain equalizer). The amplifier operates in the TE11 mode and for stabilization employs a high-average power compatible diffractive loading technique.
DTIC
Cyclotron Resonance Devices; Extremely High Frequencies; Gyroscopes; Microwave Amplifiers; Traveling Wave Tubes

20050080302 Naval Research Lab., Washington, DC USA
Modeling of Gyroklystrons with MAGY
Nguyen, Khanh T.; Levush, Baruch; Antonsen, Thomas M., Jr.; Botton, Moti; Blank, Monica; Jun. 2000; 20 pp.; In English
Report No.(s): AD-A428973; No Copyright; Avail: CASI; A03, Hardcopy

The self-consistent time-dependent code MAGY is presently being used for designing and modeling gyrodevices. In this paper, the code's self-consistent capability is used to investigate three different issues relating to the operation of gyroklystron amplifiers. These are the effect of window reflection on the properties of the output waves, higher order mode excitation in nonlinear output tapers, and excitation in cutoff drift sections. The first two effects can potentially have major impacts on the gyroklystron output radio frequency (RF) in terms of bandwidth power ripple, phase ripple across the band, and mode purity. In fact, strong correlation between simulation results and experimental data indicates that the observed bandwidth ripple in a recently tested W-band gyroklystron can be attributed to a small (-20-dB) window reflection. The last effect, excitation in cutoff drift sections, is found to result in a high level of RF fields at the drive frequency in drift sections. This effect impacts the design and use of lossy ceramics in the drift section because of thermal considerations, particularly in high average power devices.
DTIC
Computerized Simulation; Cyclotron Resonance Devices; Languages; Simulation

20050080303 Naval Research Lab., Washington, DC USA
Modeling and Design of Millimeter Wave Gyroklystrons
Levush, Baruch; Blank, M.; Calame, Jeffrey P.; Danly, Bruce G.; Nguyen, Khanh T.; May 1999; 8 pp.; In English
Report No.(s): AD-A428974; No Copyright; Avail: CASI; A02, Hardcopy

A series of high power, high efficiency Ka-band and W-band gyroklystron experiments has been conducted recently at the Naval Research Laboratory (NRL). Stagger tuning of the cavities for bandwidth enhancement is commonly used in the conventional multicavity klystrons. The desired stagger tuning is usually achieved via mechanical tuning of the individual cavities. However, in the millimeter wave regime, particularly, in the case of the high average power operation, it is desirable to be able to achieve the required stagger tuning by design. The NRL gyroklystron experiments explored the tradeoffs between power, bandwidth, efficiency, and gain to study the effects of large stagger tuning in millimeter wave without resorting to mechanical tuning of the cavities. Both, Ka-band and W-band, experiments demonstrated a record power-bandwidth product. The success of the experiments was due in large part to a battery of improved large-signal, stability, and cold test codes employed in the modeling and design stage. Theoretical models that provide the basis for these design simulation tools and the design methodology will be presented.
DTIC
Cyclotron Resonance Devices; High Gain; Millimeter Waves

20050080327 Army Research Lab., Adelphi, MD USA
A Piezoelectric MEMS Microphone Based on Lead Zirconate Titanate (PZT) Thim Films
Polcawich, Ronald G.; Nov. 2004; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429041; ARL-TR-3387; No Copyright; Avail: Defense Technical Information Center (DTIC)

Piezoelectric microelectromechanical (MEMS) scale acoustic sensors have potential applications in a wide variety of applications including hearing aids, surveillance, and heart monitoring. For each of these systems and many others, the acoustic sensors must be miniaturized and have low power requirements. A piezoelectric-based microphone can provide a solution to these requirements, since it offers the ability to passively sense without the power requirements of condenser or piezoresistive microphone counterparts. This research effort reports on the design and fabrication of a piezoelectric

PbZr(0.52)Ti(0.48)O(3) (PZT) based acoustic sensor. A circular clamped membrane consisting of a dielectric for structural support and a piezoelectric actuator has been fabricated on a silicon wafer via silicon deep reactive ion etching (DRIE). Sensors ranging from 500 to 2000 microns in diameter have been fabricated and characterized with the use of scanning laser Doppler vibrometry and calibrated acoustic tone source. The PZT sensors exhibited a sensitivity of 97.9 to 920 nV/ Pa, depending on geometry.
DTIC
Lead Zirconate Titanates; Microelectromechanical Systems; Microphones; Piezoelectricity

20050080338 Pennsylvania State Univ., University Park, PA USA
Preliminary Development of a Solid Piston Micro-Engine
Sharp, K.; Santavicca, D.; Jun. 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-1-0411
Report No.(s): AD-A429063; No Copyright; Avail: Defense Technical Information Center (DTIC)

A solid piston micro-engine has been proposed based on the following operating principles. A fuel-air delivery system alternately supplies air and premixed fuel and air to a catalytic combustor, wherein the fuel-air mixture is catalytically reacted to produce a periodic flow of low and high temperature gas over a solid-piston actuator, alternately heating and cooling the actuator (solid piston). Periodic thermal expansion and contraction of the piston is used to drive a piezo-electric transducer, whereby the mechanical energy is converted to electrical energy. Although thermal actuators have been studied by a number of researchers, to the best of our knowledge this will be the first application of a solid thermal actuator in a micro-engine, as well as the first use of a periodic combustion-driven thermal actuator. First-order analyses of the individual subsystems and their integration into the proposed micro-engine are in progress. The design has been modified based on current analyses. Fabrication of the first-generation prototype is underway; subsystem testing plans have been developed and equipment required for performing subsystem experiments has been purchased and assembled. The experiments will be conducted within the next 6 months, and the outcome of these experiments will be assessed in terms of the effects on full prototype operation and concept verification.
DTIC
Microelectromechanical Systems; Piston Engines

20050080350 California Univ., San Diego, La Jolla, CA USA
Quantum Device Technologies - Applying 2-D Photonic Crystals
Fainman, Y.; Scherer, A.; Sham, L. J.; Tu, C. W.; Nov. 2004; 19 pp.; In English
Contract(s)/Grant(s): F-49620-01-1-0497
Report No.(s): AD-A429086; AFRL-SR-AR-TR-04-0637; No Copyright; Avail: CASI; A03, Hardcopy

The project is focused in theory, fabrication and characterization of quantum information processing devices manipulating q-bits. Strong coupling between quantum dots and high-Q cavity was demonstrated, enabling both classical and quantum mechanical switching.
DTIC
Crystals; Electromagnetic Radiation; Quantum Electronics

20050080373 Louisiana State Univ., Baton Rouge, LA USA
Adaptive Membrane Masks for Next Generation Lithographies
Feldman, Martin; Jun. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0434
Report No.(s): AD-A429119; 127-20-5179; R110030; ARO-41548.3-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

The overlay accuracy, and hence the minimum useable feature size, in any integrated circuit lithography is often limited by distortions that are present in the mask and wafer. In this work selective heat loads are applied to membrane masks, thereby generating therrnal strains to compensate these distortions. Computer models have been developed that describe these effects, obtaining excellent agreement between a finite element model used at LSU and an analytical model developed at MIT. The special case of a scanned exposure, e.g., in SR X-ray lithography, is particularly well understood. Two experimental programs have been implemented, which demonstrate agreement between measured thermally generated displacements and the predictions of the computer models. At LSU the displacements were measured over an 11 x 11 array of alignment sites. Because of lithographic problems not all the sites were functional; however the average displacements showed fair agreement

with the computer predictions. At MIT the thermal input was generated by a modified 35 mm slide projector, and a holographic-phase-shift interferometer measured the resulting displacements to sub-wavelength accuracy. Detailed MARKET plots of the MIT data show good agreement with the computer predictions.
DTIC
Integrated Circuits; Lithography; Masks; Membranes

20050080375 California Inst. of Tech., Pasadena, CA USA
Proceedings of the 2003 Antenna Applications Symposium (27th) Held in Monticello, Illinois on 17-19 September 2003. Volume 1
Schaubert, Daniel; Sep. 2003; 240 pp.; In English
Report No.(s): AD-A429122; AFRL-SN-HS-TR-2005-005-VOL-1; No Copyright; Avail: CASI; A11, Hardcopy
The Proceedings of the 2003 Antenna Applications Symposium is a collection of state-of-the-art papers relating to antenna arrays, millimeter wave antennas, simulation and measurement of antennas, integrated antennas, and antenna bandwidth and radiation improvements.
DTIC
Antenna Arrays; Conferences

20050080393 Arizona State Univ., Tempe, AZ USA
Global Modeling of Compact High-Speed Circuits
Hussein, Y. A.; El-Ghazaly, S. M.; Apr. 2003; 50 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0194
Report No.(s): AD-A429148; ARO-39885.3-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)
In this report, we present the work done during May 2002 to April 2003. We developed a fast wavelet-based time-domain modeling technique to study the effect of electromagnetic-wave propagation on the performance of high power and frequency multifinger transistors. The proposed approach solves the active device model that combines the transport physics, and Maxwell's Equations on nonuniform self-adaptive grids, obtained by applying wavelet transforms followed by hard thresholding. This allows forming fine and coarse grids in the locations where variable solutions change rapidly and slowly, respectively. Comparison graphs showed a CPU-time reduction of 75% compared to a uniform-grid case, while maintaining the same degree of accuracy. After validation, the potential of the developed technique is demonstrated by electromagnetic-physical modeling of multifinger transistors. Different numerical examples are presented; emphasizing that accurate modeling of high-frequency devices should incorporate the effect of EM-wave propagation and electron-wave interactions, within and around the device. Moreover, high-frequency advantages of multifinger transistors over singlefinger transistors are highlighted. To our knowledge, this is the first time in literature to introduce and implement a fully numerical electromagnetic-physics-based simulator for accurate modeling of high-frequency multifinger transistors. We have also considered the use of genetic algorithms to develop efficient simulators for modeling of high-frequency active microwave devices. We have successfully developed a new genetic-based simulator for large signal modeling of high-frequency devices. The new approach is compared to standard simulators showing moderate speed of convergence along with excellent accuracy. The advantages of genetic algorithms are their capabilities to obtain global solutions of multiple minima optimization problems along with being unconditionally stable.
DTIC
Circuits; Electromagnetic Wave Transmission; High Speed; Wavelet Analysis

20050080397 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Trade Space Analysis of Antenna Array Architecture Using System Modeling Tools
Johnson, Eugene; Dec. 2004; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429153; AFIT/GE/ENG/04-26; No Copyright; Avail: Defense Technical Information Center (DTIC)
This trade study has two objectives. The first provides a trade space analysis of differing array architectures and associated radio frequency components using system-modeling tools. The second objective develops system modeling tools aiding similar analysis by other users. These objectives were accomplished by evaluating a selected group of output parameters to include overall system cost, mass, and power consumption, as well as the minimum detectable input level, system spurious free dynamic range, and selected beam spoilage parameters caused by the use of discrete phase shifters. A fixed number of designs were evaluated using simulation. The evaluation process examined input parameter and design impact on the output parameters and overall best design. The best overall design, by score, performed exceptionally well for minimum detectable

input level and beam spoilage parameters, very well for cost and power performance, and poor for total mass and spurious free dynamic range. The best overall design offered a 97% improvement in evaluation score over the lowest scoring design. The placement of the first stage of low noise amplifiers within the RF component chain, as well as the number of sub-arrays, were among the design parameters found to have the most profound affect on the output results. These results match commonly accepted guidelines in radar design. Selected portions of this study were verified and compared to results from commercially available software, GENESYS by Eagleware Corporation.
DTIC
Antenna Arrays; Systems Engineering

20050080399 Duke Univ., Durham, NC USA
Robust Control and Synchronization of Chaos
Gauthier, Daniel J.; Jan. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0199
Report No.(s): AD-A429159; ARO-P-39213-PH; No Copyright; Avail: Defense Technical Information Center (DTIC)

In many cases of practical importance, chaotic instabilities limit the performance of devices, such as lasers and electronic oscillators, and hence it is desirable to devise schemes to control the instabilities. During the period of this program, the authors have developed novel algorithms that efficiently control and synchronize chaotic dynamics of high-speed and high-dimensional systems using small perturbations. They have determined the sensitivity of the schemes to noise and slow variation in the system parameters and found that robust controllers and synchronizers can be constructed, but care must be applied in their design. In some situations, dynamical systems can amplify noise by extreme amounts even under conditions when the system is stable. The research has uncovered several fundamental issues related to the control and synchronization of nonlinear systems, which they anticipate will lead to improved performance of devices that are based on nonlinear systems and to the development of chaos-based communication systems. In addition, they have compared experimental observations with detailed theoretical models of the nonlinear dynamical systems to further enhance their understanding of the control and synchronization processes. This paper focuses on the following topics: synchronization of hyperchaotic oscillators, synchronization of periodic oscillators, a new source of ultra-high-speed optical chaos, an array of coupled chaotic electronic circuits, and wide-aperture nonlinear optical resonators. The paper concludes with a list of 10 publications and meeting presentations. (6 figures)
DTIC
Chaos; Mathematical Models; Nonlinear Systems; Perturbation; Synchronism

20050080412 Polytechnic Univ., Brooklyn, NY USA
Electromagnetic Modelling of Quantum-Well Infrared Photodetectors
Tamir, Theodor; Nov. 2003; 11 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0126
Report No.(s): AD-A429185; ARO-39672.11-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

Our work has focused on two principal aspects: (a) developing a rigorous modal transmission-line (MTL) approach for modeling quantum-well infrared photodetectors (QwIPs) and other optoelectronic devices. and (b) applying this approach to evaluate the performance of actual QWIPs. The geometry of the QWlPs may include any number of different dielectric and metallic layers, which may generally be periodic with &arbitrary profiles, The theoretical part (a) was carried out for both two-dimensional lamellar and three- dimensional grid geometries In the applied part (b), we have obtained numerical results for QWIPs under experimental study by scientists at the Army Research Laboratory (ARL) and Princeton University, with whom we collaborated on a continuous basis, Our analytical results show very good agreement with the experimental data, thus establishing that our MTL modeling is both powerful and accurate Using this approach, we have also derived design criteria for a wide variety of QWIPs, which were subsequently fabricated with specifications that conformed to oar design guidelines. In addition, we have developed design procedures for new QWJPs for focal plane arrays, as well as novel QWIP geometries to be used as two-color detectors, or as spectrometers over a wide frequency range. These newer devices are presently in the fabrication stage at ARL.
DTIC
Infrared Radiation; Photometers; Quantum Wells; Transmission Lines

20050080413 Clemson Univ., SC USA

Spatial and Quasi-Optical Power Combining a Multidisciplinary University Research Initiative

, L. W; Sep. 2003; 107 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAG55-97-1-0132

Report No.(s): AD-A429192; ARO-37253.46-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

This MURI program comprised an integrated effort for computer aided design (CAD) modeling of quasi optical structures and three related experimental efforts. The CAD activity involved the electromagnetic modeling of radiation from planar structures, state-variable modeling of microwave circuits, and thennal modeling of microwave circuits. The latter two have been combined into a unified CAD system that deals with microwave circuits, including electro-thermal effects. Electromagnetic structures can be coupled to this CAD system through a y-parameter interface. A closely related experimental effort has led to an electro-optical sampling system capable of measuring all three components of electric field and the temperature at distances quite close to planar radiating structures in an essentially non-penurbing fashion. The probe is a Pockel-effect crystal affixed to the end of an optical fiber. The fiber can be supported over substantial length so that the fiber and a dielectric support for the fiber are the only materials near the device under test. A tray-architecture for quasi-optical amplifiers has been extensively studied. State of the art amplifiers have been fabricated at X and Ka bands and have been thoroughly characterized. Schemes for coupled-oscillator phased-array realizations have been investigated. The parameter space in which coupled-oscillator arrays can be suitably operated has been defined, and issues relating to practical oscillator design for coupled-oscillator arrays have been identified so that a design practice suitable to MMIC fabrication is established. DTIC

Computer Aided Design; Electromagnetic Radiation; Multidisciplinary Research; Optical Properties

20050080414 Georgia Inst. of Tech., Atlanta, GA USA

Acoustic Absorption Measurements for Characterization of Gas Mixing

Cottet, Aurelien; Wu, Lei; Meyers, Andrew; Scarborough, David; Lieuwen, Tim; May 2003; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-1-0571

Report No.(s): AD-A429206; ARO-41297.1-EG; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper demonstrates the use of acoustic absorption measurements to characterize the level of molecular mixing between gaseous mixtures. This objective is motivated by the observation that many existing methods only quantify macro-scale entrainment. Over a large range of frequencies, acoustic damping is dominated by vibrational relaxation processes. Our approach takes advantage of the fact that the relaxation frequency for a particular gas is often a strong function of the other species it is in molecular contact with. Thus, the relaxation frequency of a dual component gas mixture varies with the level of molecular mixedness of the constituent species. We present the results of example calculations and experiments demonstrating the significant dependence of acoustic absorption levels upon mixing. DTIC

Absorption Spectroscopy; Absorptivity; Acoustic Attenuation; Mixing

20050080424 North Carolina Univ., Charlotte, NC USA

A New Type of Silicon Superlattice: Hetero-Epilattice

Tsu, Raphael; May 2003; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAG55-98-1-0456; AMXRO-ICA-37760-MS

Report No.(s): AD-A429220; ARO-37760-MS.1; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper introduces a new type of superlattice, consisting of a semiconductor such as silicon sandwiched between adsorbed oxygen atoms. Compared to heterojunction quantum structures, this type of superlattice allows a wider variety of man-made solid because of tolerance to interfacial strain. Experimentally, Si/O superlattice is epitaxial with defect density below 10(exp 9)/sq cm. A 9-period structure shows electroluminescence with a peak at 2.2eV, and an effective barrier height of more than 0.5eV. Early on in this project, HRTEM has been exclusively used to demonstrate the epitaxy beyond the monolayer of oxygen introduced. A year ago, superlattice structure in the strain pattern demonstrated the extent of the interfacial strain, being at least four lattice dimension. This is a very important finding because researchers may now use the Semiconductor-Atomic Superlattice (SAS) as a matching section for the epitaxial growth of one with large strain onto the other. A frequently asked question is as follows: Do the oxygen atoms cover the entire 1 x 2 site? If not, is there staggering present? Unfortunately, the answers to these questions may require in-situ STM probing, which may be something for future

consideration. Technologically, this research opens the door for future 3D ICs. A list of 17 publications related to this research is included. (10 figures, 17 refs.)
DTIC
Adsorption; Epitaxy; Oxygen; Semiconductor Devices; Silicon; Superlattices

20050080437 Massachusetts Inst. of Tech., Cambridge, MA USA
Metrology for the Sub-100 NM Domain via Fiducial Grids
Schattenburg, Mark L.; Smith, Henry I.; May 2003; 5 pp.; In English
Contract(s)/Grant(s): DAAG55-98-1-0130
Report No.(s): AD-A429303; MIT-ARO-5-1-03; ARO-38765.12-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

The supported research sought to apply interference lithography technology as a tool for metrology in the sub-100 nm critical dimension (CD) linewidth regime. Semiconductor industry roadmaps show CDs shrinking to under 35 nm within 15 years. This requires mask image placement metrology accuracy of 2 nm by 2014. There are currently no industry length-scale calibration standards at any level of accuracy that may be used to ensure metrology tool accuracy. Instead, the industry relies on various self-referencing schemes which are inaccurate, expensive, time consuming, and ineffective. MIT developed technology to produce image placement metrology standards that achieved sub-5 nm accuracy by the end of this Grant. MIT developed a new tool, called scanning-beam interference lithography (SBIL), which is used to pattern super-accurate grids that will serve as length scale standards. MIT built and tested Phase 1 of the SBIL tool, proving the concept, and then went on to design, build, and test Phase 2 of the tool. The tool was successfully used to pattern 300 mm wafers with 400 nm period gratings which has repeatability of under 3 nanometers.
DTIC
Calibrating; Lithography; Metrology; Nanotechnology; Scanning

20050080439 Massachusetts Univ., North Dartmouth, MA USA
Development of Computational Simulation Tools to Model Weapon Propulsors
Couillard, S. J.; Rice, J. M.; Jan. 2004; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66604-03-1-2965
Report No.(s): AD-A429305; No Copyright; Avail: Defense Technical Information Center (DTIC)

The development of computational simulation tools, i.e. finite element (FE) models, to model weapon propulsors evolves from the need to determine the positive or negative implications for future applications and/or design modifications. The propulsor in this case is an electric motor used in such applications as propelling defense mechanisms like torpedoes and acquiring underwater data. The ability to predict, with a computer model, the vibrational and acoustical signatures allows the user to make modifications specific to these applications as well as for performance enhancement. Vibration in an electric motor is the result of electromagnetic force interaction between the rotor and stator. This can be modeled by performing a harmonic analysis by means of a computer simulation. The periodic electromagnetic force loads are reduced to their harmonic components by approximating them with a Fourier Series. The harmonic component loads are then applied sequentially to the computer model, and the results are superimposed. This superimposition yields the displacements in the motor and the pressures in the fluid field surrounding the motor. In addition, natural frequencies and mode shapes are obtained for the motor both in air and underwater.
DTIC
Computerized Simulation; Electric Motors; Finite Element Method; Propulsion System Configurations; Propulsion System Performance

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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*.

20050061267 Purdue Univ., West Lafayette, IN, USA
Interfacial Area and Interfacial Transfer in Two-Phase Flow Systems
Ishii, M.; Hibiki, T.; Revankar, S. T.; Kim, S.; LeCorre, J. M.; Jul. 2002; 126 pp.; In English
Report No.(s): DE2004-809191; PU/NE-02-06; No Copyright; Avail: Department of Energy Information Bridge

In the two-fluid model, the field equations are expressed by the six conservation equations consisting of mass, momentum and energy equations for each phase. The existence of the interfacial transfer terms is one of the most important characteristics of the two-fluid model formulation. The interfacial transfer terms are strongly related to the interfacial area concentration and to the local transfer mechanisms such as the degree of turbulence near interfaces. This study focuses on the development of a closure relation for the interfacial area concentration. A brief summary of several problems of the current closure relation for the interfacial area concentration and a new concept to overcome the problem are given.
NTIS
Two Phase Flow; Two Fluid Models; Kinetic Energy

20050061268 Sandia National Labs., Albuquerque, NM
CFD Calculation of Internal Natural Convection in the Annulus between Horizontal Concentric Cylinders
Francis, N. D.; Itamura, M. T.; Webb, S. W.; James, D. L.; Oct. 2002; 50 pp.; In English
Report No.(s): DE2004-808039; SAND2002-3132; No Copyright; Avail: Department of Energy Information Bridge
The objective of this heat transfer and fluid flow study is to assess the ability of a computational fluid dynamics (CFD) code to reproduce the experimental results, numerical simulation results, and heat transfer correlation equations developed in the literature for natural convection heat transfer within the annulus of horizontal concentric cylinders. In the literature, a variety of heat transfer expressions have been developed to compute average equivalent thermal conductivities. However, the expressions have been primarily developed for very small inner and outer cylinder radii and gap-widths. In this comparative study, interest is primarily focused on large gap widths (on the order of half meter or greater) and large radius ratios. From the steady-state CFD analysis it is found that the concentric cylinder models for the larger geometries compare favorably to the results of the Kuehn and Goldstein correlations in the Rayleigh number range of about 10(sup 5) to 10(sup 8) (a range that encompasses the laminar to turbulent transition). For Rayleigh numbers greater than 10(sup 8), both numerical simulations and experimental data (from the literature) are consistent and result in slightly lower equivalent thermal conductivities than those obtained from the Kuehn and Goldstein correlations.
NTIS
Computational Fluid Dynamics; Convective Heat Transfer; Free Convection

20050061271 Science and Engineering Associates, Inc., Santa Fe, NM, USA, Bechtel Nevada Corp., Las Vegas, NV, USA
International High-Level Radioactive Waste Management Conference Breached Drip Shield Test and Validation of a TSPA Sub-Model
Walton, Z. P.; Kam, J. T.; 2004; 12 pp.; In English
Report No.(s): DE2004-808018; No Copyright; Avail: Department of Energy Information Bridge
The Engineered Barrier System (EBS) represents the system of human engineered barriers in the isolation of high-level radioactive waste in the proposed repository at Yucca Mountain. It is designed to complement and enhance the natural barriers to isolate and prevent the transport of radionuclides into the surrounding environment. The transport mechanism most frequently postulated for radionuclides is liquid water flux that has penetrated the EBS through corrosion breaches in the drip shield and waste packages (WP). A water flux-splitting model is used to predict flow through WP and drip shield breaches and is documented in the EBS Radionuclide Transport Abstraction . The current version of the flux-splitting model is incapable of accounting for water that has been splashed from the impact location, the deviation of water paths (rivulets) from the axis of impact, and water loss due to evaporation. This paper will present the results of a series of breached drip shield tests used to collect empirical data for the initial validation and further development of the flux-splitting model. Additionally, this paper will present a comparison between numerical calculations used as a part of the flux-splitting model validation and calibration and a portion of the data collected from the breached drip shield test.
NTIS
Fluid Dynamics; Radioactive Wastes; Radioactive Isotopes

20050070922 Sojo Univ., Kumamoto, Japan
Lubrication Mechanism By Oil-Mist Lubrication And Oil-Air Lubrication To Spindle Bearing And Its Effect On Thermal Displacement
Koreta, Noriyuki; Ario, Hidenobu; Sasaki, Masaaki; Progress of Machining Technology; December 2004, pp. 442-447; In English; See also 20050070885; Copyright; Avail: Other Sources
High speed cutting based on the technique by Oil-mist lubrication and oil-air lubrication has been generally applied in the machine tools. However, their advantages and disadvantages are not necessarily clear about the actual guides for use. To

clarify these, this paper compares with those performances in the same spindle system by changing only lubrication system from oil-air to oil-mist. Moreover, the good timing between cooling the housing and starting the spindle rotation is reported. In addition, lubrication mechanism about such as the time required from starting lubrication to finishing it by reaching the object lubricated, the influence of the remains among a lubricating piping system and the effect of length from nozzle and object lubricated on the quantity adhered are experimented, and the state of spreading of lubricant throughout object is visualized by CCD camera.
Author
Lubrication Systems; Machine Tools; High Speed; Displacement; Mist; Oils

20050070973 Kagawa Univ., Takamatsu, Japan
Lubricating Characteristics And Cutting Performance Of Esters For MQL System
Tsuboi, Yoichiro; Wakabayashi, Toshiaki; Suda, Satoshi; Tsukuda, Akira; Bando, Shinnosuke; Progress of Machining Technology; December 2004, pp. 175-180; In English; See also 20050070885; Copyright; Avail: Other Sources

Synthetic esters have recently been used as a high performance lubricant m minimal quantity lubrication (MQL) machining. However, there is little understanding about the relationship between the cutting performance and the lubricating action of these esters. Based on a survey of suitable esters for MQL machining, therefore, this study investigates their lubricating characteristics. According to a base patent of esters for MQL machining, the survey provided a number of commercially available esters having various chemical structures. They comprised monoesters and polyol esters, and the latter esters were divided into saturated and unsaturated fatty acid types. For comparison, several rapeseed oils of. different oleic acid contents were also included in the examination. In the results of basic frictional tests, polyol esters showed the lower coefficient of friction than that of monoesters. In those polyol esters, unsaturated ones presented the better lubricity than saturated ones. Further, an ester having the higher number of ester bonds in one molecule was found to provide the more preferable lubricating characteristics. On the other hand, rapeseed oils indicated no superior lubricating effect to the esters examined. In order to evaluate the cutting performance of surveyed esters, this study also carried out inspection of cutting conditions of turning in the cases of MQL and dry machining operations.
Author
Cutting; Machining; Esters; Lubrication; Chemical Composition; Coefficient of Friction

20050071553 Purdue Univ., West Lafayette, IN
Investigation of Homogeneous and Heterogeneous Sonochemistry for Destruction of Hazardous Waste
2004; 26 pp.; In English
Report No.(s): DE2004-827232; No Copyright; Avail: Department of Energy Information Bridge

The primary objective of this research project is to acquire a deeper fundamental knowledge of acoustic cavitation and cavitation chemistry, and in doing so, to ascertain how ultrasonic irradiation can be more effectively applied to environmental problems. The primary objective will be accomplished by examining numerous aspects of sonochemical systems and acoustic cavitation. During the course of the project, the research group will investigate sonochemical kinetics and reactive intermediates, the behavior of heterogeneous (solid/liquid) systems, and the significance of physical variables during sonolysis. An additional component of the project includes utilizing various techniques to image cavitation bubble cloud development.
NTIS
Bubbles; Hazardous Wastes; Ultrasonic Processing; Chemical Reactions

20050071585 Oak Ridge National Lab., TN, Georgia Inst. of Tech., Atlanta, GA, USA, Tennessee Univ., Knoxville, TN, USA
Phase Equilibria Modification by Electric Fields
Tsouris, C.; Shah, V. M.; Blankenship, K. D.; Depaoli, D. W.; Dong, J.; 2004; In English
Report No.(s): DE2004-827419; No Copyright; Avail: National Technical Information Service (NTIS)

This project has been focused on equilibrium and transport properties of gas-liquid, liquid-liquid, and solid-liquid systems under electric fields. The objective was to intensify separations methods that are used or can be used to process liquid waste or contaminated groundwater within DOE sites. Examples of processes that have been investigated are distillation (gas-liquid), extraction (liquid-liquid), and sorption (solid-liquid). Effects of electric fields on phase equilibria and interfacial transport have been investigated. So far, this project was directed at basic research on a broadly crosscutting concept. The results advocate

continuation of this research in two directions, with the objective to solve problems related to solvent extraction of tank waste and groundwater treatment.
NTIS
Chemical Reactions; Liquid Wastes; Electric Fields

20050071598 Idaho National Engineering and Environmental Lab., Idaho Falls, ID, Iowa State Univ. of Science and Technology, Ames, IA, Maryland Univ. Baltimore County, Catonsville, MD, USA
Fundamental Thermal Fluid Physics of High Temperature Flows in Advanced Reactor Systems
McEligot, D. M.; Condie, K. G.; Foust, T. D.; McCreery, G. E.; Dec. 31, 2002; In English
Report No.(s): DE2004-822187; INEEL/EXT-2002-1613; No Copyright; Avail: National Technical Information Service (NTIS)

The ultimate goal of the study is the improvement of predictive methods for safety analyses and design of advanced reactors for higher efficiency and enhanced safety and for deployable reactors for electrical power generation, process heat utilization and hydrogen generation. While key applications would be advanced gas-cooled reactors (AGCRs) using the closed Brayton cycle (CBC) for higher efficiency (such as the proposed Gas Turbine - Modular Helium Reactor (GT-MHR) of General Atomics, results of the proposed research should also be valuable in reactor systems with supercritical flow or superheated vapors, e.g., steam. Higher efficiency leads to lower cost/kwh and reduces life-cycle impacts of radioactive waste (by reducing waters/kwh). The outcome will also be useful for some space power and propulsion concepts and for some fusion reactor concepts as side benefits, but they are not the thrusts of the investigation. The objective of the project is to provide fundamental thermal fluid physics knowledge and measurements necessary for the development of the improved methods for the applications.
NTIS
Thermodynamics; Fluid Dynamics; Gas Cooled Reactors; Heat Generation

20050071608 Massachusetts Inst. of Tech., Cambridge, MA, USA
Lorentz Force Turbulence Control
Sura, D.; Chryssostomidis, C.; Kimball, R.; Karniadakis, G.; 2004; 88 pp.; In English
Report No.(s): PB2005-101319; MITSG-04-6; Copyright; Avail: National Technical Information Service (NTIS)

The experimental hardware design for the General Atomics flat plate testing was based on MIT Sea Grant's previous flat plate and cassette design. The hardware was designed to accommodate the tasks of measuring total frictional drag force applied by the fluid over the cassette, and characterization of local wall shear via boundary layer measurements. These tests were conducted at MIT's water tunnel at the Marine Hydrodynamics Laboratory in building 3. Sea Grant's original hardware design consisted of a 4:1 elliptical nose delrin base plate, a magnet filled cassette, a cassette post for mounting of the cassette, two rails for mounting of the base plate to the water tunnel test section, and a front dam to block the flow of water underneath the base plate.
NTIS
Lorentz Force; Turbulence; Hydrodynamics; Water Tunnel Tests; Flat Plates

20050071627 Akron Univ., Akron, OH, USA, Illinois Inst. of Tech., Chicago, IL, USA
Computational and Experimental Modeling of Three-Phase Slurry-Bubble Column Reactor
Gamwo, I. K.; Gidaspow, D.; Sep. 1999; In English
Report No.(s): DE2004-825382; No Copyright; Avail: National Technical Information Service (NTIS)

Considerable progress has been achieved in understanding three-phase reactors from the point of view of kinetic theory. In a paper in press for publication in Chemical Engineering Science (Wu and Gidaspow, 1999) we have obtained a complete numerical solution of bubble column reactors. In view of the complexity of the simulation a better understanding of the processes using simplified analytical solutions is required. Such analytical solutions are presented in the attached paper, Large Scale Oscillations or Gravity Waves in Risers and Bubbling Beds. This paper presents analytical solutions for bubbling frequencies and standing wave flow patterns. The flow patterns in operating slurry bubble column reactors are not optimum. They involve upflow in the center and downflow at the walls. It may be possible to control flow patterns by proper redistribution of heat exchangers in slurry bubble column reactors. We also believe that the catalyst size in operating slurry bubble column reactors is not optimum. To obtain an optimum size we are following up on the observation of George Cody of Exxon who reported a maximum granular temperature (random particle kinetic energy) for a particle size of 90 microns. The attached paper, Turbulence of Particles in a CFB and Slurry Bubble Columns Using Kinetic Theory, supports George

Cody's observations. However, our explanation for the existence of the maximum in granular temperature differs from that proposed by George Cody. Further computer simulations and experiments involving measurements of granular temperature are needed to obtain a sound theoretical explanation for the possible existence of an optimum catalyst size.
NTIS
Bubbles; Computerized Simulation; Experimentation; Data Acquisition; Temperature Measurement

20050071628 National Energy Technology Lab., Morgantown, WV, USA, Akron Univ., Akron, OH, USA, Illinois Inst. of Tech., Chicago, IL, USA
Computational and Experimental Modeling of Slurry Bubble Column Reactors
Lam, P.; Gidaspow, D.; 2004; In English
Report No.(s): DE2004-825384; No Copyright; Avail: National Technical Information Service (NTIS)

This project is a collaborative effort between the University of Akron, Illinois Institute of Technology and two industries: UOP and Energy International. The tasks involve the development of transient two and three dimensional computer codes for slurry bubble column reactors, optimization, comparison to data, and measurement of input parameters, such as the viscosity and restitution coefficients. To understand turbulence, measurements were done in the riser with 530 micron glass beads using a PIV technique. This report summarizes the measurements and simulations completed as described in details in the attached paper, 'Computational and Experimental Modeling of Three-Phase Slurry-Bubble Column Reactor.' The Particle Image Velocimetry method described elsewhere (Gidaspow and Huilin, 1996) was used to measure the axial and tangential velocities of the particles. This method was modified with the use of a rotating colored transparent disk. The velocity distributions obtained with this method shows that the distribution is close to Maxwellian. From the velocity measurements the normal and the shear stresses were computed. Also with the use of the CCD camera a technique was developed to measure the solids volume fraction. The granular temperature profile follows the solids volume fraction profile. As predicted by theory, the granular temperature is highest at the center of the tube. The normal stress in the direction of the flow is approximately 10 times larger than that in the tangential direction.
NTIS
Bubbles; Computation; Experimentation; Data Acquisition; Velocity Measurement; Reactor Cores

20050080388 Defence Science and Technology Organisation, Victoria, Australia
Probabilistic Methods for the Quantification of Uncertainty and Error in Computational Fluid Dynamic Simulations
Faragher, John; Oct. 2004; 41 pp.; In English
Contract(s)/Grant(s): DSTO-TR-1633
Report No.(s): AD-A429143; DODA-AR-013-229; No Copyright; Avail: CASI; A03, Hardcopy

The life of engine components is determined by a combination of the material properties and the applied stresses and temperatures. As a consequence of variability in these parameters, the component life is not fixed (deterministic) but stochastic (random) and may be characterized by a probability density function (PDF). In order to reduce the cost of ownership of ADF aircraft these PDFs need to be determined as accurately as possible. Probabilistic techniques offer significant potential for accurate and realistic estimates of component lives by quantifying stochastic elements of an analysis rather than introducing excessive conservatism to allow for them. This report examines the feasibility of using a probabilistic approach for modelling the component temperatures in an engine using CFD (Computational Fluid Dynamics).
DTIC
Computational Fluid Dynamics; Errors; Simulation

20050080706 QSS Group, Inc., Cleveland, OH, USA
Wind-US Unstructured Flow Solutions for a Transonic Diffuser
Mohler, Stanley R., Jr.; January 2005; 20 pp.; In English; AIAA 43rd Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2005, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS3-00145; WBS-22-066-50-01
Report No.(s): NASA/CR-2005-213417; AIAA Paper 2005-1004; E-14939; No Copyright; Avail: CASI; A03, Hardcopy

The Wind-US Computational Fluid Dynamics flow solver computed flow solutions for a transonic diffusing duct. The calculations used an unstructured (hexahedral) grid. The Spalart-Allmaras turbulence model was used. Static pressures along the upper and lower wall agreed well with experiment, as did velocity profiles. The effect of the smoothing input parameters on convergence and solution accuracy was investigated. The meaning and proper use of these parameters are discussed for

the benefit of Wind-US users. Finally, the unstructured solver is compared to the structured solver in terms of run times and solution accuracy.
Author
Computational Fluid Dynamics; Unstructured Grids (Mathematics); Transonic Flow; Inlet Flow; Diffusers; Computer Programs

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*.

20050061176 National Inst. of Information and Communications Technology, Japan
Experimental Plans Using Time Comparison Equipment
Takahashi, Yasuhiro; Gotoh, Tadahiro; Fujieda, Miho; Hosokawa, Mizuhiko; Imae, Michito; Nakagawa, Fumimaru; Kiuchi, Hitoshi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 269-277; In English; See also 20050061163; Copyright; Avail: Other Sources

The Engineering Test Satellite VII (ETS-VIII) missions will include application experiments using Cesium atomic clocks in space. Using this satellite, the CRL (Communications Research Laboratory) and the JAXA (Japan Aerospace Exploration Agency) is planning to conduct a precise time and frequency transfer between an atomic clock on-board the satellite and a ground-reference clock. This paper describes the experimental plan for precise time transfer between the ground reference clock and on-board clock.
Author
Engineering Test Satellites; Atomic Clocks; Spacecraft Equipment; Time Synchronization; Performance Tests

20050061197 National Inst. of Information and Communications Technology, Japan
Time Comparison Equipment for ETS-VIII: Data Processing, Analysis and Capability of Time Comparison
Nakagawa, Fumimaru; Takahashi, Yasuhiro; Gotoh, Tadahiro; Imae, Michito; Kiuchi, Hitoshi; Journal of the National Institute of Information and Communications Technology Vol. 50, Numbers 3 and 4; December 8, 2004, pp. 251-259; In English; See also 20050061163; Copyright; Avail: Other Sources

Engineering Test Satellite VIII (ETS-VIII) is planning to be launched in 2004 for fundamental studies on satellite positioning technologies and is the one first to be installed a highly precise cesium clock. To measure the clock offset between the satellite and the TCE Earth station, Time Comparison Equipment (TCE) has been developed in the CRL. The TCE will be used to improve TWTFT (Two Way Time and Frequency Transfer) and to measure both code and carrier phases. It is possible to compare two clocks with high precision. Moreover, TCE and TCE Earth stations have abilities to remove the delay by terrestrial ionosphere or in the receivers and transmitters. From the examinations using TCE-EM (Engineering Model), we confirmed that TCE is able to measure the phases of clock with precision of a few nanoseconds by code observation and of a few picoseconds by carrier phase observation. Using these results, we estimated errors of time correction and found that TCE can perform on the TWTFT with high precision.
Author
Engineering Test Satellites; Atomic Clocks; Autonomous Spacecraft Clocks

20050061204 NASA Langley Research Center, Hampton, VA, USA, Army Research Lab., Hampton, VA, USA
Application of Ultrasonic Guided Waves for Evaluating Aging Wire Insulation
Anastasi, Robert F.; Madaras, Eric I.; January 2005; 32 pp.; In English
Contract(s)/Grant(s): WU 23-376-70-30-05
Report No.(s): NASA/TM-2005-213520; ARL-TR-3384; L-19068; No Copyright; Avail: CASI; A03, Hardcopy

Aging wiring has become a critical issue to the aerospace and aircraft industries due to Shuttle and aircraft incidents. The problem is that over time the insulation on wire becomes brittle and cracks. This exposes the underlying conductive wire to the potential for short circuits and fire. Popular methods of monitoring aging wire problems focuses on applying electrical sensing techniques that are sensitive to the conductor's condition, but not very sensitive to the wire insulation's condition. Measurement of wire insulation stiffness and ultrasonic properties by ultrasonic guided waves is being examined. Experimental measurements showed that the lowest order extensional mode could be sensitive to stiffness changes in the wire

insulation. To test this theory conventional wire samples were heat damaged in an oven, in a range of heating conditions. The samples were 12, 16, and 20 gauge and the heat damage introduced material changes in the wire insulation that made the originally flexible insulation brittle and darker in color. Results showed that extensional mode phase velocity increased for the samples that were exposed to heat for longer duration.
Author
Aging (Materials); Wire; Insulation; Measuring Instruments; Ultrasonic Radiation

20050061304 Institute for Human Factors TNO, Soesterberg, Netherlands
Augmenting Camera Images for Operators of Unmanned Aerial Vehicles
Veltmann, J. A.; Oving, A. B.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 21-1 - 21-10; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The manual control of the camera of an unmanned aerial vehicle (UAV) can be difficult due to several factors such as: 1) time delays between steering input and changes of the monitor content, 2) low update rates of the camera images and 3) lack of situation awareness due to the remote position of the operator and the small field of view of the camera images. Therefore, it is important to assist the operator with adequate tools. We constructed and evaluated a perspective (3D) digital map with information about the predicted viewing direction of the camera. In an experiment, participants inspected roads and edges of wood with and without the 3D map. A 2D map with the same information as the 3D map was available in all conditions. With the 3D map, the participants: 1) were able to inspect larger areas, especially when the task became more difficult due to time delays and low update rates, 2) were better able to perform an additional task, and 3) reported lower workload compared to the condition without the 3D map. These subjective workload results were not supported by objective (physiological) workload measures. Analysis of eye movements showed that the 3D map was used very frequently, especially in conditions with time delays and low update rates.
Author
Cameras; Manual Control; Pilotless Aircraft

20050071047 Kagoshima National Coll. of Technology, Japan
Characteristic Of Projection Image Width Of End Mills With Small Diameter
Kawano, Yoshihiro; Zuo, Dunwen; Yoshimitu, Shinichi; Minami, Akira; Yamashita, Shunichi; Progress of Machining Technology; December 2004, pp. 571-575; In English; See also 20050070885; Copyright; Avail: Other Sources

In this paper, the characteristic of projection image width of end mills with 1mm and 2mm diameter was investigated experimentally. Experiments were made under different picturing condition. It is shown that there exist an upper and a lower threshold values in the illumination intensity of light source. The response delay of the measuring system was found to be much important to affect the image shape, especially for the end mill to rotate at high speed. Finally, the distributing characteristic of the image width was discussed in details.
Author
Milling Machines; CCD Cameras; Image Processing; Projection

20050071070 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Space Infrared Interferometric Telescope (SPIRIT)
Leisawitz, David; [2005]; 1 pp.; In English; American Astronomical Society Meeting, 9-13 Jan. 2005, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

We report preliminary results of a study of the Space Infrared Interferometric Telescope (SPIRIT), a candidate Origins Probe mission. SPIRIT is a two-element Michelson interferometer operating over a nominal wavelength range 25 to 400 microns and offering a powerful combination of spectroscopy and sub-arcsecond angular resolution imaging in a single instrument. With angular resolution comparable to that of JWST and far-IR sensitivity nearly two orders of magnitude better than that of the Spitzer Space Telescope, SPIRIT will measure the resonant structures in exozodi debris disks to find and characterize extrasolar planets; characterize the atmospheres of selected extrasolar gas giant planets; elucidate the evolution of young stellar systems and their planet-forming potential; and track the luminosity evolution and chemical and dust enrichment of galaxies on a cosmological timescale. SPIRIT could be ready to launch as early as 2015. The SPIRIT study is sponsored by NASA under the Origins Science Mission Concept study program.
Author
Space Infrared Telescope Facility; NASA Space Programs; Michelson Interferometers

20050071096 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Multi-Sensor Distributive On-Line Processing, Visualization, and Analysis Infrastructure for an Agricultural Information System at the NASA Goddard Earth Sciences DAAC

Teng, William; Berrick, Steve; Leptuokh, Gregory; Liu, Zhong; Rui, Hualan; Pham, Long; Shen, Suhung; Zhu, Tong; [2004]; 2 pp.; In English; Americal Geophysical Union Fall Meeting, 13-17 Dec. 2004, San Francisco, Ca., USA

Report No.(s): AGU-10004557; No Copyright; Avail: Other Sources

The Goddard Space Flight Center Earth Sciences Data and Information Services Center (GES DISC) Distributed Active Center (DAAC) is developing an Agricultural Information System (AIS), evolved from an existing TRMM On-line Visualization and Analysis System precipitation and other satellite data products and services. AIS outputs will be ,integrated into existing operational decision support system for global crop monitoring, such as that of the U.N. World Food Program. The ability to use the raw data stored in the GES DAAC archives is highly dependent on having a detailed understanding of the data's internal structure and physical implementation. To gain this understanding is a time-consuming process and not a productive investment of the user's time. This is an especially difficult challenge when users need to deal with multi-sensor data that usually are of different structures and resolutions. The AIS has taken a major step towards meeting this challenge by incorporating an underlying infrastructure, called the GES-DISC Interactive Online Visualization and Analysis Infrastructure or 'Giovanni,' that integrates various components to support web interfaces that ,allow users to perform interactive analysis on-line without downloading any data. Several instances of the Giovanni-based interface have been or are being created to serve users of TRMM precipitation, MODIS aerosol, and SeaWiFS ocean color data, as well as agricultural applications users. Giovanni-based interfaces are simple to use but powerful. The user selects geophysical ,parameters, area of interest, and time period; and the system generates an output ,on screen in a matter of seconds.

Derived from text

Multisensor Applications; On-Line Systems; Visual Control; Agriculture

20050080374 Naval Air Warfare Center, China Lake, CA USA

Modeling an Interferometric Fiber Optic Gyroscope

Martin, Jorge M.; Oct. 2004; 124 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429120; NAWCWD-TP-8592; No Copyright; Avail: Defense Technical Information Center (DTIC)

(U) In this paper we derive an expression for the output intensity of a general Interferometric Fiber Optic Gyroscope (IFOG). The light source is assumed to be non-monocromatic with an arbitrary frequency distribution function belonging to L2 (R). This result is expanded and expressed in terms of the parameters involved in the definition of each of the four entries of the clockwise Jones matrix of a generic IFOG with an even frequency distribution. We obtain an expression for the Sagnac phase shift error and compute it for a Gaussian, rectangular, and triangular frequency distribution function. The clockwise loop Jones matrix of a fairly general IFOG model is computed. Matlab programs for computing the output intensity and Sagnac phase shift error are also included.

DTIC

Fiber Optics; Gyroscopes; Interferometry

20050080361 Arizona Univ., Tucson, AZ USA

Feasibility Study of a Quantum-Interference Infrared Photon Detector

Binder, Rudolf; Kwong, Nai H.; Jul. 2003; 4 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0549

Report No.(s): AD-A429101; ARO-42356.1-PH; No Copyright; Avail: Defense Technical Information Center (DTIC)

We performed a theoretical feasibility study of a conceptually new infrared photon detector. The operational principle of the detector is based on a 3-level quantum coherence effect. The study involved 3-level quantum coherence effects with incoherent (thermal) light in semiconductor quantum dots and the optimization of the detected signal. We were mainly concerned with one specific design concept, namely the one based on an interferometric waveguide geometry. The infrared light couples the two lowest conduction band states in the quantum dot, and an auxiliary coherent laser light beam couples the valence band states with one of the conduction band states. We have performed detailed theoretical studies of the noise properties of the detector. Specifically, we have investigated the noise due to vacuum fluctuations of the infrared light in the interferometer. We have also studied the temperature dependence of the noise equivalent power. An estimate of the normalized detectivity D* at room temperature yields 5 X 10^6 cm sqrt(Hz)/Watts.

DTIC

Feasibility; Infrared Detectors; Photons; Quantum Theory

20050080422 Princeton Univ., NJ USA
Voltage Tunable Two-Color Quantum Well Infrared Photodetector
Chou, Stephen; Tsui, Daniel; Jun. 2003; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0506
Report No.(s): AD-A429217; ARO-41381.1-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

Significant progress was made to further advance the quantum well infrared photodetector (QWIP) technology in two areas: 1) designating demonstrating, and understanding voltage tunable two-color QWIPs, and 2) understanding the light coupling mechanism in the so-called quantum grid infrared photodetectors. We have also been working on imprint technology to create pillars which can be used to enhance the performance of the photodetectors. The NIL molds with different period and different shape of the pillars have been created. Implementation of the small pillars to photo-detectors are in progress. DTIC

Color; Electric Potential; Infrared Radiation; Photometers; Quantum Wells

20050080445 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record Number 199
Overbay, Larry; Oct. 2004; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8-CO-160-UXO-021
Report No.(s): AD-A429351; ATC-8862; No Copyright; Avail: Defense Technical Information Center (DTIC)

This scoring record documents the efforts of Shaw Environmental, Inc. to detect and discriminate inert unexploded ordnance (UXO) utilizing the APG standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center. DTIC

Ammunition; Explosives Detection; Ordnance; Scoring; Standardization

20050080446 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Standardized UXO Technology Demonstration Site Open Field Scoring Record Number 129
Overbay, Larry; Nov. 2004; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8-CO-160-UXO-021
Report No.(s): AD-A429352; ATC-8755; No Copyright; Avail: Defense Technical Information Center (DTIC)

This scoring record documents the efforts of Geophex, Ltd. to detect and discriminate inert unexploded ordnance (UXO) utilizing the APO Standardized UXO Technology Demonstration Site Open Field. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center. DTIC

Ammunition; Explosives Detection; Ordnance; Scoring; Standardization

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*.

20050070917 Hyogo Univ. of Teacher Education, Yashiro, Japan
Study On CO2 Laser Cutting Of Magnesium Alloy Sheet
Okuda, Koichi; Ueno, Masaaki; Nunobiki, Masayuki; Shimada, Yoshihiro; Progress of Machining Technology; December 2004, pp. 348-353; In English; See also 20050070885; Copyright; Avail: Other Sources

This study deals with characteristics in a CO2 laser cutting process of magnesium alloy sheet. In order to investigate the basic machining property and clarify the problem in the laser cutting technology, a laser cutting test ofAZ31 sheet was carried

out by using a CO2 laser processing machine. By evaluating the height of dross, the width of kerfs and the roughness of cut surface, the effect of the machining condition on the cutting integrity is examined. The dross is more generated by a CW laser comparing with a PW laser. However, the flashlight and the sound are caused during a cutting with PW laser, especially under the condition of high laser power and low pulse frequency, while they are not generated during a cutting with CW laser. Key words CO2 laser cutting, magnesium alloy, dross, kerf, surface roughness
Author
Carbon Dioxide Lasers; Cutting; Magnesium Alloys; Metal Sheets

20050071115 NASA Langley Research Center, Hampton, VA, USA
Tm:YLF Pumped Ho:YAG and Ho:LuAG Lasers
Barnes, Norman P.; Reichle, Donald J.; Walsh, Brian M.; Axenson, Theresa J.; December 08, 2004; 3 pp.; In English; 20th Anniversary Meeting on Advanced Solid State Photonics, 6-9 Feb. 2005, Vienna, Austria; Original contains color illustrations
Contract(s)/Grant(s): 23-090-20-35; No Copyright; Avail: CASI; A01, Hardcopy

Room temperature Ho:YAG and Ho:LuAG lasers pumped by a Tm:YLF laser demonstrated a 3.4 mJ threshold and 0.41 slope efficiency, incident optical to laser output energy. Results for numerous rod lengths, Ho concentrations, and output mirror reflectivities are presented.
Author
Laser Pumping; Yag Lasers; Room Temperature; Laser Outputs

20050071576 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Improved Analytical Characterization of Solid Waste-Forms by Fundamental Development of Laser Ablation Technology
Russo, R. E.; Oct. 2000; 28 pp.; In English
Report No.(s): DE2004-828184; No Copyright; Avail: Department of Energy Information Bridge

Laser ablation (LA) with inductively coupled plasma mass spectrometry (ICP-MS) has been demonstrated as a viable technology for sample characterization within the EM complex. Laser ablation systems have been set up at the Hanford Site, Savannah River Plant, the Pu immobilization program (MD), Los Alamos, and at numerous other DOE facilities. Characterization of elemental and isotopic chemical constituents is an important function in support of tank-waste operation and remediation functions. Proper waste characterization enables safe operation of the tank farms, resolution of tank safety questions, and development of processes and equipment for retrieval, pretreatment, and immobilization of tank waste. All of these operations are dependent on the chemical analysis of tank waste (1). A specified need by the Tanks Focus Area (TFA) is to validate the laser ablation mass spectrometer (LA/MS) technology through round robin testing of standard materials and through fundamental studies of the laser ablation process (2). Advancement of the laser ablation technology is warranted to guarantee accuracy of analysis for the diversity of complex EM samples. This EMSP research endeavored to understand fundamental laser-ablation and ICP-MS detection characteristics, to ensure accurate and sensitive analytical characterization for EM wastesite samples.
NTIS
Laser Applications; Laser Ablation; Radioactive Wastes; Mass Spectroscopy; Chemical Analysis

20050071580 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Improved Analytical Characterization of Solid Waste-Forms by Fundamental Development of Laser Ablation Technology
Russo, R. E.; Jun. 15, 1999; 14 pp.; In English
Report No.(s): DE2004-828183; No Copyright; Avail: Department of Energy Information Bridge

Laser ablation (LA) with inductively coupled plasma mass spectrometry (ICP-MS) has been demonstrated as a viable technology for sample characterization within the EM complex. Laser ablation systems have been set up at the Hanford Site, Savannah River Plant, the Pu immobilization program (MD), Los Alamos, and at numerous other DOE facilities. Advancement of this technology is warranted to guarantee accuracy of analysis for the diversity of complex EM samples. This EMSP research endeavors to understand fundamental laser-ablation and ICP-MS detection characteristics, to ensure accurate and sensitive analytical characterization for EM waste site samples. The difficulty in characterization of EM waste samples is that matrix-matched standards are not available. ICP-MS instrumental calibration must be performed with a series of standards. The sample-matrix will influence the ablation process, such as an amount of ablated mass, elemental fractionation, particle size distribution and p article transport characteristics, and ICP-MS response. If matrix-matched standards existed, the

quantity of mass, degree of fractionation, and particle transport would be the same for standards and samples; hence, accuracy of analysis would be guaranteed. In contrast, for most EM samples in which standards are not available, accuracy can only be accomplished through knowledge of the laser ablation processes.
NTIS
Laser Spectroscopy; Laser Ablation; Radioactive Wastes; Decontamination; Solid Wastes

20050071604 Swedish Defence Research Establishment, Linkoeping
Protection Against Laser in the Infrared Initial Experimental Tests
Nilsson, C.; Hallberg, T.; Kariis, H.; Lopes, C.; Svensson, S.; Dec. 2003; In Swedish
Report No.(s): PB2005-101259; FOI-R-1063-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The research at FOI concerning protection against laser has until now mainly been focused on protection of eyes against damaging and distracting radiation. Military optical sensors active in the range 3-5 micrograms can also be subject to damage or distraction by laser. The development of anti-sensor lasers for use on IR sensitive target designators has been intense in recent years. The achievements in area protection of target designator devices from laser are still in their cradles. The requirements set on IR protection are slightly different from those set on lasers of visual wavelengths, and other physical principles can also be used. Examples are (1) Mott transitions e.g. VO2, (2) excitation of charged carriers in semiconductors (InAs), and (3) polarized twist in LC components. In this report these three principles are exemplified by elementary laser damage threshold studies.
NTIS
Lasers; Infrared Radiation; Optical Measuring Instruments; Eye Protection; Laser Damage

20050080679 Physics and Electronics Lab. TNO, The Hague, Netherlands
Laser Beam Steering for Directed Infrared Countermeasures
Bekman, H. H. P. T.; June 2004; 397 pp.; In English
Contract(s)/Grant(s): TNO Proj. 015.31313
Report No.(s): TD-2004-0143; FEL-04-B102; Copyright; Avail: Other Sources

This report is a result of a six nations WEAG Thales co-operation CEPA JP8.11 'Investigation of precision laser beam steering' to investigate techniques that will enable laser beams to be pointed at remote targets with enhanced precision. The main driver for this study has been the investigation of innovative techniques and methods that could be applicable to a directed infrared countermeasures system. An additional application that has been investigated is the demanding requirements for laser beam steering in air-to-ground targeting.
Author
Beam Steering; Laser Beams; Optical Countermeasures; Infrared Radiation

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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*.

20050070885 Beijing Univ. of Aeronautics and Astronautics, Beijing, China, Japan Society for Precision Engineering, Japan, Chinese Society of Metal Cutting and AMT for Universities, China
Progress of Machining Technology
Chen, Wuyi, Editor; Yamane, Yasuo, Editor; Fan, Rui, Editor; Ochi, Akio, Editor; December 2004; 1034 pp.; In English; Seventh International Conference on Progress of Machining Technology, 8-11 Dec. 2004, Suzhou, China; See also 20050070886 - 20050071069; Copyright; Avail: Other Sources

The papers presented in this conference proceedings are grouped into the following categories: 1) Keynote Papers; 2) Machining of New Materials; 3) New Tool Materials and New Abrasive Tools; 4) Cutting/Grinding Fluids; 5) Precision, Micro, and Nano-machining; 6) Abrasive Machining; 7) Unconventional Machining; 8) New Machine Tools and Tooling Technology; 9) Monitoring and Control of the Machining Process; 10) Surface Integrity and Machining Quality; 11) Cutting

Mechanisms, Analysis, and Simulation; 12) Information Technologies in Manufacturing; 13) Modeling and CNC Machining; 14) Other Topics in Advanced Manufacturing Technology.
Author
Conferences; Machining; Metals; Composite Materials; Numerical Control; Machine Tools; Manufacturing

20050070889 Okayama Univ. of Science, Japan
Lubricant applying effect in stainless steel cutting
Kaneeda, Toshiaki; Okada, Yoshikazu; Laurence, Anthony; Progress of Machining Technology; December 2004, pp. 163-168; In English; See also 20050070885; Copyright; Avail: Other Sources

Applying materials on the precut surface in ductile metal cuttings can greatly improve the machinability, due to a reduction in friction between the lamella of the chip. We call this effect the lubricant applying effect(LAE) and have described it in various ductile metals, including pure aluminum, pure copper, alpha-brass and mild steel. LAE plays a major role in lubrication under most cutting conditions, offering the possibility of near(semi) dry machining. Near dry machining can be achieved by utilizing LAE in ductile metal cutting. Here, LAE cutting experiments have been carried out using stainless steel plates as the work material, showing that near dry machining can be achieved with this useful material.
Author
Lubricants; Stainless Steels; Metal Cutting

20050070890 Sydney Univ., Australia
Coolant Flow Characteristics in a Segmented Grinding Wheel System
Nguyen, Thai; Zhang, Liang-Chi; Progress of Machining Technology; December 2004, pp. 236-241; In English; See also 20050070885; Copyright; Avail: Other Sources

It has been found that using a segmented grinding wheel with a fluid chamber can significantly minimize the quantity of coolant while improving the ground surface integrity. The present investigation aims to explore the fluid flow mechanism in such a wheel system. To this end, the Weber theory for Newtonian jet instability was applied to quantitatively determine the contribution of coolant flow rate to mist and ligament modes. A model was then developed to predict the mist flow rate by taking into account both the grinding parameters and fluid properties. It was shown that the model prediction was in good agreement with experimental measurements.
Author
Grinding Machines; Wheels; Coolants; Fluid Flow; Flow Characteristics

20050070892 Tottori Univ., Japan
Study On Vibration Cutting By Using Piezo-Electric Actuators
Tanaka, Hisataka; Sato, Masahiko; Sakamoto, Satoshi; Okamura, Susumu; Fujiwara, Yoshiyuki; Progress of Machining Technology; December 2004, pp. 366-371; In English; See also 20050070885; Copyright; Avail: Other Sources

The characteristics of vibration cutting, that is, the effects of vibration frequency and amplitude on the reduction of cutting force are evaluated theoretically and examined experimentally. New vibration device equipped with two piezo-electric actuators has been designed and used in experiments. The cutting tool is vibrated in the direction normal to principal cutting force and thrust force by the actuators. The vibration cutting is applied to cutting-off operations of the workpieces of mild steel and aluminum. The reduction of cutting force and the adhesion of chip to the cutting tool, and the improvement of surface roughness of machined surface are examined in experiments. It has become clear that 1) the cutting force decreases to 50-60% by using the vibration tool, 2) in the cutting of aluminum, the chip flows smoothly and the cutting force does not increase due to the tool vibration, and 3) the surface roughness of machined parts is improved.
Author
Vibration Effects; Cutting; Piezoelectricity; Actuators; Frequencies

20050070893 Jilin Univ., Changchun, China
The Discharge Cylindrical Grinding Technology Based On Wire EDM Machine
Yang, Zhao-Jun; Jia, Qing-Xiang; Zhang, Li-Xin; Feng, Huan-Qin; Zhang, Hai-Wei; Progress of Machining Technology; December 2004, pp. 388-391; In English; See also 20050070885; Copyright; Avail: Other Sources

A new machining method that carries out discharge grinding in wire EDM machine is presented. A spindle device which was fixed to the wire EDM machine to make workpiece rotate were researched and developed. The pulse power supply of the machine was rebuilt so that the discharge energy per spark was reduced. Discharge grinding in refitted wire EDM machine,

the minisize shaft with 0.08mm at diameter and surface roughness at RaO.4731.microns was obtained. Key words discharge grinding, wire EDM machine, minisize shaft machining
Author
Grinding Machines; Cylindrical Bodies; Machining

20050070894 Kanagawa Polytechnic Univ., Japan
Influence of the Characteristics of Tool Holders on the Surface Quality in High-Speed Ball End Milling of Alloy Tool Steel
Okabe, Masayuki; Hatakeyama, Chuichi; Sato, Kohei; Wada, Masaki; Yoneyyama, Minoru; Fujitake, Shuji; Progress of Machining Technology; December 2004, pp. 474-479; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper deals with the experimental evaluation about the characteristics of tool holders in high-speed machining of alloy tool steel by using a vertical MC. The research purpose is to clarify how the characteristics of MC spindle, tool holder, and tool affect the machined surface in high-speed milling. After evaluating both static and dynamic characteristics for different tool holders, cutting tests of alloy tool steel SKD61 at HRC50 were carried out by using ball end mill. Cutting speed and feed-rate were 358 m/min and 3,800 mm/min respectively and the machined surfaces were measured to compare surface roughness, waviness, and form accuracy. As the results, it was probed that the difference of surface quality appears clearly by the characteristic differences among tool holders even if the cutting conditions were the same.
Author
Milling (Machining); Steels; Alloys; Holders; Machine Tools; Mathematical Models; Balls

20050070895 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Machine Tool Controller Based On Mc/Os-II
Chen, Yondong; Wang, Tianmiao; Wei, Hongxing; Cao, Yunan; Progress of Machining Technology; December 2004, pp. 551-554; In English; See also 20050070885; Copyright; Avail: Other Sources

In this paper, an embedded controller for conventional CNC machine tool is described. The system hardware architecture including the ARM processor, Field Program Array Gate (FPGA), memory and the serial bus is presented. The system software architecture applies a generic open architecture model with a software bus. The control function units include HMI, interpreter, interpolator, sensor, supervisory, logic control and servo control. Every unit is a task of muc/os- II, and is scheduled by priority-based. The controller was developed and experimented on the lathe. The result presented proved the feasibility of this solution based on ARM and muc/os- II.
Author
Controllers; Machine Tools; Architecture (Computers); Computer Systems Design; Software Engineering

20050070896 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Research On Frequency Control To Ultrasonic Transducer
Jiang, Xing-Gang; Zhang, De-Yuan; Progress of Machining Technology; December 2004, pp. 567-570; In English; See also 20050070885; Copyright; Avail: Other Sources

The frequency control to ultrasonic transducer has two requirements. One is resonant frequency automatic following, the other is sweep frequency modulation. The first problem is solved by PLL (Phase Locked Loop) technology. The second problem is solved by DDS (Direct Digital Synthesis) technology. But both PLL and DDS have their own shortcomings. To solve these problems, the technology of PLL plus DDS is put forward. The experiment results show that this scheme is feasible.
Author
Frequency Control; Transducers; Ultrasonics; Vibration Measurement; Control Systems Design

20050070897 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Improving Accuracy Of PKMS By Active Force Control Of Redundant Leg
Liang, Hui; Bai, Zhi-Fu; Chen, Wu-Yi; Progress of Machining Technology; December 2004, pp. 587-592; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50375010; Copyright; Avail: Other Sources

The accuracy and rigidity of PKMs can be influenced by the clearance, accuracy and contact stiffness of the joints. A new approach by active force control of redundant leg to improve the accuracy of PKMs is discussed. A 3-DOF Parallel Machine tool with Actuation Redundancy (PMAR) was introduced, and kinematics equations were presented. The relation between the

internal force and the extension of legs was given. A method of active force control was proposed. A simulation proved that this method could improve the accuracy of PKMs.
Author
Active Control; Approach Control; Kinematics; Machine Tools; Redundancy; Accuracy; Joints (Junctions); Loads (Forces)

20050070898 Sydney Univ., Australia
The Effect Of Liquid Nitrogen At Surface Grinding On The Microstructure Of A Quenchable Steel
Nguyen, Thai; Zhang, Liangchi; Zarudi, Irena; Progress of Machining Technology; December 2004, pp. 699-704; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper discusses the metallurgical effects in quenchable steel and the consequent results of surface integrity due to surface grinding with liquid nitrogen. It was found that martensite layer was induced on the ground surface. The microstructure features a dispersion of very fine carbides within the martensite lattice, resulting in a remarkable increase in hardness. High compressive residual stresses were found within the martensite layer. The topography of ground surfaces indicates that the material was predominantly removed by brittle fracture while oxidisation was suppressed. Keywords liquid nitrogen, grinding, residual stresses, phase transformation, oxidised suppression.
Author
Liquid Nitrogen; Microstructure; Steels; Martensite; Carbides; Compressibility

20050070899 Hafei Moto Die Manufacture Co. Ltd., Harbin, China
The Study Of Virtual Debugging Of Automobile Molds Based On Autoform
LI, Jinyu; Wu, Lingwei; Ding, Yongle; Chen, Yuquan; Guo, Lingrong; Liu, Shengdong; Progress of Machining Technology; December 2004, pp. 741-746; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-1054HZ005; Copyright; Avail: Other Sources

By using AUTOFORM software, virtual debugging of automobile molds is analyzed and investigated, which consists of setting up stamping technological scheme, defining the additional form of technology and their correlative stamping parameters. According to the finite element stimulating results, the data, such as the forming, the changes of thickness, the size of stress and strain, and material FLD of sheet metal are obtained. The time and the part of cracking and wrinkling, and the geometric dimensions are shown dynamically in the forming processes. By analyzing the finite element stimulating results, the correlative parameters of fillets of convex-concave dies, blank sizes, frictional forces, pressing edge forces, shapes and sizes of braking beads and the technological compensation can be adjusted. Acceptable punches whose stamping defects are eliminated can be gotten with the help of careful calculation. Therefore, virtual debugging of molds can be implemented before they are machined. Key words stamping process scheme, finite element simulation, virtual debug
Author
Automobiles; Dies; Finite Element Method; Stress-Strain Relationships; Defects

20050070900 Harbin Univ. of Science and Technology, Harbin, China
3d Stress Field Analysis and Fuzzy Comprehensive Evaluation for Milling Insert with Complex Groove
Tan, Guangyu; Li, Zhaokun; Liu, Guangjun; Rong, Yiming; Progress of Machining Technology; December 2004, pp. 780-785; In English; See also 20050070885
Contract(s)/Grant(s): Proj. 50275042; Proj. 1054HZ006; Copyright; Avail: Other Sources

The parametric model of milling insert with 3D complex groove was established. On the basis of milling experiment, the function of milling force is established, and the boundary condition was developed according to the function of milling force. The finite element analysis of the stress field of milling insert was processed. The fuzzy comprehensive evaluation of stress field was processed to evaluate the stress field by the application of fuzzy mathematics theory, which provided basis for the groove reconstruction of milling insert with 3D complex groove.
Author
Three Dimensional Models; Stress Analysis; Milling (Machining); Grooves

20050070903 Harbin Univ. of Science and Technology, Harbin, China
Pre-Processing of Data Points and Surface Reconstruction in RRE
Huang, Jianmei; Tan, Guangyu; Progress of Machining Technology; December 2004, pp. 902-907; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-105G301; Copyright; Avail: Other Sources

Firstly on the basis of the scattered data points of profile surface measured by non-contacted coordinate machine, a new method of segmentation in Rapid Reserve Engineering (RRE) was presented using the character of self-organizing feature mapping (SOM) network. Weighted input vector was adopted in terms of its degree of contribution to improve the precision of the segmentation, and initialized weight vector with the quasi-clustering center to improve the segmentation speed. Secondly constrained optimizing the weights of Non-Uniform Rational B-Splines (NURBS) curve by the method of penalty function to improve the accuracy of curve fitting, which is the fundamental step of surface reconstruction. Lastly the method was validated by the real data points.
Author
Preprocessing; Machining; Neural Nets; Reverse Engineering; Data Processing

20050070904 Shenyang Univ. of Technology, Shenyang, China
Development of High Precise Die Spotting Hydraulic Press
Su, Donghai; Cui, Xiao; Liang, Quan; Wu, Xihong; Progress of Machining Technology; December 2004, pp. 980-983; In English; See also 20050070885; Copyright; Avail: Other Sources

In order to spot and manufacture high precise die, the synchronous driving system with double hydraulic cylinders is adopted. According to the difficult synchronous control of double hydraulic cylinders in fluid transmission and control, a new high-precise type of synchronous system by proportional-valve and servo-valve is presented and the design scheme, control method and control performances are analyzed. This system is not easy to form accumulated synchronous errors, and it has many advantages such as high precision of synchronous control, high utilization ratio of energy.
Author
Hydraulic Equipment; Presses; Hydraulic Fluids; Fluid Management

20050070907 Beijing Inst. of Tech., China
Factorial Study on Nonlinear Characteristics of Ultra High Strength Alloy Steel in High-speed Cutting Process
Wang, Xi-Bin; Long, Zhen-Hai; Wang, Hao-Chen; Kang, Yun-Jiang; Progress of Machining Technology; December 2004, pp. 85-89; In English; See also 20050070885
Contract(s)/Grant(s): NSTCF Proj. 41318.1.2.2; Copyright; Avail: Other Sources

Factorials design and uniform design are applied in the high-speed end-milling experiments of ultra high strength steel (hardness greater than 50 HRc, tensile strength (sigma)b greater than l.4 GPa). The characteristics of this difficult-to-cut material in high-speed cutting process are analyzed and a nonlinear mathematics model on the relationship between cutting force and cutting regimes is proposed. Experiments indicate that under the high-speed cutting of ultra high strength alloy steel condition, the interaction between depth of cut and feed per tooth, the interaction between width of cut and depth of cut, and the interaction between width of cut and feed per tooth are among the statistic significant effects on cutting force; the relationships between cutting forces and cutting regimes are nonlinear, the scale effect of cutting parameters is significant; the effect of one cutting parameter on cutting force is sensitive to the choice of other cutting parameters. Key words ultra high strength alloy steel, high-speed machining, uniform design, nonlinear model, scale effect
Author
Nonlinearity; High Strength Alloys; High Strength Steels; Cutting

20050070911 Kyushu Univ., Fukuoka, Japan
Improvement of the Quality and Performance of Micro Flat Drills with a Diameter of 10 micron
Ohnishi, Osamu; Onikura, Hiromichi; Yamamoto, Kenichiro; Min, Seung-Ki; Koga, Toshinobu; Progress of Machining Technology; December 2004, pp. 203-208; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper describes improvement of the quality and performance of micro flat drills with a diameter of 10 microns. Micro fiat drills with a diameter of 10 microns were fabricated by precision grinding with different grinding wheels. Surface roughness of drills were improved by using grinding wheels which had small grit size and were finished by small grit size rotary dresser. However, improvement of drilling performance by using these improved drills was not clear in the drilling test. The problems about drill life and burr remained.
Author
Drills; Fabrication; Flat Plates

20050070912 Huaqiao Univ., Quanzhou, China
Analysis of Forces Acting on the Abrasive Grits in the Diamond Sawing of Granite
Li, Yuan; Xu, Xi-Peng; Progress of Machining Technology; December 2004, pp. 230-235; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50175030; Copyright; Avail: Other Sources

An experimental study was carried out to quantitatively evaluate the forces acting on the diamond grits during the sawing of granite with a circular diamond saw-blade. Measurements were made of the cutting forces and power in both down-cutting and up-cutting modes over a wide range of operating conditions. The mean normal and tangential force components (f(sub n) and f(sub t)) acting on single active diamond grain were subsequently calculated. It was found that the feed rate (v(sub f)) ranked first in governing f(sub n) and f(sub t) relative to the depth of cut (a(sub p)) in either down or up cutting mode. The conclusions presented in this paper can serve as a useful guideline for the selection of optimal machining parameters in circular sawing of granites.
Author
Grit; Abrasives; Diamonds; Granite; Cutting

20050070913 Harbin Univ. of Science and Technology, Harbin, China
Adaptability of Polishing Disk to the Surface of Automotive Dies in Floating Polishing
Xu, Xiao-Cun; Yuan, Zhe-Jun; Chen, Yu-Quan; Huang, Qing-Bao; Progress of Machining Technology; December 2004, pp. 254-257; In English; See also 20050070885; Copyright; Avail: Other Sources

The surfaces of automotive dies are complex, especially automotive panels are free-form surfaces. So, at present, automobiles dies polishing is mostly done through manual work. Studying floating polishing technology to develop a polisher to replace the manual work, therefore, is a target die manufactures are looking for. One important problem is how to make polishing disk accrete the free-form surface of dies. So, based on analyzing the characteristics and engineering requests of automotive dies, the adaptability of polishing disk with several typical curved surface is studied, and the expressions of max limit of polishing disk, shape of surface and a sway angle of polishing disk are gained in the condition that the polishing disk adapts to the typical curved surfaces. The results offer a rule to design a series of floating polishing disk.
Author
Dies; Disks (Shapes); Metal Polishing

20050070916 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Study On The Low-Frequency Vibration Tapping In Nickel-Base Super Alloy
Li, Guangjun; Han, Fengqi; Zhang, Deyuan; Progress of Machining Technology; December 2004, pp. 336-341; In English; See also 20050070885; Copyright; Avail: Other Sources

Tapping in nickel-base super alloys is very difficult for strong tapping torque. In this paper, the technology of low-frequency vibration tapping is used for tapping in nickel-base super alloy GH4169. The tapping torque and its influencing parameters are assessed by a large quantity of experiments with taps of M3, M6 and M10. It was showed that vibration tapping is qualified for tapping in GH4169 because it can reduce tapping torque and lengthen tool life. And it was found that the impact force, which may lead to tap-tooth breakage, was increasing with the diameter of tap increasing, but it can be avoided by optimizing conditions and improving on the structure of tap. Key words Ni-base super alloy, tapping, vibration tapping, low-frequency vibration
Author
Nickel Alloys; Low Frequencies; Vibration; Taps

20050070918 Jilin Univ., Changchun, China
Investigation On Cutting Time Ratio And Drilling Force Of Vibration Driling
Wang, Xin; Liu, Xiang-Yang; Wang, Li-Jiang; Progress of Machining Technology; December 2004, pp. 376-381; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-59675059; Copyright; Avail: Other Sources

In this paper, by analyzing the axial cutting thickness, a concept of cutting time ratio K in vibration drilling is introduced. The new drilling force model of separate vibration drilling is presented. And the drilling force model includes cutting force and chip-evacuation force. The results of simulation and experiments prove that the model is right. The experiment results also show the effect of cutting time ratio on the drilling force. Key words vibration drilling, cutting time ratio, chip-evacuation force, drilling force
Author
Time Dependence; Drilling; Vibration; Cutting

20050070919 Huaqiao Univ., Quanzhou, China
Tool Wear in Rotary Ultrasonic Machining of Advanced Ceramics
Zeng, W. M.; Li, Z. C.; Pei, Z. J.; Treadwell, C.; Progress of Machining Technology; December 2004, pp. 392-397; In English; See also 20050070885; Copyright; Avail: Other Sources

Rotary ultrasonic machining (RUM) is considered as an effective machining method, which has been utilized to machine hard and brittle materials such as advanced ceramics. There are a few research reports about the tool wear in RUM process, but no systematic studies on tool wear in RUM have ever been published and reviewed. This paper presents an overview of the investigations into tool wear during the process of RUM on advanced ceramics. Directions of future research on tool wear in RUM are also proposed.
Author
Brittle Materials; Ceramics; Ultrasonic Machining; Wear

20050070920 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Study on Micro-Hole Vibration Drilling and Magnetic Deburring
Zhang, Peng; Li, Xianhao; Zhang, Deyuan; Progress of Machining Technology; December 2004, pp. 398-401; In English; See also 20050070885; Copyright; Avail: Other Sources

The micro-hole machining is all long the difficulty in manufacturing. Its exit burrs are also a problem. The NC precise micro-hole vibration drilling system self-developed is used for experiments. The results indicate that vibration drilling can increase the drill life at more than ten times compared with common drilling. The new technology of magnetic deburring is put forward, and the experiments are also conducted. From the results it can be drawn that the craft presented can evidently remove the burrs of micro-holes. It is more significant for applications.
Author
Drilling; Manufacturing; Vibration; Micromachining

20050070923 Taiyuan Univ. of Technology, China
A New Type Of Shaving Cutter Used For Working Involute Spur And Helical Gear
Li, Shu-Juan; Xun, Shao-Bin; He, Cai-Yun; Progress of Machining Technology; December 2004, pp. 448-451; In English; See also 20050070885; Copyright; Avail: Other Sources

A new type of shaving principle based on the plunge shaving and the conventional shaving is put forward, and a nover of shaving cutter will promise to be applied to shaving processing after the gears have been quenched. Key words shaving cutter, conventional shaving, plunge cut shaving
Author
Cutters; Cutting; Gears

20050070924 Zhanjiang Ocean Univ., Guangdong, China
Precision Design Of Form Turning Tools With Axial Feeding
Liu, Jiehua; Zhao, Huiling; Progress of Machining Technology; December 2004, pp. 463-467; In English; See also 20050070885; Copyright; Avail: Other Sources

In order to overcome the shortage of form turning tools with radial feeding, the precision design of form turning tools with axial feeding is put forward. Key words axial feeding; form turning tool; precision design
Author
Precision; Machine Tools; Axial Loads; Feeding (Supplying)

20050070925 North China Univ. of Technology, Beijing, China
A Simulated Investigation on the Machining Instability and Dynamic Surface Generation
Luo, Xue-Ke; Liu, Ying; Cheng, Kai; Luo, Xi-Chun; Progress of Machining Technology; December 2004, pp. 468-473; In English; See also 20050070885; Copyright; Avail: Other Sources

In this paper, the authors propose the generic concept of machining instability based on analyze all kinds of machining instable behavior and their features. The investigation covers all aspects of the machining process dynamics, including the machine tool structural response, cutting process variables, tooling geometry and workpiece material property in a full dynamic scenario. The paper presents a novel approach on coping with sophisticated machining instability and its effect on the surface generation through a combination of numeric method with the characteristic equations and using block diagrams/functions to integrate implicit equations and nonlinear factors. It therefore avoids the lengthy algebraic manipulations in deriving the outcome and the solution scheme is simple, robust and intuitive. Several machining case studies and their simulation results demonstrate the proposed approach being feasible for shop floor CNC machining in particular. The

results also show the proposed approach is useful to monitor the machining instability and surface topography and to be potentially applied in adaptive control of the instability in real time.
Author
Machining; Simulation; Stability; Topography; Surface Properties; Mathematical Models; Dynamic Control

20050070926 Shenyang Univ. of Tech., Shenyang, China
Analysis Of Profile Error As Machining Spatial Helical Surface With Ex-Arc-Generatrix Approach Method
Wang, Ke; Fu, Yusheng; Sun, Feng; Progress of Machining Technology; December 2004, pp. 480-485; In English; See also 20050070885; Copyright; Avail: Other Sources

Applying spatial meshing theory and spatial geometry relation between helical surface and cutter, a new method -- approach of helical surface with ex-arc-generatrix -- is put forward. The error analysis and calculation are completed in theory. The arithmetic of the cutter parameters and the mathematical model are confirmed accordingly. Proved by analysis and experiment, with this method being applied in screw machining, the machining precision and efficiency of screw have been enhanced and some problems of machining for the twin-screw multiphase pump have been solved.
Author
Error Analysis; Machining; Mathematical Models; Arc Generators; Surface Properties; Helices

20050070927 Chang Chun Univ. of Technology, Chang Chun, China
Failure Mode, Effect And Criticality Analysis Of CNC Lathes
Wang, Min; Chen, Diansheng; Lu, Tianshan; Progress of Machining Technology; December 2004, pp. 486-490; In English; See also 20050070885; Copyright; Avail: Other Sources

Failure Mode, Effect and Criticality Analysis of CNC lathes is described. A failure information database of 15 CNC lathes is established based on the failure data collected for three years. The most frequent failure mode is breakage of components in the electrical system. Through failure position and criticality analysis it is found that electrical system, spindle assembly and turret are the weak subsystems, for which reliability improvement design should be made to enhance the reliability level of CNC lathes.
Author
Failure Modes; Lathes; Electrical Engineering; Mechanical Engineering

20050070928 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
On The Kinematics And Linear Interpolation Of A Parallel Kinematics Machine Tool
Wang, Ruiqiu; Chen, Wuyi; Progress of Machining Technology; December 2004, pp. 496-501; In English; See also 20050070885; Copyright; Avail: Other Sources

A Parallel Kinematics Machine tool (PKM) structured with a Stewart platform and a rotation table is introduced in this paper. The forward and inverse kinematics of the machine tool is discussed. And a linear interpolation algorithm is developed, in which the maximal trajectory deviation between two machining points is calculated by investigating the deviation at middle sample points approximately. Base on the ratio of maximal trajectory deviation without linear interpolation to allowable tolerance the curvature radius of linear motion is estimated and the number of the equidistant interpolation points is derived. At last, a computational example is given to verify the proposed interpolation strategy.
Author
Interpolation; Inverse Kinematics; Machine Tools; Algorithms

20050070929 Harbin Inst. of Tech., China
Kinematics Design Of Machine Tool With Bonnet For Aspheric Surface Polishing
Yao, Yingxue; Gao, Bo; Xie, Dagang; Yuan, Zhejun; Progress of Machining Technology; December 2004, pp. 520-525; In English; See also 20050070885; Copyright; Avail: Other Sources

Bonnet tool polishing is a novel aspheric surface polishing method. According to the analyses of the movement and the architectures of bonnet polishing machine, two equations related to the bonnet polishing tool are set up, which are primary transformation equation for the movement of the bonnet polishing tool and an universal coordinate transformation equations for NC processing, and can be used for controlling the movement of the machine. Then the effects of the centering errors on polishing track are analyzed, and a control principle for the distribution of these errors is proposed. The analysis will provide

a theoretical basis for the manufacture, assembly and NC programming of the bonnet polishing machine.
Author
Machine Tools; Polishing; Aspheric Optics; Surface Finishing; Mechanical Engineering

20050070930 Beijing Inst. of Tech., China
Computer Aided 3D Design And Database Of Qun Drill
Progress of Machining Technology; December 2004, pp. 541-544; In English; See also 20050070885; Copyright; Avail: Other Sources

Computer aided three-dimension (3D) design for Qun Drill (QD) and the corresponding database are proposed in this paper. It is the first time to use CAXA XP(sub r2) entity design software to set up 3D models of standard twist drill (STD) and QD. A database is built up, which includes 2D engineering drawings, 3D models and the related geometrical parameters of QD. Users can retrieve the database and look up for the 3D models of QD easily. The database introduces QD with different shapes and geometrical parameters for drilling different workpiece materials in different cutting regimes. It can be popularized to practical uses.
Author
Computer Aided Design; Data Bases; Drilling; Three Dimensional Models; Surface Geometry

20050070931 Okayama Univ., Japan
Development Of Touch Sensor Based On Grinding Fluid Spouting Phenomenon
Tsukamoto, Shinya; Fujiwara, Takanon; Nishi, Atsuhiko; Progress of Machining Technology; December 2004, pp. 555-560; In English; See also 20050070885; Copyright; Avail: Other Sources

In this study, a non-contact type touch sensor, which can predict a machining start point in an external cylindrical plunge grinding process, is developed. The detecting mechanism of this sensor is based on the peculiar grinding fluid spouting phenomenon, which appears in a grinding process with a porous grinding wheel. Grinding fluid, cools the sensor, which is previously heated by the Joule's heat slightly, and then a quantity of spouting grinding fluid increases with a decrease of a distance between grinding wheel and workpiece. Therefore, a unique touch sensing method is proposed, in which the residual wheel head approach distance can be predicted by the sensor output change in a wheel head approach.
Author
Machining; Touch; Grinding (Comminution); Fluids; Sensors

20050070933 Harbin Univ. of Science and Technology, Harbin, China
The calibration of line structure light measuring system in reverse engineering
Mao, Chi; Tan, Guangyu; Huang, Jianmei; Progress of Machining Technology; December 2004, pp. 593-597; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-105G301; Copyright; Avail: Other Sources

Firstly build a camera model. Secondly combine active vision measuring technology and Tsai calibration technique according to the characteristics of line structure light three-dimension measuring, a kind of coordinate system consisting of grid-board and one-dimensional rail is presented to calibrate the parameters of line structure light measuring system in Reverse Engineering. Lastly experiment is carried out to test the calibration effect.
Author
Calibrating; Reverse Engineering; Visual Control

20050070934 Jilin Univ., Changchun, China
Chatter Suppression Based on Recognizing Stable Spindle Speed
Wang, Xiao-Jun; Yu, Jun-Yi; Zhao, Hong-Wei; Jia, Qing-Xiang; Progress of Machining Technology; December 2004, pp. 639-644; In English; See also 20050070885; Copyright; Avail: Other Sources

In this paper, a new chatter control method is developed based on recognizing stable spindle speed. The current paper deduces the hidden function expression of the cutting vibration response variance Sigma(sup 2) versus the spindle speed n for regenerative cutting chatter system and presents a control method for chatter suppression based on recognizing stable cutting spindle speed . Sigma(sup 2) is utilized as the characteristic parameter for monitoring chatter omen and recognizing stable cutting spindle speed at which chatter ceases. Simulation and experimental results show that it can suppress chatter effectively,

the cutting process can always conduct in stable state. The test works were performed on a lathe.
Author
Vibration; Spindles; Speed Control

20050070935 Jilin Univ., Changchun, China
An NC Machining Simulation System Development and Machining Error Analysis
Wang, Zhan-Li; Yu, Jun-Yi; Wang, Ling-Yan; Progress of Machining Technology; December 2004, pp. 645-650; In English; See also 20050070885; Copyright; Avail: Other Sources

A developed three-dimensional NC machining simulation system is proposed in this paper. Windows 2000 is used as the developing platform and Visual C++ 6.0 and OpenGL are used as the developing tools of this system. By using this system the NC machining can be fully and effectively simulated and the simulation is much more accordant to the real machining process and the machining error analysis in NC machining process are resolved; the machining quality can be guaranteed and improved and the product developing period can be shortened greatly; the machining cost can be reduced and the better economic benefit and societal benefit can be received. This system can be used in practical machining work and also can be used as a CAI software in teaching.
Author
Three Dimensional Models; Machining; Simulation; Error Analysis

20050070936 Industrial Technology Center of Okayama Prefecture, Okayama, Japan
A Newly Developed Crack Detecting Method Using Reactive Ion Etching
Yokomizo, Seiichi; Kubota, Shinichirou; Uno, Yoshiyuki; Progress of Machining Technology; December 2004, pp. 664-669; In English; See also 20050070885; Copyright; Avail: Other Sources

A new crack detecting method using reactive ion etching for brittle material such as monocrystalline silicon, crystal and fine ceramics has been proposed. The effect of etching condition on the crack detection for monocrystalline silicon was experimentally investigated. The experimental analysis made it clear that the anisotropic etching is predominant under low etchant gas pressure condition for brittle material. Therefore we can detect the cracks more clearly using this method compared to the conventional wet etching.
Author
Etching; Silicon; Cracks; Reactivity; Detection

20050070937 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Effect of Burnishing Parameters on Surface Microhardness in the Burnishing of Non-ferrous Metals
Luo, Hong-Yun; Liu, Jian-Ying; Wang, Li-Jiang; Zhong, Qun-Peng; Progress of Machining Technology; December 2004, pp. 693-698; In English; See also 20050070885; Copyright; Avail: Other Sources

The rules of the effect of burnishing parameters on surface microhardness during the burnishing processing of non-ferrous metals with polycrystalline diamond tools has been investigated Two kinds of materials, Al-alloy LY12 and brass H62 were used as the workpiece materials. The different burnishing parameters - burnishing depth, burnishing feed rate, and burnishing speed (spindle revolution speed) are concerned. According the results of the elements regression experiments the linear regression equation is obtained from which it can be seen that burnishing feed rate f is the most significant parameter that affects the surface microhardness, while the spindle revolution speed n has the smallest effect.
Author
Nonferrous Metals; Microhardness; Surface Finishing

20050070938 Sydney Univ., Australia
Residual Stresses In Steel Components Ground Without Liquid Coolant
Xiao, Keqin; Zhang, Liangchi; Progress of Machining Technology; December 2004, pp. 714-718; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper investigates experimentally the residual stresses of tool steel components ground with compressed cold air (CCA) instead of liquid coolant. It shows that CCA can reduce grinding temperature and produce a compressive residual stress up to the grinding depth of 30_tm. Grinding forces using CCA are close to those using liquid coolant. On the other hand,

vegetable oil was found to be more effective than either liquid coolant or CCA in reducing grinding heating at small grinding depths.
Author
Residual Stress; Compressed Air; Surface Finishing; Steels; Compression Loads

20050070940 Guangxi Univ., Nanning, China
Mechanics Analysis For New Structure Of Dry Cutting Circular Saw Blade
Qiu, Jun; Huang, Wei; Wang, Zhiwei; Hu, Yingning; Progress of Machining Technology; December 2004, pp. 763-768; In English; See also 20050070885
Contract(s)/Grant(s): Proj. 50365002; Proj. 0339012; Copyright; Avail: Other Sources

Static, modal and linear buckling analysis for diamond circular saw blade that has cooling grooves on the disc base for dry cutting, are carried out by the finite element software ANSYS. The effects of grooves' width, number, length, directional angle and position are discussed and the influence of structural parameters on stress, deformation, modal and buckling load are also analysed. The present method provides theoretical foundation for structural design of dry cutting saw blade. Key words saw blades for dry cutting, static analysis, modal analysis, linear buckling analysis
Author
Cutting; Finite Element Method; Structural Design; Deformation; Buckling

20050070941 Taiyuan Univ. of Technology, China
Heat Analysis on Strip Mill Workroll Bearing Chock by 3d Finite Element Method
Wang, Jianmei; Yang, Shichun; Huang, Qingxue; Yan, Xianguo; Progress of Machining Technology; December 2004, pp. 809-813; In English; See also 20050070885
Contract(s)/Grant(s): Proj. ZZ01-13A-02-01; Copyright; Avail: Other Sources

The heat deformation failure form of workroll bearing chock in BaoShan steel 2050mm hot strip mill was studied by using finite element method. This phenomenon indicates that the internal friction heat in the bearing is the major heat source that results in temperature rise. With the establishment of reasonable temperature boundary conditions on free and contact surfaces, the heat conduction model of bearing chock was built and discreted. By means of finite element method and three dimensional FEM program, the rules of temperature distribution and heat stress distribution of bearing chock were discussed. Moreover, some suggestions on bearing improvement are brought up.
Author
Boundary Conditions; Conductive Heat Transfer; Internal Friction; Stress Distribution; Milling (Machining)

20050070945 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
A Hopfield Neural Network Algorithm For Machining Operations Sequencing
Yan, Haitao; Qiao, Lihong; Progress of Machining Technology; December 2004, pp. 879-884; In English; See also 20050070885
Contract(s)/Grant(s): 2002AA414410; Copyright; Avail: Other Sources

The sequencing of machining operations is not only a very important part of manufacturing process planning but also one of the bottleneck tasks in developing a computer-aided process planning (CAPP) system. This paper presents an algorithm based on Hopfield neural network to resolve the problem of operations sequencing. The model of the network and the parametric form of three rules for sequencing are addressed with an illustrative example. Further discussions on parameterizing and transforming of the sequencing rules as constraints in the Hopfield algorithm are conducted. The proposed algorithm can be used to generate an operations sequence automatically and can include operations sequencing rules flexibly so as to improve sequencing results with more practical considerations of process planning.
Author
Algorithms; Machining; Manufacturing; Neural Nets; Mathematical Models; Operations Research

20050070946 Northwestern Polytechnical Univ., Xian, China
Numerical Prediction Of Surface Topography And Roughness In Milling Process
Gao, Tong; Zhang, Weihong; Qiu, Kepeng; Wan, Min; Progress of Machining Technology; December 2004, pp. 896-901; In English; See also 20050070885; Copyright; Avail: Other Sources

Machined surface topography is very critical since it affects directly the surface quality, especially the surface roughness. Based on the trajectory equations of the cutting edge relative to the workpiece, a new method is developed for the prediction

of the machined surface topography. This method has the advantage of simplicity and it is a mesh-independent direct computing method over the traditional interpolation scheme. The topography value of any point on the machined surface can be calculated directly and the spindle runout can be taken into account. The validity of the method is demonstrated by several simulation examples of end and ball-end milling processes.
Author
Milling (Machining); Surface Roughness; Algorithms; Numerical Analysis; Topography

20050070947 Sojo Univ., Kumamoto, Japan
Optimum Tool Position And Effect Of MQL On Surface Roughness In Five-Axis Milling With Ball-Nosed End Mill
Koreta, Noriyuki; Oosaki, Takayosi; Zhao, Xio-Ming; Progress of Machining Technology; December 2004, pp. 908-913; In English; See also 20050070885; Copyright; Avail: Other Sources

Along with a recent remarkable growth of machining complicated shape of work-pieces, the improvement of the accuracy and the surface roughness in machining a free-form surface has become very important in recent years in five-axis milling with ball-nosed end mill. Unlike the study before, this study investigates the effect 6f tool position angle and tilting angle of ball-nosed end mill on surface roughness. Specifically speaking, this study adds the four tool position angle where front, back, fight and left ward cutting to the intermediate angles among, for example, tilting the tool axis diagonal to front and right tilting direction toward cutting feed direction. By this, it has become possible to study all the tool positions applied in five-axis milling. Moreover, this paper intends to clarify the relation between chip formation generated and machined surface. In addition, this paper reports the results of the experiment on the effect of minimal quantity liquid cutting by use of vegetable oil, biodegradable mineral oil on surface roughness.
Author
Milling Machines; Surface Roughness; Optimization

20050070950 Xuzhou Normal Univ., Xuzhou, China
Synthesis of Slider Crank Mechanism with the Characteristic of Quick-Return
Han, Ji-Guang; Wang, Gui-Cheng; Progress of Machining Technology; December 2004, pp. 965-968; In English; See also 20050070885
Contract(s)/Grant(s): JSNSF-BK2004027; Copyright; Avail: Other Sources

Slider crank mechanism is often used as performing mechanism such as inertial sieve etc. The synthesis problems of a slider crank mechanism, which make it have maximum time ratio or have maximum minimum transmission angle, are completely solved by the technique of curve fitting. The optimal approaching of algebraic polynomial is adopted. This method can not only judge the feasibility, but also determine the parameters of mechanism one time. The iteration and checking are avoided, so it makes the synthesis of mechanism fast and accurately. There is the practical value of engineering. Otherwise, the synthesis formulations according to the time ratio are given with the assistance conditions of crank's length, couple' length, offer set or the ratio of crank's length and couple' length. The synthesis formulations are united. The synthesis methods are perfected and united.
Author
Eccentrics; Curve Fitting; Mechanical Devices; Time; Angles (Geometry)

20050070954 Taiyuan Heavy Machinery Inst., Shanxi, China
Study On Method And Appliance Of Drum-Type Gear For Reducing Cyclecar Noise
Yin, Yufeng; Yang, Jianwei; Progress of Machining Technology; December 2004, pp. 1012-1034; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-20011023; Copyright; Avail: Other Sources

A new scheme for reducing the cyclecar noise is proposed in the paper, in which the axial gear-shaving cutter that has been modified processes the drum-type gear. The final axial modification of the cutter is composed of the theoretical tooth-modification of the axial gear-shaving cutter being gained according to meshing theory and the approximate drum-size of the drum-type gear expressed by using parabola, by which the cutter will be designed to process the drum-gear. The result indicates that the drum-type gear that is processed by final axial modification of the cutter can not only reduce running noise quite obviously, but also lower the production cost.
Author
Transmissions (Machine Elements); Gear Teeth; Noise Reduction; Automobiles; Drums

20050070957 Osaka Univ., Suita, Japan

Cutting of Wear and Impact Resistance Cemented Carbides

Miyamoto, Taskeshi; Heo, Sung Jung; Hanasaki, Skinsaku; Fujiwara, Junsuke; Progress of Machining Technology; December 2004, pp. 44-49; In English; See also 20050070885; Copyright; Avail: Other Sources

The tool wear was very severe in cutting cemented carbides without cutting fluid. Then, in this study mist and wet cutting of the cemented carbides using PCD (Poly-Crystalline Diamond) tools were adopted to investigate how to reduce the tool wear. Additionally, the PcBN (Poly-crystalline cubic Boron Nitride) and the usual cBN tools were also used to be compared with the PCD tool. Summary of results are shown as follows: (1) In mist or wet cutting, it was cleared that the tool wear decreased due to enough lubrication between the workpiece and the flank. (2) The flank wear width in the usual cBN tool was largest among the three tools. (3) At the cutting distance of 40 m, the tool failure was found in the cBN and PcBN tools. (4) Adhesion on the PCD tool was largest among the three tools and the existence of Co which was the binder of the PCD tool and the cemented carbide seems to be concerned with this adhesion. Key words cutting, cemented carbides, tool wear mechanism, mist cutting,

Author

Cutters; Wear Resistance; Impact Resistance; Carbides

20050070959 Hiroshima Univ., Japan

Reduction of Fracture of Work Piece at the Exit of Tool in Machining Powder Compact of Sintered Steel

Sekiya, Katsuhiko; Yamane, Yasuo; Progress of Machining Technology; December 2004, pp. 56-61; In English; See also 20050070885; Copyright; Avail: Other Sources

Turning and drilling tests of the compacts of sintered steel were conducted with various geometries and materials of tools. Reduce of the fracture at the exit of the cutting tool from a work material and surface roughness in machining compact before sintering process were discussed. The tool that has a sharp cutting edge and a large rake angle well cut the grains of compact, and brought good surface finish while the tool wear became large because of chipping. As rake angle decreased, some little hollow resulting from peeling the small pieces of the grain off were observed on machined surface. Subsequently, the flow zone was observed beneath the surface and the roughness became slightly small. When machining with cermet tool that has a chamfer, pool surface was obtained because of the large cutting force and low strength of work material while tool wear became small. The failure at the exit of the tool from work piece in continuous peripheral turning depended on the resultant of feed and thrust forces. When the force was enough small, the width of failure was about 3 times larger than the grain size. The failure at the exit of the hole in drilling depended on the point angle near the margin. Small point angle near the margin enabled reduction of the size of failure.

Author

Metal Powder; Steels; Sintering; Fractures (Materials); Machining

20050070962 South China Univ. of Technology, Guangzhou, China

On the Ductile-Mode Machine of Optical Glass under Conventional Cutting Conditions

Wan, Zhenping; Tang, Yong; Liu, Yajun; Progress of Machining Technology; December 2004, pp. 80-84; In English; See also 20050070885

Contract(s)/Grant(s): NSF-04300123; Copyright; Avail: Other Sources

How to obtain crack-free and finish surface with high efficiency in process of optical glass machining is always the goal which people seek to achieve. This paper proposes a new idea of machining optical glass that crack-free surface formed in ductile regime can be gotten under conventional cutting parameters by suppressing initiation and controlling propagation of cracks. In this paper, edge-indention experiments are conducted in order to find the rules of crack initiation and propagation in the process of optical glass cutting and large-circular tool for glass cutting by which cracks initiation and propagation can be controlled properly and requirements of machining glass in ductile manner can also be met are designed based on rules of brittle breaking and properties of micro-plastic deformation. And also, morphologies of soda-lime glass surface machined by the large-circular tool are presented.

Author

Glass; Optical Materials; Surface Finishing; Cutting; Machining

20050070963 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Experimental Study on the Drilling of Cast Nickel-based Super Alloy K24

Xing, Lihua; Chen, Xiang; Zhang, Deyuan; Progress of Machining Technology; December 2004, pp. 90-95; In English; See also 20050070885; Copyright; Avail: Other Sources

Nickel-based super alloys are generally known to be one of the most difficult materials to machine because of their high hardness, high strength at high temperature, affinity to react with the tool materials, and low thermal diffusivity. Cast nickel-based super alloy K24 is one of the most diffficult-to-cut supper alloys. In the paper, the drilling experiment with different tools materials and drilling parameters is carried out according to the characteristic of K24. The cause of tool life and wear under the different drilling conditions is analyzed. As a result of these considerations, lower cutting speed, slower feed rate and higher rigidity of process system should be applied when drilling K24 by cemented carbide.
Author
Experimentation; Drilling; Cast Alloys; High Strength; Thermal Diffusivity

20050070966 Beijing Univ., China
Optimization Design Of Hydrodynamic Bearing With Multiple Spiral Grooves
Wu, Liangsheng; Liu, Pingan; Liu, Zhenyu; Liu, Zhengping; Yang, Quingkun; Wei, Yuanqian; Progress of Machining Technology; December 2004, pp. 502-507; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper investigates on the optimization design of a new type of hydrodynamic bearing with multiple spiral oil grooves. The mechanical behavior and stability of the new bearing, which includes pressure distribution, Sommerfeld number and attitude angle, have been obtained through solving Reynolds equation. The analysis and calculation show that, among the hydrodynamic bearings with multiple oil grooves, the bearing with two grooves has the best mechanical behavior and stability as well as the same excellent ability of dispersing heat. The hydrodynamic bearing of two oil grooves with the width diameter equaling to 2 and the eccentricity ratio equaling to 0.8 is designed for practical use. The load carrying ability of hydrodynamic bearing with two oil grooves is two times larger than that of the hydrodynamic bearing of four oil grooves. The attitude angle of it decreases about 20 degrees and the stable rotate speed increases from 3000 rpm to 6000 rpm.
Author
Grooves; Mechanical Properties; Optimization; Spirals; Mechanical Engineering

20050070968 Zhejian Univ. of Technology, Hangzhou, China
Research on Ultra-Precision Processing of KTP
Zhao, Ping; Lou, Feiyan; Yuan, Julong; Wang, Zhiwei; Du, Weipeng; Progress of Machining Technology; December 2004, pp. 102-106; In English; See also 20050070885
Contract(s)/Grant(s): NSF-501097; RC-02066; NSTB-2002A41017; Copyright; Avail: Other Sources

Potassium Titanium Oxide Phosphate (KTP) is a new nonlinear frequency-conversion crystal. It has stability of chemistry, high nonlinear coefficient, high damage threshold, easily-polished surface, and a broad transparency range. It is used in solid green laser with medium and low power widely. The requirement for surface roughness is less than 1nm. In this paper, the removal rate and surface roughness are discussed with different velocity, pressure and size of abrasive powder. In order to satisfy the requirement, new machining techniques with Nanopoli-100 ultra-precision plane polishing machine, and fine A1203, SiO2 powders are proposed in this study. The machining process and characteristics are also indicated in this study.
Author
Potassium Phosphates; Crystal Surfaces; Titanium Oxides; Potassium Oxides; Machining; Precision; Polishing; Abrasion Resistance

20050070971 Horkos Corp., Fukuyama, Japan
Drilling with MQL process
Makiyama, Tadashi; Yamane, Yasuo; Progress of Machining Technology; December 2004, pp. 169-174; In English; See also 20050070885; Copyright; Avail: Other Sources

The paper deals with the effects of MQL process on drillng. In dfilling, clearance of chips from a hole drilled, tool wear, accuracy and surface roughness of the hole are the most problems especially in deep drilling. Minimum Quality Lubrication (MQL) process gives fairly good results about these problems, however these mechanisms have not been clarified yet. In this study, drilling tests with different conditions, dry, MQL and wet, were carried out on a 0.5% carbon steel by using solid carbide twist drills having two through holes. Tool life, profile of inside wall drilled, surface roughness and accuracy of the wall, cutting resistance were examined in the tests. Results obtained were as follows. (a) The longest tool life and the best quality of the drilled hole were obtained by using MQL process. (b) Diameters of drilled holes in MQL process were larger than those in other process. (c) The maximum torque in drilling with MQL process is smaller than that with other process. (d) The results

suggest that cutting temperature must be in the best condition for tool life and friction between the drill and the hole drilled in MQL process.
Author
Drilling; Lubrication; Wear; Surface Roughness; Chips

20050070972 Jilin Univ., Changchun, China
Study On Dynamics Of Virtual Axis Hybrid Polishing Machine Tool With Clearance
Yu, Miao; Zhao, Ji; Zhang, Lei; Zhong, Sheng; Progress of Machining Technology; December 2004, pp. 536-540; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper develops a novel five DOF virtual axis hybrid polishing machine tool which is made up of '3 axes parallel + 2 axes series' in order to obtain more stable machining result in the elastic polishing on the free-form surfaces. Because the machine tool is a complex multibody system that comprises many close-ring structures, jointing clearance becomes the important influence factor to its moving stability. The unified rigid multibody dynamics equation of for the parallel mechanism of virtual axis hybrid polishing machine tool is built, which considers the influence of joint with clearance and applies the kinematics model of Newton second state. The result of analysis shows that the moving stability of the virtual axis hybrid polishing machine tool is reduced due to the existing jointing clearance. However, the interior flexibility of the mechanism can reduce the shock effect of collision in the part of motion pair. It call improve the working stability of mechanism.
Author
Machine Tools; Polishing; Rigid Structures; Clearances; Dynamic Models

20050070974 Beijing Univ. of Technology, Beijing, China
Environmentally Benign Machining with Combined Mist-Jet Eco-Machining Fluids
Wei, Yuanqian; Wang, Ailing; Zhu, Xijing; Sun, Xudong; Liu, Zhongzbu; Men, Hao; Progress of Machining Technology; December 2004, pp. 187-190; In English; See also 20050070885; Copyright; Avail: Other Sources

To replace traditional machining fluids, cooled air, minimum naturally dissoluble oils and a small amount of water are used to form combined mist-jet (CMJ) eco-machining fluids. A large number of machining experiments are carried out on a precision NC plane grinder by using CMJ eco-machining fluids in comparison with a traditional machining fluid such as emulsion flood coolant. The experimental results have further shown that the new eco-machining fluids can acquire the same grinding accuracy and higher by comparison with emulsion flood coolant. Clearly, CMJ eco-machining fluids have excellent lubrication and cooling effects and are applicable to grinding processes to some extent.
Author
Machining; Mist; Fluid Jets; Lubricant Tests; Lubricants

20050070975 Beijing Inst. of Tech., China
Research On The Devices For Cutting Edge Treatment Of Electropolishing
Yan, Xianguo; Pang, Siqing; Zhao, Wenxiang; Li, Yongtang; Wang, Jianmei; Progress of Machining Technology; December 2004, pp. 514-519; In English; See also 20050070885; Copyright; Avail: Other Sources

An electropolishing device for cutting tool edge treatment is developed. It can remove the burrs produced by regrinding, and can change the micro geometric shape, and consequently, the quality and life of cutting tool are improved. The basic theory of electropolishing of cutting edge treatment is discussed in this paper. Electrolytic power supply, electrobath and electrolyte prescription for electropolishing of cutting edge treatment are devised. Experimental results have shown that the tap life which has been treated by an electropolishing device can be increased by more than one times, and the precision by one level as well.
Author
Electropolishing; Machine Tools; Mechanical Engineering; Mechanical Devices

20050070977 Tokyo Metropolitan Coll. of Aeronautical Engineering, Japan
Effects Of Jackscrews Of Surface Grinding Machines On Their Rocking Mode Vibrations
Yoshida, Kiichi; Noda, Yutaka; Maejima, Miyabi; Yanagida, Kouichi; Inuduka, Hayato; Progress of Machining Technology; December 2004, pp. 526-529; In English; See also 20050070885; Copyright; Avail: Other Sources

It is well known that the mounting conditions and mounting elements of the machine affect their dynamic characteristics as well as machine level. In horizontal spindle reciprocating table type surface grinding machines, many shocks occur when the work table is reversed. It is well known that rocking mode vibrations due to the shocks result in poor grinding' accuracy.

The rocking mode vibrations are affected by the deformation of parts supporting the grinding machine. So far, relationships between various mounting elements and relative receptances have been investigated. In this study, effects of jackscrews of surface grinding machines on their rocking mode vibrations are investigated experimentally. The relative receptances between grinding wheel and work table is measured under various mounting conditions. These data are analyzed by an FFI' analyzer. The receptances are small when overhang of jackscrews is long.
Author
Grinding Machines; Screws; Surface Geometry; Vibration Mode; Dynamic Characteristics

20050070978 Jilin Univ., Changchun, China
Research On The Microgear Measurement Technique Based On CCD Image
Chen, Xiangwei; Wang, Longshan; Liu, Qingmin; Ding, Ning; Progress of Machining Technology; December 2004, pp. 545-550; In English; See also 20050070885; Copyright; Avail: Other Sources

The technique difficulty in traditional measurement method of contact for microgear is discussed. At the same time, a new non-contact measurement method of microgear based on CCD image is put forward. The non-contact measurement principle making use of image measurement technology is introduced. The A102f CCD digital camera is used as image sensor in the system. The main measurement approaches include collecting image, filtering image and reducing noise with the edge retention filter, creating a binary image with threshold method, detecting edge of the image and obtaining the edge of the single pixel, system calibration and calculation of gear's parameters etc. The system measuring microgear by non-contact method is designed and the components of the system, the key technology is solved and the actual measuring experiment is accomplished. The tooth profile errors and pitch errors of microgear is measured and the measurement precision is analyzed. Experiment shows that measurement principle put forward in the system is correct and feasible and the software can meet the production demands.
Author
CCD Cameras; Image Processing; Gear Teeth; Microelectromechanical Systems

20050070979 Kyushu Polytechnic Coll., Kitakyushu, Japan
The Effect of Oil-Mist Application on the Machinability in Turning of Super Heat-Resistant Alloy Inconel 718 (in case of Using Cermet and Coated Carbide Inserts)
Yatsuzaki, Toru; Onikura, Hiromichi; Progress of Machining Technology; December 2004, pp. 191-196; In English; See also 20050070885; Copyright; Avail: Other Sources

Recently, the realization of cutting operations without using a coolant at work-sites has become an important research subject in the field of eco-cutting. The purpose of the present study is to clarify the possibility of developing an eco-cutting process for the high speed machining of the super heat-resistant alloy Inconel 718 which usually needs a high volume of coolant during machining. A dry cutting and a wet cutting with an emulsion coolant as well as an oil-mist cutting were evaluated in this study. A Ti compound cermet insert, a TiCN-Al2O3-Ti compound CVD coated cemented carbide insert and a (Ti, Al)N PVD coated cemented carbide insert were used for the turning of the periphery of round bars. It was found that Inconel 718 as a low machinability material can be machined at a cutting speed of 100m/mm using a combination of the (Ti, Al)N PVD coated carbide insert and vegetable oil mist 12ml/h with 0.5MPa air.
Author
Oils; Mist; Machining; Heat Resistant Alloys; Cermets; Coatings; Carbides; Inconel (Trademark)

20050070981 Toyohashi Univ. of Technology, Aichi, Japan
Development Of A Chip-Breaking Tool For Tapping
Yamauchi, Masako; Horiuchi, Osamu; Murakami, Yoshihiko; Sugano, Hiroto; Shibutani, Hideo; Progress of Machining Technology; December 2004, pp. 508-513; In English; See also 20050070885; Copyright; Avail: Other Sources

In tapping, chips jammed in the tap's flute or twined around the tap cause tool breakage very frequently. It has been an obstacle to automation of tapping. In order to resolve this problem, a chip-breaking tool has been developed, which forms grooves axially on the inner wall of hole before tapping. In this paper described are design of the tool and its effectiveness. The tool was composed of a cylindrical body and three V-groove cutting edges. The diameter of body was equal to that of tap drills. The major diameter of V-groove cutting edges was slightly larger than that of taps. To investigate the effectiveness of the tool, tapping experiments for M3 and M6 threads were performed with and without using the tool. The work material was structural steel SS400 and the taps used were the conventional spiral fluted taps made of high speed steel. It has been ascertained by experiments that by using the newly developed tool, the tool life of tap lasts much longer and the tapping torque

becomes smaller and stable, and moreover, the surface roughness becomes smoother.
Author
Taps; V Grooves; Manufacturing; Machine Tools; Chipping

20050070982 Beijing Univ. of Technology, Beijing, China
The Machining Stability Analysis For Boring Thin Walled Hollow Workpieces
Wang, Min; Fei, Renyuan; Yang, Jianwu; Xie, Chunliu; Progress of Machining Technology; December 2004, pp. 491-495; In English; See also 20050070885; Copyright; Avail: Other Sources

In the factory, there are many hollow shafts with thin wall need to be machined using boring operations. When machining the workpiece with thin wall the relationship between the dynamics of the bar and the workpiece has a strong and complex influence on the machining stability. The reason is that the stiffness of workpiece is at the same magnitude as the boring bar. The machining stability is sensitive to the minute change of the relationship between the dynamics of the bar and the workpiece. At the same time, it is difficult to analyze and improve the machining stability because the dynamics of the workpiece has a significant change along with the cutting process. For the boring chatter avoidance, this paper gives a mathematic model depicting the chatter mechanism for boring the thin walled workpiece. By utilizing numeric simulation method in the time domain, it is analyzed that how the relationship between the dynamics of the bar and the workpiece affects the boring stability.
Author
Machining; Shafts (Machine Elements); Stability Tests; Thin Walls; Boring Machines; Hollow

20050070983 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
The Working Table Design With High Specific Stiffness For High Speed Machine Tool
Yu, Maolin; Chen, Wuyi; Progress of Machining Technology; December 2004, pp. 530-535; In English; See also 20050070885; Copyright; Avail: Other Sources

Working table is one of the moving parts in a high speed machine tool which requires high specific stiffness. Light weight and high stiffness are two goals in its design. In this paper, bionic principle was applied to design a working table impelled by electric linear direct driver in a high speed machine tool. The FEM result shows that the weight and the deformation of the new structure are both decreased compared with the original design under the same loading and constraint. This method can also be applied in the design of other parts of high speed machine tool.
Author
Bionics; Machine Tools; Stiffness; Mechanical Engineering; Mathematical Models

20050070984 Kumamoto Univ., Japan
Ultra-smoothness Grinding of Glass with #140 Metal Bond Diamond Wheel
Sawa, Takekazu; Yasui, Hei-Ji; Progress of Machining Technology; December 2004, pp. 215-218; In English; See also 20050070885; Copyright; Avail: Other Sources

Glass is one of the most important materials in the optical industries. The high efficiency ultra-smoothness grinding technique of the glass has been strongly required. To improve the productivity, in our previous researches, the newly devised ultra-smoothness grinding method is proposed. By applying the new method to the horizontal surface grinding, the sm'face roughness of cemented carbide tool, silicon carbide ceramic and so on is found to attain below 30nm (Rz) or 5nm (Ra) in the measuring area of 256 microns x 256 microns. As a result, the new method is ascertained to be useful for finishing near the ultra-smoothness surface. In this report, ultra-smoothness grinding of a glass is examined. The specification of metal bond diamond wheel used is the grain size of #140 and the concentration of 50, respectively. The 3D surface roughness of glass formed using the suitable grinding condition attains about 27nm(Rz) or 1.4nm(Ra).
Author
Grinding Machines; Glass; Grain Size; Diamonds; Wheels

20050070985 Kyoto Inst. of Tech., Japan
Microultrasonic Machining Using Multitools
Egashira, Kai; Taniguchi, Tomoya; Tsuchiya, Hachiro; Miyazaki, Makoto; Progress of Machining Technology; December 2004, pp. 297-301; In English; See also 20050070885; Copyright; Avail: Other Sources

Multitools have been fabricated and then been used in microultrasonic machining (MUSM) of arrays of microholes. MUSM with a single tool had so far been carried out on hard and brittle materials, however, it is time-consuming for drilling

lots of holes, which is often required for the applications of microholes. The multitool fabrication process include: (1) shaping a small-diameter tungsten electrode by wire electrodischarge grinding, (2) drilling arrays of microholes in copper foil by electrodischarge machinng (EDM) using the fabricated electrode and (3) fabricating a multitool by EDM using the foil as the electrode with an assistance of ultrasonic oscillation. The multitool consists of 16 single tools arranged in a square army. MUSM has been performed in soda-lime glass using a tungsten carbide abrasive 0.6_rn in grain size with oscillation amplitudes of 0.4 to 1.6pro, machining loads of 0.025 to 0.2N and an oscillation frequency of 40kHz. As results, arrays of microholes have been successfully drilled, with few holes having chippings around their entrances. The drilling speed and the tool wear ratio have also been investigated. Using cemented carbide tools, the drilling speed rises with increases in the machining load as that for a single tool does. In contrast, it decreases as the oscillation amplitude increases. The tool wear ratio varies widely and does not show clear relationships with the machining load or the oscillation amplitude. Polycrystalline diamond tools have excellent wear resistance, while they are apt to break under high machining loads. Key words ultrasonic machining, micromachining, multitool, microhole, EDM
Author
Machine Tools; Tungsten Carbides; Ultrasonic Machining; Fabrication; Machining; Drilling

20050070986 Kansas State Univ., Manhattan, KS, USA
Experimental Investigations into Jig Grinding
Churi, N. J.; Pei, Z. J.; Progress of Machining Technology; December 2004, pp. 219-224; In English; See also 20050070885; Copyright; Avail: Other Sources

Jig grinding is a precision internal machining process for high precision products such as dies and fixtures. It is usually used for grinding circular holes and various contour holes to accurate size and location. This paper presents results of experimental investigations into jig grinding on hardened die steel with electro-deposit CBN grinding wheels under different grinding conditions. It reports effects of quill motion, wheel speed, grain size, and wheel shank length on grinding characteristics such as grinding force, surface roughness, and roundness. The experimental results show that, as the wheel speed increases, the grinding forces, the surface roughness, and the roundness decrease. As the quill speed increases, grinding forces and surface roughness decrease. As the grain size increases, roughness and roundness decrease. As the wheel shank length increases, roughness and roundness increase. Key words jig grinder, jig grinding, grinding force, roundness, surface roughness.
Author
Surface Roughness; Grain Size; Metal Grinding; Jigs

20050070989 Harbin Inst. of Tech., China
Research On The Mechanical-Electrochemical Polishing Of Pure Titanium
Chen, Yu-Quan; Dong, Shen; Qiu, Feng; Xu, Xiao-Cun; Huang, Qing-Bao; Progress of Machining Technology; December 2004, pp. 292-296; In English; See also 20050070885
Contract(s)/Grant(s): NSF-E0320; ICF-WC02108; Copyright; Avail: Other Sources

By applying a process of mechanical-electrochemical polishing with a magnetic field, the difficult-to-machine material, pure titanium, can be polished with ease. This paper describes the principle of polishing and makes some experimental comparisons under conditions with and without a magnetic field. The analysis and experiment results show that the mechanical-electrochemical polishing process with a magnetic field is helpful for improving polishing efficiency and quality of pure titanium.
Author
Electropolishing; Magnetic Fields; Metal Polishing; Titanium

20050070992 Toshiba Machine Co., Ltd., Tokyo, Japan
A Non-Contact Compensation Method of an Alignment and a Radius of a Grinding Wheel in Ultra-Precision Grinder
Yamane, Yasuo; Fukuta, Masahiko; Sekiya, Katsuhiko; Sugino, Tadanori; Progress of Machining Technology; December 2004, pp. 561-566; In English; See also 20050070885; Copyright; Avail: Other Sources

The study proposes a non-contact adjustment method of grinding wheel alignment in ultra-precision grinder by using electric capacitance between a grinding wheel and a reference ball. Cemented carbide with almost no binder is used for die material as molding glass lens. The carbide is one of the most difficult-to-cut materials because of its high hardness. Diamond wheel therefore is generally used for grinding the material under quite light grinding conditions such as less than 1 micrometer of depth of cut. In such ultra-precision grinding, an alignment and a radius of a grinding wheel must be settled precisely to

achieve high efficient grinding. In ultra-precision grinding, grinding and measuring are repeated several times, that is, after grinding the work form is measured, and the result is used to correct a grinding program for next grinding. The method proposed in this study is based on an electric capacitance between grinding wheel having conductivity and the reference ball, this means that the method is carried out without any contact between the wheel and the reference. The capacitance is in inverse proportion to the gap, and that can be measured precisely. Using the method, the alignment and the radius of the wheel can be adjusted within short time.
Author
Alignment; Grinding Machines; Precision; Wheels; Mathematical Models

20050070995 Jilin Univ., Changchun, China
Prediction of Surface Roughness in Cylindrical Longitudinal Grinding Based on Evolutionary Neural Networks
Li, Guo-Fa; Wang, Long-Shan; Ding, Ning; Progress of Machining Technology; December 2004, pp. 225-229; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-20020632; Copyright; Avail: Other Sources

Artificial neural networks are introduced in the area of grinding. There are some disadvantages in BP (Back Propagation) algorithm, such as low rate of convergence speed, easily falling into local minimum point and weak global search capability. In order to settle these problems, this paper presents a new learning algorithm that uses GA (Genetic Algorithm) to train BP neural networks. The prediction model of surface roughness in cylindrical longitudinal grinding based on evolutionary neural networks is proposed in detail. The experimental and the simulating results shows that the combination of BP and GA can effectively overcome the problem of easily falling into local minimum point, and this method can get higher accuracy of prediction. By motoring the grinding parameters, this method using in this paper can realize the on-line prediction for the roughness of the workpiece.
Author
Surface Roughness; Predictions; Grinding (Material Removal)

20050070996 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Dynamic Modeling of a 3-DOF Parallel Machine Tool with Actuation Redundancy
Bai, Zhifu; Han, Xianguo; Chen, Wuyi; Progress of Machining Technology; December 2004, pp. 407-412; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50375010; Copyright; Avail: Other Sources

This paper analyzes a 3-DOF Parallel Machine tool with Actuation Redundancy (PMAR) which is designed based on the 3RPS parallel mechanism with a redundant SPS leg. The Jacobian matrix with four rows and three columns is proposed. Based on Newton-Euler equation, the dynamic model of this mechanism is established. The compatibility equation must be found to solve the dynamic problem due to actuation redundancy, as makes the dynamic analysis difficult. This paper presents the compatibility equation using Castigliano's second theorem. The conclusion will be significant for detailed research and redundant control of this mechanism. The ultimate goal is to use these results to design a prototype to grind drilling tools.
Author
Dynamic Models; Machine Tools; Redundancy

20050070997 Shounan Inst. of Tech., Tsujido, Japan
High Smoothness Grinding of Aluminum Alloy with Surface Traverse Grinding
Odaki, Toshimi; Yasui, Heiji; Tomita, Susumu; Progress of Machining Technology; December 2004, pp. 242-247; In English; See also 20050070885; Copyright; Avail: Other Sources

High smoothness machining of aluminum alloy has been increasingly becoming important. Generally aluminum alloy is finished smoothly by cutting with diamond tool. High smoothness grinding of aluminum alloy, however, has been strongly desired because of the difficulty of re-sharpening of diamond tool. In the report, the influence of surface traverse grinding conditions on high smoothness grinding of aluminum alloy is examined by the comparisons of the dressing and grinding characteristics. The experiment are executed using the resinoid bonded diamond wheel of coarse grain size and two types of grinding fluids which are the two kinds of emulsion type, that is, the Conventional emulsion type and the special emulsion type including the extreme pressure additives. From the results it is found that the characteristic obtained by using the special emulsion type is much better than the conventional emulsion type.
Author
Aluminum Alloys; Metal Grinding; Surface Finishing

20050071000 Beijing Univ. of Technology, Beijing, China

Identification of Diamond Dresser Blunt Using SPC and AE Technique in Grinding Processes

Zan, Tao; Wang, Min; Fei, Ren-Yuan; Yang, Jian-Wu; Xu, Hong-An; Progress of Machining Technology; December 2004, pp. 264-268; In English; See also 20050070885; Copyright; Avail: Other Sources

Dressing of grinding wheel is necessary because of the wheel wear in grinding processes. Single diamond dresser is widely used in this field. With the times of dressing wheels increasing, the diamond becomes more and more blunt. So, it's a problem that how to measure the blunt degree of the diamond and when is the best time to replace it. In this paper, a new try of the identification of the status of the diamond blunt is presented, which uses statistic process control(SPC) and acoustic emission (AE) technique. Along with the grinding operation going on, AE signals are acquired during the course of the diamond becoming blunt by the AE sensor installed on the support of the diamond dresser. Through the experiments it is conformed that the AE signals are sensitive to the diamond being blunt. At the same time, for deciding whether the diamond is blunt or not and the blunt degree according to the AE signal, the control chart and process capability(Cp) index are calculated according to the dimensions of the batch of machined workpieces. Based on the control chart and Cp index, the time can be estimated of the diamond being blunt. At the end of the paper, a method of the identification of the status of the diamond blunt is suggested as a future work.

Author

Acoustic Emission; Grinding (Material Removal); Wear

20050071001 Beijing Inst. of Tech., China

Research of Dressing Technology on Major Diameter Thin Acetabuliform Diamond Wheel

Zhao, Wen-Xiang; Wang, Xi-Bin; Li, Ya-Fei; Kuang, Xi-Mei; Pang, Si-Qin; Progress of Machining Technology; December 2004, pp. 269-274; In English; See also 20050070885

Contract(s)/Grant(s): NNSF-40402030106; Copyright; Avail: Other Sources

The dressing technology of the dishing diamond grinding wheel which grinds the monolithic carbide pinion-type cutter has been a technical difficulty, since monolithic carbide pinion-type cutter is frequently used for machining the high precision little gear of double gear and blind hole annular gear which are hardened as the final working procedure. Based on establishing a theoretic model of dressing dishing diamond wheel with GC cup wheel, we introduce, in this paper, a dresser is designed and manufactured by ourselves to contain the GC cup wheel, by which major diameter thin dishing resin bond diamond grinding wheel dressed. We did a series of experiments upon dressing the dishing diamond grinding wheel with the dresser in different conditions such as different principal axis speeds, wheel parameters and feeding speeds. It is concluded that the dressing effect of GC cup wheel on dishing resin bond diamond wheel is efficient enough, and the good quality and low cost of dressing meet the needs of production; meanwhile, the reasonable processing parameters are found to improve the dressing quality and to enhance the dressing efficiency.

Author

Grinding Machines; Machining

20050071003 Harbin Inst. of Tech., China

A Mathematical Model Based On Chemo-Mechanical Equilibrium For Chemical Mechanical Polishing Process Of Silicon Nitride Balls

Lu, Bing-Hai; Yuan, Ju-Long; Yao, Ying-Xue; Wang, Zhi-Wei; Lou, Fei-Yan; Progress of Machining Technology; December 2004, pp. 342-347; In English; See also 20050070885

Contract(s)/Grant(s): NNSF-50375147; NSF-501097; NSF-RC-002066; Proj. 2002A41017; Copyright; Avail: Other Sources

This paper presents a mathematical model for CMP processes of Si3N4, which is developed making use of the concepts of chemical-mechanical equilibrium, chemical kinetics, contact mechanics, and Gibb's free energy. Three key variables are defined to describe the chemical-mechanical synergetic effects in terms of the process and material parameters of the system. The governing equation of the material removal reveals some insights into the process and offers some sensible explanations to the effects of various parameters on the rate of material removal and process quality. By further modification of the model, a more accurate formula will be got, and a better understanding of the fundamental mechanism involved in the CMP process of the Si3N4 balls can be obtain. Key words silicon nitride (Si3N4) balls, chemical mechanical polishing (CMP), material removal mechanism, modeling

Author

Mathematical Models; Chemical Equilibrium; Polishing; Gibbs Free Energy; Reaction Kinetics; Silicon Nitrides

20050071004 Harbin Univ. of Science and Technology, Harbin, China

A Study On Machining Process Simulation Of NC-WEDM System Of Polar Coordinates By Means Of Computer

Ren, Fu-Jun; Wang, Dian-Jun; Progress of Machining Technology; December 2004, pp. 354-359; In English; See also 20050070885; Copyright; Avail: Other Sources

In this paper, the characteristics and general laws of cutting complex curved surface by NC-WEDM (Numeric Control-Wire Cut Electric Discharge Machining) system of polar coordinates are systematically analyzed, and the motion parameters and motion forms of NC-WEDM system of polar coordinates are also analyzed. The universal mathematical models of NC-WEDM system of polar coordinates are derived. Then, the basic idea of machining process simulation of NC-WEDM system of polar coordinates is introduced. A lot of simulating programs are programmed. Some good simulation results are obtained. Experiments on cutting complex curved surface by NC-WEDM system of polar coordinates are conducted and many complex curved surface parts are machined. The application of this simulating technology is analyzed as well. All these works provide an effective approach for us to resolve the problems of cutting complex curved surface parts by NC-WEDM.

Author

Electric Discharges; Machining; Polar Coordinates; Cutting; Wire

20050071005 Kanazawa Univ., Japan

Influence Of Temperature And Process Parameters On Bending Angle In Laser Forming

Sentoku, Eisuke; Ueda, Takashi; Yamada, Keiji; Hosokawa, Akira; Tanaka, Ryutaro; Progress of Machining Technology; December 2004, pp. 360-365; In English; See also 20050070885; Copyright; Avail: Other Sources

Laser-forming is sheet metal bending processing caused by the thermal stresses in the sheet irradiated by a laser beam. Therefore final bending angle of the irradiated sheet depends on the temperature distribution of the sheet. In this study, a thin stainless steel is bent by the irradiation of CO2 laser. Then both temperatures at irradiated and opposite surfaces are measured using the infrared radiation pyrometer with an optical fiber. And influences of the temperature, thickness of sheet and diameter of laser beam on final bending angle for laser-forming are experimentally investigated. Experimental results show a correlation between the temperature measured and the bending angle achieved. The bending angle linearly increases with an increase of the irradiated surface temperature. In the constant irradiated surface temperature, the increase of diameter of laser beam and the decrease of thickness of material enlarge the bending angle. Key words laser forming, plastic forming, infrared pyrometer

Author

Bending; Temperature Effects; Metal Sheets; Temperature Distribution; Thermal Stresses; Irradiation; Laser Beams

20050071006 Harbin Univ. of Science and Technology, Harbin, China

Experimental Studies on Finish High-Speed WEDM in Gas

Wang, Tong; Zhang, Xin-Fu; Zhao, Xue-Fang; Progress of Machining Technology; December 2004, pp. 372-375; In English; See also 20050070885

Contract(s)/Grant(s): NNSF-50105003; FHPOS-1053HQ005; Copyright; Avail: Other Sources

This paper investigates the features of finish high-speed Wire-cut Electrical Discharge Machining (WEDM) in atmosphere and emulsion. Experimental results have shown that WEDM in atmosphere offers a series of advantages such as better straightness accuracy and higher removal rate compared with processing in emulsion. It was also found that there is an optimal feed both in atmosphere and emulsion at which the best straightness and the highest removal rate can be obtained. Considered its better processing quality and higher removal rate, the finish high-speed WEDM in gas possesses a broad prospects for its application.

Author

Cutting; Machining; Wire; Air

20050071008

Machining Technology Of Self-Rotary Cutting Tool

Chang, Xing; Pang, Xuehui; Wu, Wenge; Progress of Machining Technology; December 2004, pp. 413-417; In English; See also 20050070885; Copyright; Avail: Other Sources

The basic theory of self-rotary cutting tool mad its differences in machining process with plain tool are introduced briefly. And the structural peculiarity of a kind of special self-propelled rotary turning tool which combined with two cutting inserts,

right and left, is discussed. Advanced specialty and practicability of this special tool be analyzed. Moreover, the claim attention of the tool in manufacturing and using are emphasized.
Author
Machining; Cutting; Manufacturing

20050071009 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Study On Energy Density Needed In Nd:Yag Laser Polishing Of CVD Diamond Thick-Film
Xu, Feng; Zuo, Dun-Wen; Wang, Min; Progress of Machining Technology; December 2004, pp. 382-387; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50275076; Copyright; Avail: Other Sources

Chemical vapor deposited (CVD) diamond film is a good material for high-tech fields because of its a series of excellent properties. But because of its polycrystalline morphology, CVD diamond film has a rough surface that limits its application in engineering. In this paper, theoretical and experimental research was conducted on laser polishing CVD diamond films prepared by electron-assisted CVD method. The mechanisms of laser processing diamond film are thermal oxidation, graphitization and evaporative ablation of graphite. The different temperatures lead to different physical and chemical changes of diamond, so the temperature distribution was analyzed by using heat transfer theory. Based on the model, it is found that laser energy density greatly affected the temperature that leads to the removal of diamond. It is shown that Q-switched pulsed Nd:YAG laser that has high pulse power density is effective to remove the salience on the film surface, though some damages occurred in the surface. Since the diamond film has pyramidal-like polycrystalline morphology that has peaks and valleys, the temperature distributions in valleys and peaks are different. The ablation rates of peaks and valleys are inequality, which lead to the reducing of surface roughness. Experimental results show that surface roughness of the film surface was reduced from Ra4.5 microns to Ra1.2 microns by laser polishing. Key words diamond film, laser polishing, surface roughness, temperature field
Author
Vapor Deposition; Diamond Films; Polishing; Neodymium Lasers; Yag Lasers; Temperature Distribution; Oxidation; Graphitization; Ablation

20050071010 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Study On The Kinematics Of A New Redundant Actuated PKMS
Han, Xianguo; Chen, Wuyi; Progress of Machining Technology; December 2004, pp. 424-429; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50375010; Copyright; Avail: Other Sources

Due to the singularities, the orientation workspace of Parallel Kinematics Machines (PKMs) is very small. The redundant actuators can remove singularities and extend the workspace of PKMs. A new redundant actuated mechanism for machining was introduced, and it could be subpart of 5-axis machining equipment. The structure of the mechanism was described and its inverse and forward kinematics equation was analyzed. The velocity relationship was given due to the velocity constraint. At last the dexterity of both redundant and no redundant mechanisms was analyzed, and the result showed that there was no singularities in the workspace of the mechanisms with redundant actuators.
Author
Inverse Kinematics; Singularity (Mathematics); Actuators; Machining

20050071011 Kanazawa Inst. of Tech., Ishikawa, Japan
A Study On The High-Speed Milling Using Small-Diameter End Mill Tool
Kato, Hideharu; Shintani, Kazuhiro; Iwata, Kazuo; Sugita, Hiroaki; Progress of Machining Technology; December 2004, pp. 436-441; In English; See also 20050070885; Copyright; Avail: Other Sources

Recently, the demand for small parts has increased with the popularization of portable products. It is necessary to develop small machine tools in which high-speed machining is possible. Highly efficient processing using high-speed machining is useful for milling small parts with a small-diameter tool. In this study, the design and production of a desk-top-type small machine tool were carried out and the cutting performance of a small-end mill tool at high-speed condition is investigated. The size .of the developed machine tool is 300 X 400 X 340mm, and the weight is 50kg. This machine could reach a cutting speed of 25.0m/s using a small-diameter tool of 1.7mm. As a result of high-speed milling with this machine, a surface roughness of 0.6_tmRz without tear parts was obtained at cutting speed of 25.0m/s. In addition, the thickness of deformed layers produced by cutting at a speed of 25.0m/s decreased in comparison with that of the layers produced at 2.5m/s. It was

confirmed that the thickness of deformed layers at 25.0m/s was 0.6_rn. Key words desk-top-type miniature machine tool, small end mill tool, high-speed milling, thickness of deformed layer, surface roughness
Author
Milling Machines; High Speed; Machine Tools; Surface Roughness; Machining; Cutting

20050071012 Makino Seiki Co. Ltd., Kanagawa, Japan
Auto Positioning System For Regrinding Of Small-Diameter Tools
Inoue, Shigeru; Aoyama, Tojiro; Progress of Machining Technology; December 2004, pp. 430-435; In English; See also 20050070885; Copyright; Avail: Other Sources

A non-contact type optical sensor has been incorporated into a system that performs positioning in the rotation direction for tool regrinding (hereinafter called phase alignment) in order to enable automatic positioning at the machining start point for small diameter tools of (phi)1mm and less, for which it was difficult to perform regrinding in the past. Up until now, a touch probe has generally been used to perform automatic positioning for tool grinding. However, a certain load must be applied through the contact stylus to activate the touch switch and in turn drive the touch probe sensor mechanism. Accordingly, when performing phase alignment for small diameter tools, the tool rake face is extremely small, and a proper contact point for the stylus cannot be provided. Furthermore, the extremely low rigidity of small diameter cutting tools makes measurement impossible due to the tendency of the tool to be easily deformed or broken. A non-contact type optical sensor has been incorporated in the phase alignment process for regrinding of small diameter tools in order to address these problems. The least squares method is used to obtain the phase angle applied to the maximum tool diameter from the measured data, and it has been verified that automatic positioning that is adequate for regrinding of small diameter tools can be performed. Key words wet grinding, touch probe, optical measuring device, least squares method
Author
Optical Measuring Instruments; Machining; Alignment; Rotation

20050071013 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Research On The Transducer Of The Ultrasonic Elliptical Vibration Cutting Based On The Finite Element Method
Li, Xun; Ji, Yuan; Zhang, Deyuan; Progress of Machining Technology; December 2004, pp. 452-457; In English; See also 20050070885; Copyright; Avail: Other Sources

The ultrasonic elliptical vibration cutting has been successfully applied to precision cutting due to its superior performances, such as low cutting force, high quality surface finish and long tool life. This paper presents an asymmetrical structural model of the ultrasonic elliptical vibration transducer with only the longitudinal excitation through analyzing the model of the longitudinal vibration transducer. Based on the modal and static analysis of the finite element method, the various parameters of the model are modified to meet the needs of the vibration modality and the inherent frequency. A system of the ultrasonic elliptical vibration cutting with the single longitudinal excitation is developed. The surface finish with high quality can be achieved by the ultrasonic elliptical vibration cutting with the PCD tools. It is proved that the ultrasonic elliptical vibration transducer can be designed rationally with the finite element method and the ultrasonic elliptical vibration cutting can effectively improve the quality of the surface finish. Key words ultrasonic elliptical vibration cutting, Finite element method, PCD tools
Author
Cutting; Vibration; Finite Element Method; Surface Finishing; Asymmetry; Frequencies

20050071014 Okayama Univ. of Science, Japan
Estimation Of Weld Size Of Partial Penetration Butt Welds By Ultrasonic Testing
Matsuura, Hiroshi; Progress of Machining Technology; December 2004, pp. 598-603; In English; See also 20050070885; Copyright; Avail: Other Sources

Partial penetration butt welds are widely used in order to reduce their weld metal for fabrication. It is important that the weld size is estimated accurately so that unpenetrated portion acts as a crack like flaw. The method to estimate the weld size and fatigue crack in weld was studied by ultrasonic testing (UT). UT was performed using angle probes, and pulse echo technique and pulse transmission technique were examined. Results show that the pulse echo decreased and the transmitted pulse increased as the weld size was increased. Furthermore, using the weld size estimated by UT and fracture mechanics, failure load was evaluated and compared with an actual failure load.
Author
Ultrasonic Tests; Fracture Mechanics; Butt Joints; Welded Joints; Cracks; Fatigue (Materials)

20050071015 Harbin Univ. of Science and Technology, Harbin, China

Study On Force Density Function Of Complex Three-Dimension Grooves Milling Insert

Li, Zhenjia; Cheng, Yaonan; Zheng, Minli; Zhang, Rungong; Progress of Machining Technology; December 2004, pp. 458-462; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper studies on force density function of complex three-dimension grooves milling insert with the waved-edge milling insert developed by the Harbin University of Science and Technology. On the basis of the milling force mathematical model of the waved-edge milling insert, we built the experimental formula of the milling force and interface parameters by the milling force experiments of the complex three-dimension grooves milling insert. We built the milling force equation which includes the interface parameters. Thus we built the force density function of the curve rake plane of the complex three-dimension grooves milling insert by two differential coefficients and matrix transform. All these studies have laid down a theoretic base for the Stress field analysis and groove optimization of complex three-dimension grooves milling insert. Author

Stress Distribution; Inserts; Grooves; Milling Machines; Machining

20050071016 Mori Seiki Co. Ltd., Nara, Japan

An Intelligent Process Control System For End Milling Processes

Murozumi, Masanori; Saraie, Hidenori; Kakino, Yoshiaki; Ibaraki, Soichi; Progress of Machining Technology; December 2004, pp. 604-609; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper presents a process design scheme to determine machining conditions and a tool within each canned cycle, under the assumption that the cutting force is regulated at a constant level by performing the feedrate optimization. Furthermore, a process planning scheme to extract machining features from the given product geometry, to allot canned cycles to each machining feature, and to optimize the machining procedure is presented. As an objective function for the optimization, the total production cost is used. To investigate the validity of the proposed process planning scheme, it is applied to the machining of a base mold part. Keywords end milling, machining cost, process planning, canned cycle, intelligent manufacturing system Author

Milling (Machining); Manufacturing; Cutting; Production Costs; Extraction

20050071017 California Univ., Davis, CA, USA

Development Of A Simulation System For Surface Topographic Features In 5-Axis Cnc Machining Process

Soshi, Masakazu; Liu, Xianbing; Yamazaki, Kazuo; Mori, Masahiko; Progress of Machining Technology; December 2004, pp. 932-937; In English; See also 20050070885; Copyright; Avail: Other Sources

Finish milling with a ball end mill is the key process in manufacturing high precision and complex parts such as dies and molds. Due to complexity of the milling process, it is difficult to evaluate the surface micro characteristics such as surface topographic features and roughness of machined workpieces, which necessitates the simulation of the process. In this area, the existing related simulation researches mainly focus on scallop height, and few has presented a whole picture of micro characteristics of milled surfaces. This paper develops a comprehensive simulation system based on Z-map model for predicting surface topographic features and roughness formed in the 5-axis CNC milling process. Experiments are also carried out to study the milling process and to verify the simulation results. The difference between the simulation and the experiment results is discussed. Author

Milling Machines; Systems Simulation; Topography; Surface Geometry; Mathematical Models; Computer Programs

20050071018 Kagoshima National Coll. of Technology, Japan

Monitoring Of Stability Of Dynamic Cutting Process In End-Milling By Measurement Of Spindle Head Vibrations

Shimana, Kenji; Kondo, Eiji; Hagihara, Koichi; Kawagoishi, Norio; Progress of Machining Technology; December 2004, pp. 622-627; In English; See also 20050070885; Copyright; Avail: Other Sources

It is known that a stability limit of regenerative chatter vibrations in end milling process takes a lot of local maximum values with increase in spindle speed. Therefore, the final purpose of this study is to suppress regenerative chatter vibrations by adjusting automatically spindle speed. For this final purpose, since it was difficult to measure vibration data of cutting tool directly, in this study, parameters in dynamic cutting process were estimated from vibrations of a spindle head of a machining center and considered the relation between the parameters and the stability limit. Therefore, inner modulation was defined as 'present vibrations', outer modulation was defined as 'previous vibrations', the parameters of dynamic cutting process adopted

in this paper are peak value, dominant frequency, and phase angle of cross-spectrum between the present vibrations and the previous vibrations. Here, the lag time between the present vibrations and the previous vibrations is one fourth of period of spindle rotation because of four-flute end-mills used in the cutting tests. As a result of cutting tests and considerations, it was indicated that phase angles between the present vibrations and the previous vibrations had good relation with the stability limit. Key words monitoring, dynamic stability, end-milling process, spindle head vibrations
Author
Spindles; Milling (Machining); Machining; Dynamic Stability; Vibration Measurement; Cutting

20050071019 Oita Prefectual Inst. of Industrial Science and Technology, Ohita, Japan
Tool Wear Estimation Under A Strategy For Constant Cutting Forces In End Milling
Ohtsuka, Hirotoshi; Yamaji, Iwao; Kakino, Yoshiaki; Nakagawa, Heisaburo; Sudo, Katsuzo; Nishida, Susumu; Progress of Machining Technology; December 2004, pp. 619-621; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper describes the process and utility of a method to detect cutting forces and estimate tool wear with inner sensors using a linear motor driven machining center (MC). This method is intended to realize an intelligent end-milling system. First, a mathematical prediction model for cutting forces in end milling was extended to handle cases with worn end mills. Cutting experiments using a linear motor driven MC with a static guideway showed that monitoring cutting forces and estimating tool life by utilizing the current of a feed motor were very effective without having to use the current of a spindle motor. In addition, we designed algorithms which allow the feed rate to change automatically according to the current of a feed motor, q-hereby,these algorithms can maintain constant cutting forces. Experimental results using them revealed that tool life increased by restraining the progress of tool wear. Using both the mathematical prediction model and the inner sensor based on the feed motor current, one can estimate how far the tool wear progresses if the cutting engagement angle is given as a known quantity.
Author
Wear; Machining; Cutting; Milling (Machining); Prediction Analysis Techniques

20050071020 Fanuc Ltd., Japan
Vibration Suppression Control Of Linear Motor Driven Machine Tool
Shimana, Kenji; Kondo, Eiji; Hagihara, Koichi; Kawagoishi, Norio; Progress of Machining Technology; December 2004, pp. 628-633; In English; See also 20050070885; Copyright; Avail: Other Sources

Recently, the number of machine tools driven by linear motor targeting high speed and high accuracy is increasing. However, linear motor drive is direct drive without reduction mechanism, and is firmly connected to machine frame. Therefore, it is influenced directly from the mechanical resonance of machine frame, so it is often difficult to achieve high gain servo necessary for high accuracy. Normally, the mechanical resonance is composed of not only a single frequency but also multiple frequencies, and additionally the frequency itself varies to some extent, so conventional simple filtering technique could not resolve the problem. The authors, herein, report that they developed the filter with variable damping and with multiple frequencies up to 4 points based on notch filter technique, and they achieved good results in actual machine.
Author
Resonant Vibration; Vibration Damping; Machine Tools; Servomechanisms; High Speed

20050071021 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
An Embedded Monitor Of Construction Machinery Based On ARM
Wang, Tianmiao; Chen, Diansheng; Wei, Hongxing; Tao, Wei; Progress of Machining Technology; December 2004, pp. 634-638; In English; See also 20050070885; Copyright; Avail: Other Sources

An embedded monitor for construction machinery is developed in this paper. The hardware platform adopts 32 bit ARM as microprocessor with expanded peripheral interfaces such as serial port, CAN bus, keyboard, display and USB etc. The RTOS of the monitor software is muC/OS-II. The monitor is connected by CAN bus to the slave controller on engineering vehicles, with two serial ports linked to GPS and GSM module respectively. By starting-up multitask periodical scan task, the vehicle's geographical position and various running state is acquired by receiving serial port and CAN bus information, so that centralized display and remote monitoring of the state and parameters can be achieved. A performance test is carried on a prototype monitor of a wheel loader, and the results show that all the monitor functions are achieved, the performance guidelines are met, and it can maintain longtime stable and reliable working in various conditions. Key words construction machinery, monitor, ARM, embedded system
Author
Embedding; Microprocessors; Construction; Performance Tests; Global Positioning System; Bus Conductors

20050071022 Manufacturing Technology Inst., Inc., Tokyo, Japan

A Constant Cutting Force Control for Finishing Process of Die and Mold by Using a Ball and Mill

Kakino, Yoshiaki; Sudo, Katsuzo; Ohtsuka, Hirotoshi; Yamaji, Iwao; Ibaraki, Soichi; Progress of Machining Technology; December 2004, pp. 610-621; In English; See also 20050070885; Copyright; Avail: Other Sources

In a finishing process of die and mold by using a ball end mill, a contour parallel tool path is usually used under a constant depth of cut (typically around 0.1 mm) and a constant feedrate. In such a process, the cutting force acting on a tool is usually less than 20 N. It varies, however, significantly along the tool path, which naturally causes the variation of tool deflection, and then deteriorates the machining accuracy. To address this issue, we propose a tool path modification scheme to control the depth of cut in an intermediate-finishing process, such that the cutting force is regulated constant in a finishing process and thus the machining accuracy is improved. To this goal, in this paper we experimentally investigate the following: 1) the relationship between the angular location of the cutting point on a tool and the cutting force, and 2) the relationship between the depth of cut and the cutting force. The relationship between the depth of cut and the engagement angle can be computed from a CAD model. A mathematical prediction model of cutting forces can be identified based on these relationships.
Author

Cutting; Machining; Cutters; Prediction Analysis Techniques; Dies

20050071024 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Application Of The Hermite Method On Tool Path Generation

Wang, Ruiqiu; Chen, Wuyi; Progress of Machining Technology; December 2004, pp. 943-948; In English; See also 20050070885; Copyright; Avail: Other Sources

A novel kind of tool path generation technique called Multi-point machining (MPM) is investigated in this paper. Conclusion is drawn that it is feasible to realize two points contact between the tool and the workpiece in tool path generation. Hermite method is introduced to Multi-point machining to estimate distance of the two contact points based on the ratio of the maximal machining error to allowable tolerance to adjust tool positions. A computational example is given to apply the new tool positioning strategy. According to the example, the distribution of the machining error along the direction perpendicular to tool motion is demonstrated as 'W' approximately. It is proved that Multi-point machining provides a new solution to realize a better geometric match between the tool and the machined surface in tool path generation.
Author

Machining; Algorithms; Interpolation; Approximation; Machine Tools

20050071028 Guangdong Univ. of Technology, Guangzhou, China

Analysis Of Vibration In ID Slicing Process Of Silicon Ingot

Wei, Xin; Xie, Zhen-Hua; Huang, Rui-Wei; Xiong, Wei; Progress of Machining Technology; December 2004, pp. 651-655; In English; See also 20050070885

Contract(s)/Grant(s): NNSF-2002cI020201; GEB-[2003]44; Copyright; Avail: Other Sources

ID (inner-diameter) slicing is widely used in cutting ingots. The cutting state of a blade depends on its stiffness and inner edge roundness, and affects greatly the surface quality and accuracy of sliced wafers. In this paper, the deflection and vibration of the blades in different slicing conditions were acquired. The thickness and surface roughness of sliced wafers were measured. The characteristics, the effects of deflection and vibration on accuracy and surface roughness of sliced wafers were analyzed. Key words ID slicing; vibration, silicon wafer, surface roughness
Author

Slicing; Vibration Effects; Silicon; Cutting; Surface Roughness

20050071030 Jilin Univ., Changchun, China

On-Line Monitoring Of Drilling Thrust Of Micro-Drills

Yang, Zhaojun; Yang, Yonghai; Cui, Yaxin; Progress of Machining Technology; December 2004; In English; See also 20050070885; Copyright; Avail: Other Sources

Present work on-line monitors drilling thrust of micro-drills. Fifty Micro-drills of 0.34mm diameter were chosen random to carry out drilling experiment, and limit values of the drilling thrust were obtained by measuring when the micro-drills broke. The distribution of the limit values was found by curve fitting. From the reliability theory, the drilling thrust with respect to different reliabilities of micro-drills can be determined using the distribution. Final, the threshold value for on-line monitoring

the work of micro-drills is obtained from the thrust to prevent micro-drills from breaking.
Author
On-Line Systems; Monitors; Drilling; Thrust; Curve Fitting

20050071032 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Research On Non-Contact Tool Setting System For Tool Grinding Machine
Zhang, Xi; Chen, Wu-Yi; Wang, Ding-Ding; Progress of Machining Technology; December 2004, pp. 670-675; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper deals with tool setting method on tool grinding machines. A non-contact automatic tool setting scheme based on light trigger is presented. An experimental device is designed with which diameters of bars and cutters are measured in order to evaluate feasibility and accuracy of the presented method. The results show that the setting scheme is feasible and the level of output voltage used as trigger signal greatly affects measurement accuracy. Key words tool grinding machine, non-contact, automatic tool setting
Author
Grinding Machines; Machine Tools; Cutters; Actuators; Signal Measurement

20050071034 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Study On The Residual Stress Of Aluminum Alloy By Using Distortion Measurement
Wang, Zhaojun; Chen, Wuyi; Zhang, Yidu; Chen, Zhitong; Liu, Qiang; Progress of Machining Technology; December 2004, pp. 705-709; In English; See also 20050070885; Copyright; Avail: Other Sources

The residual stress in aluminum alloy thick plates has distinct influence on machining distortion, which seriously affects the precision of the parts. To predict the distribution of the residual stress in the thick plate, a cutting method for measuring residual stress is used in this paper under the theory of stress relief. In addition, the origin of residual stress of Aluminum alloy 7075T7351 was analyzed. The results show that the magnitude of residual stress normal to rolling direction is about 66% of the magnitude along rolling direction. Methods to reduce machining distortion caused by the residual stress were put forward based on the FEM simulation and the experimental results. It was concluded that a proper placing method might reduce over 45% of the distortion caused by residual stress.
Author
Aluminum Alloys; Residual Stress; Distortion; Stress Distribution; Thick Plates; Cutting

20050071035 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Feasibility of Projection Image Application in On-line Measurement of End-mill Radial Wear
Zuo, Dun-Wen; Kawano, Yoshihiro; Wang, Min; Yoshimitu, Shinichi; Yamashita, Shunichi; Progress of Machining Technology; December 2004, pp. 682-686; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50375072; Copyright; Avail: Other Sources

A new approach was proposed to measure quantitatively the radial wear of an end mill in the on-line way by means of the tool projection image in this paper. A measuring system was constructed, which consists of a CCD camera, a special vision system, a digital laser optic sensor and a personal computer. The repeatable accuracy of the system was made clear. It was shown that the tool projection image could be obtained with a high repeatable accuracy and the accuracy could be easily controlled within +/-l micron if the average value is used. The radial wear of squared end mills was estimated successfully from their images by practical milling experiments.
Author
Feasibility Analysis; Image Resolution; Milling Machines; On-Line Systems; Wear

20050071036 Kagoshima National Coll. of Technology, Japan
Study of Depth of Work Hardened Surface Layer in Orthogonal Non-Ferrous Metal Cutting
Hikiji, Rikio; Harada, Masakazu; Kawano, Yoshihiro; Kondo, Eiji; Arai, Minoru; Progress of Machining Technology; December 2004, pp. 687-692; In English; See also 20050070885; Copyright; Avail: Other Sources

Finish machining used to be carried out in grinding, but it is being replaced by cutting with very small undeformed chip thickness. In ultra precision process, the effects of the cutting conditions and the complicated factors on the machined surface integrity are the serious problems. In this research, work hardened surface layer was dealt with as an evaluation of the machined surface integrity and the effect of the mechanical factors on work hardening was investigated experimentally in orthogonal nonferrous metal cutting. As a result, it was found that work hardened surface layer was affected not only by the

shear angle varied under the cutting conditions and the thrust force of cutting resistance, but also by the thrust force acting point, the coefficient of the thrust force and the compressive stress equivalent to the bulk hardness. Furthermore, these mechanical factors acting on the depth of the work hardened surface layer were investigated with the calculation model.
Author
Surface Layers; Orthogonality; Nonferrous Metals; Work Hardening; Metal Cutting

20050071037 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
The Simulation of the Welding Process Based on Concurrent Engineering
Wang, Su; Li, Xiaohui; Xiao, Yuping; Chen, Guanghui; Progress of Machining Technology; December 2004, pp. 996-1000; In English; See also 20050070885; Copyright; Avail: Other Sources

Based on the concurrent engineering thought, in order to optimize product designing and minimize production cost, the simulation software on the welding process was developed. Finite Difference Method was used to deal with the formula of temperature field in this software to code the program for calculating, thus the simulation of the temperature field and the residual stresses field of the welding process has been realized. Using the software to simulate welding intersection line by use of moving heat source, the simulated trends match the real situation.
Author
Welding; Simulation

20050071041 Shandong Univ., Jinan, China
Wear Behaviors Of Boron Carbide Ceramic Nozzles In Dry Abrasive Blasting Surface Treatments
Deng, Jianxin; Progress of Machining Technology; December 2004, pp. 719-723; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-20030422015; Copyright; Avail: Other Sources

Boron carbide nozzles were produced by hot pressing. The erosion wear behaviors of this nozzle caused by abrasive particle impact were investigated by dry abrasive blasting surface treatments. Silicon carbide and aluminum with different hardness were used as the erodent abrasive particles. Results showed that the hardness of the erodent particles played an important role with respect to the erosive wear. As the hardness of the erodent particles increases, there is a dramatic increase in erosion rate of the nozzles. The nozzle entry bore section suffered form severe abrasive impact under large impact angles. At the beginning, wear in the nozzle entrance section become a maximum, after several hours operation, a tapered shape entrance bore was developed. The wear mechanisms of the boron carbide nozzle in this area appeared to be entirely brittle in nature with the evidence of large scale chipping, and exhibited a brittle fracture induced removal process. On the nozzle center wall section, most of the particles traveled parallel to the nozzle wall, and the bore profile generally become convergent owing to a decrease in material removal rate. The wear mode in this area changed from impact to sliding erosion, and the wear mechanisms appeared to be the lateral cracking propagation due to a surface fatigue fracture mechanism.
Author
Wear; Boron Carbides; Ceramics; Nozzle Walls; Abrasives; Surface Treatment

20050071042 North China Inst. of Tech., Taiyuan, China
Surface Integrity In High Efficiency Reversible Fine Machining Technique
Wu, Wen-Ge; Pang, Si-Qin; Chang, Xing; Progress of Machining Technology; December 2004, pp. 710-713; In English; See also 20050070885
Contract(s)/Grant(s): 20001022; Copyright; Avail: Other Sources

Reversible cutting method is a new research thesis proposed to shorten processing route, decrease tool number and handling time, increase machining efficiency. The aim of the presented work was to examine the effects of reversible fine machining technique on the chip formation and the surface integrity. Nonlinear hardening during reverse loading and the change of the Bauschinger effect factor with plastic strain were properly taken into account. In experiments, the residual stresses have been measured using the X-ray diffraction technique (at the surface of the workpiece and in depth). Moreover, micro-hardness and surface roughness of machined surface are presented. Experimental data for the range of cutting parameters tested showed that the reversible fine machining produce the tensile residual stresses at the surface, which are critical in the performance of the machined components. The experimental results of micro-hardness of reversible fine machining technique are smaller than that of general fine machining show that decreased plastic deformation of the surface layer and work-hardening. Surface roughness of machined surface with reversible finishing is discussed. Research results indicated that it can be adopted such planning which rough machining during advance stroke and fine machining or

semi-finishing during return stroke in machining process. In this way, it has such advantages that increase machining efficiency and machining accuracy, decrease bending deformation.
Author
Machining; Cutting; Surface Layers; Chips; Bauschinger Effect; Plastic Deformation; Work Hardening

20050071044 Shenyang Univ. of Technology, Shenyang, China
Analysis and Simulation of Dynamic Properties of High Frequency Hydraulic Vibrator
Su, Dong-Hai; Cui, Xiao; Wu, Xi-Hong; Progress of Machining Technology; December 2004, pp. 984-989; In English; See also 20050070885; Copyright; Avail: Other Sources

This thesis introduces the basic working principle of high frequency hydraulic vibrator, with an analysis of the dynamic properties. It sets up the mathematic model and develops method of designing system compensator, offering theoretical basis for further experiment and machining.
Author
Simulation; High Frequencies; Dynamic Characteristics; Hydraulic Equipment; Vibration

20050071045 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Simulation Of Effect Of Clamping On Residual Stress Of Aero-Components By Means Of Fem
Guo, Hun; Zuo, Dunwen; Wang, Min; Wang, Shuhong; Progress of Machining Technology; December 2004, pp. 730-734; In English; See also 20050070885; Copyright; Avail: Other Sources

Many thin-walled aero-parts have complex structure, and high machining accuracy is required. But because of their poor rigidity, it is easy to bring machining deformation caused by the existence of the clamping residual stress. To reflect the relationship between clamping methods and residual stresses and fatigue resistance, finite element models with press plate clamping and vac-sorb clamping were built and the manufacturing procedure was simulated. Analysis of the residual stress shows that under the condition of press plate clamping the press plate can generate bigger uneven residual stress at the machined surface, particularly, for thin-walled areo-parts. Under the condition of vac-sorb clamping, distribution of the residual stress is more uniform than that in the former. In addition, workpiece distortion introduced by the residual stress is further analyzed and compared under the clamping conditions mentioned above. It was made clear that under the condition of vac-sorb clamping thin-walled areo component is improved effectively, and its deformation due to the residual stress is smaller, Furthermore, because smaller residual stress is distributed at the machined surface, its fatigue resistance is growing better. Key words clamping, residual stress, thin-walled component, deformation
Author
Clamps; Residual Stress; Finite Element Method; Presses; Stress Analysis; Fracture Strength; Fatigue (Materials)

20050071048 Tokyo Inst. of Tech., Tokyo, Japan
Development Of Cutting Simulator For End Milling
Obikawa, Toshiyuki; Shinozuka, Jun; Sonoda, Tetsuri; Sasajima, Kazuyuki; Progress of Machining Technology; December 2004, pp. 753-758; In English; See also 20050070885; Copyright; Avail: Other Sources

Recently the prediction of cutting performance is increasingly required for realizing reliable and high-speed end milling of free form surfaces and selecting proper cutting conditions. In this paper a solid model based cutting simulator for ball nosed end milling was developed. The workpiece and a ball nosed end mill were modeled using dexel and STL formats, respectively. Since cutting could be regarded as interference between the workpiece and .tool edges, small parts of the workpiece swept by the edges were removed incrementally to update the shape of the machined workpiece. Through this process, the detail topographies of finished surfaces are obtained under different cutting conditions. The removal rate of workpiece was able to be monitored at any moment. Key words cutting simulator, end milling, solid model
Author
Cutting; Milling (Machining); Milling Machines; Grinding (Comminution); Simulators

20050071049 Guangdong Univ. of Technology, Guangzhou, China
Advances Of Molecular Dynamics Simulation For Ultra-Fine Machining
Huang, Zhi-Gang; Guo, Zhong-Ning; Progress of Machining Technology; December 2004, pp. 735-740; In English; See also 20050070885
Contract(s)/Grant(s): Proj. 50375029; Proj. 4009486; Copyright; Avail: Other Sources

This paper surveys the advances of Molecular Dynamics (MD) simulation in the research of ultra-fine machining and the

related technologies include: nanometric cutting, ionized beam processing and ultra-smooth polishing et al. The multi-physics phenomena revealed by MD simulation in these technologies are discussed. Different modeling methods adopted in the simulations are introduced, and different potential theories have been formulated and compared. Key words molecular dynamics, ultra-fine machining
Author
Molecular Dynamics; Cutting; Machining; Polishing

20050071050 Southern Inst. of Metallurgy, Jiangxi, China
Numerical Simulation Of The Roll Pressure Distribution Of Aluminum Strip On Hot Rolling Process
Liu, xiaobo; Zhang, Xiaoli; Progress of Machining Technology; December 2004, pp. 747-752; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-0250020; Copyright; Avail: Other Sources

According to the characteristics of hot rolling process, incorporating the model of 3-D (three dimension) stress in rolling deformation zone of aluminum strip with the model of deformation resistance in hot rolling. This paper conducts numerical simulations of the roll pressure distribution in the deformation zone in hot rolling process, which were done on aluminum strip of several specimens. A comparison of simulation results and experimental results indicates a good agreement, which verifies the validity of the simulation results.
Author
Stress Distribution; Metal Strips; Pressure Distribution; Deformation; Aluminum

20050071052 Tokyo Univ. of Agriculture and Technology, Japan
Finite Element Analysis On Temperature And Machining Accuracy of Fine Boring Process
Sasahara, Hiroyuki; Tang, YuLong; Progress of Machining Technology; December 2004, pp. 769-774; In English; See also 20050070885; Copyright; Avail: Other Sources

On a fine boring process of the cylinder of the engine block, the machining tolerance.is going to be very severe in these days. one of the main causes of the machining error in the fine boring is thermal expansion of the cylinder. As the cutting energy flows into the work piece and the temperature increases, the machining point expands correspond to the temperature rise. After the machining, the temperature decreases and the diameter of the cylinder shrinks. It will affect the cylindricity of the holes. Our research resolves these effects on the machining accuracy of fine boring process by FEM analysis, which deals with the temperature field and the thermal expansion of work piece in the machining operation.. Key words FEM_ Temperature, Accuracy, Fine boring, Thermal expansion
Author
Finite Element Method; Machining; Temperature Distribution; Accuracy; Drilling

20050071054 Kanazawa Univ., Japan
Effect of Additional Current on Cutting Mechanism of Free Machining Steels in Turning
Tanaka, Ryutaro; Hosokawa, Akira; Yamada, Keiji; Ueda, Takashi; Progress of Machining Technology; December 2004, pp. 786-791; In English; See also 20050070885; Copyright; Avail: Other Sources

It is well known that the electro motive force generated at an interface between tool and workpiece in cutting influences on the shape of built-up edge and the tool life. There is, however, few reports about the current flow in the closed circuit of tool-workpiece-machine on the behavior of deposited layer called 'belag' observed in machining workmaterials such as calcium deoxidized steel and BN added steel and so on. This paper deals with the machinability of steels in turning with additional current. Tested workmaterials were plane carbon steel JIS S45C and BN added steel which has good machinability at high cutting speed. Turning tests were performed by carbide tool P30 in order to investigate the influence of electrical conditions of closed circuit system on the cutting mechanism of BN added steel. The tool life, cutting force, chip geometries and others were investigated practically and these results were discussed.
Author
Carbon Steels; Cutting; Machining; Currents

20050071056 Kagoshima Univ., Japan
Monitoring Of Wear Of Single Crystal Diamond Tools Using Static Cutting Forces
Kondo, Eiji; Iwamoto, Ryuichi; Tanaka, Ippei; Kawagoishi, Norio; Progress of Machining Technology; December 2004, pp. 576-581; In English; See also 20050070885; Copyright; Avail: Other Sources

Large wear of diamond tools for ultra-precision cutting of soft metals deteriorates quality of machined surface, and the worn tools have to be replaced with new tools when the tools have reached the tool life. However, it is difficult to predict the tool life since all cutting tools have individual tool life. Therefore, the purpose of this study is to monitor a single crystal diamond tool wear by using static cutting forces, and the relation between tool wear and static cutting forces were experimentally investigated in ultra-precision face turning with a radius diamond tool. As a result of cutting tests, it was found that ratio of principal force to thrust force had good relation with ratio of area of flank wear land to area of cutting cross section under some cutting conditions carried out in this study. Furthermore, it was revealed that shape of tool wear land was greatly related to shape of cutting cross section.
Author
Cutting; Diamonds; Machine Tools; Single Crystals; Wear; Statics

20050071057 Jiangsu Univ., Zhenjiang, China
Study On Boundary Notch Of Cemented Carbide Cutting Tool
Wang, Guicheng; Pei, Hongjie; Li, Qinfeng; Zhang, Chunye; Progress of Machining Technology; December 2004, pp. 803-808; In English; See also 20050070885
Contract(s)/Grant(s): NNSC-59775071; NNSF-50275066; Copyright; Avail: Other Sources

The performance of cemented carbide cutting tools directly influence machining quality of the machined workpiece .In this paper, the forming mechanism of boundary notch of cemented carbide cutting tool is studied, related theories analyzed, a definition of the boundary notch size presented, and main factors to influence boundary notch of tool pointed out. Besides forming process and change lay of the boundary notch of tool are found out, and a certain number of measures to decrease and control the boundary notch of tool have been advanced.
Author
Cutting; Carbides; Machining; Cementation

20050071058 Shantou Univ., Shantou, China
Application Of Database Technique In Section Curve Smoothing Of Form Wheel
Zhang, Xiao-Hong; Zhang, Zi-Qiang; Zheng, Zhi-Dan; Chen, Shao-Bo; Yan, Qiu-Sheng; Progress of Machining Technology; December 2004, pp. 891-895; In English; See also 20050070885
Contract(s)/Grant(s): GNSFC-Z03036; Copyright; Avail: Other Sources

The normal vector of the dressing tool must follow the section curve of the wheel to ensure the shape precision during the dressing process for form wheels. An Approximate Double Circular Arc Interpolated Method can be applied to make the section profile of the wheel become smooth. This can be accomplished by dividing each circular arc into a large number of short arcs. As a result the normal vector of the dressing tool can be equal to the normal vector of the gradually changed curve. Although lots of operation and ordering about the interpolated coordinate data need to be carried out during smoothing curve with plane point range, the software programming can be effectively simplified by using database technique of Visual FoxPro 6.0 with powerful index function to order and operate the point range.
Author
Data Bases; Applications Programs (Computers); Smoothing; Machining; Curves (Geometry); Wheels; Forming Techniques

20050071060 Shantou Univ., Shantou, China
Application of Approximate Double Circular Arc Interpolated method in NC Programming of Aspheric Curve
Zhang, Ziqiang; Luo, Yihe; Zheng, Zhidan; Chen, Shaobo; Progress of Machining Technology; December 2004, pp. 960-964; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-Z03036; Copyright; Avail: Other Sources

A curve smoothing technique was proposed by the author in form grinding of revolving curved surface grooves and named Approximate Double Circular Arc Interpolated Method. The new approach was different from other circular arc interpolated methods. It requires only the included angles between the normal directions of the adjacent circular arcs at intersection points to be less than designated value, but does not require the adjacent circular arcs to be tangent like others. The technique is attempted to use in NC programming of aspheric curve before NC machining of aspheric curved surface. And step of approximating precision controlling is adopted to produce a curved surface with both satisfying smoothness and good form accuracy. The works of the authors in this aspect are introduced in this paper.
Author
Process Control (Industry); Interpolation; Surface Finishing; Numerical Control; Machining; Computer Programming

20050071061 Chang Chun Univ. of Technology, Chang Chun, China

A New Method Of Machining Features Recognition Based On Feature Design

Cheng, Kai; Zhang, Weibo; Progress of Machining Technology; December 2004, pp. 823-828; In English; See also 20050070885; Copyright; Avail: Other Sources

Features are domain dependent and design features and manufacturing features have different interpretations and different representations, so recognizing manufacturing features automatically from a design model is necessary in seamless interface between design and manufacturing applications. In this paper a new method of machining features recognition from the feature-based design model is proposed. Using this method the effective recognition process of machining features is going on during the design stage of a part, and the work of feature design and feature recognition is well integrated. Key words feature model, machining feature, feature recognition

Author

Machining; Manufacturing

20050071062 South China Univ. of Technology, Guangzhou, China

Study on the Forming Mechanism of Serrated Chip in High Speed Turning for Steel

Ye, Bang-Yan; Xu, Jin; Wu, Wei-Jie; Zhao, Xue-Zhi; Liu, Xiao-Chu; Progress of Machining Technology; December 2004, pp. 819-822; In English; See also 20050070885

Contract(s)/Grant(s): GNSFC-011513; Copyright; Avail: Other Sources

The forming process of serrated chip in high speed cutting for steel is analyzed based on experimental observation. The cause of serrated chip forming in high speed cutting process is the multiple effects of high cutting heat and strain rate. The shear deformation is concentrated in a narrow band and results in a shear localization. In this article, the forming mechanism of serrated chip is analyzed in accordance with the SEM photograph and metallographics got from experiment.

Author

Steels; Deformation; Chips; Cutting

20050071067 Okayama Univ., Japan

Transition of Form Accuracy in Cylindrical Plunge Grinding Process of Ti-Ni Alloy

Ohashi, Kazuhito; Tsukamoto, Shinya; He, Guifu; Nakajima, Toshikatsu; Progress of Machining Technology; December 2004, pp. 50-55; In English; See also 20050070885; Copyright; Avail: Other Sources

The Ti-Ni alloy is one of the diffficult-to-machine materials and its grinding mechanism has not yet been made clear. In this study, the grinding characteristics of Ti-Ni alloy is experimentally investigated, analyzing the transition of form accuracy in cylindrical plunge grinding process with a cBN wheel. The form accuracy of 'Ti-Ni alloy decreases in the cylindrical plunge grinding and is improved by spark-out grinding. But the form error of Ti-Ni alloy remains even if a spark-out grinding finishes.

Author

Cylindrical Bodies; Titanium Alloys; Metal Grinding

20050071069 Shandong Univ., Jinan, China

Erosive Wear Behaviors Of Coal Water Slurry Nozzles

Ding, Zeliang; Deng, Jianxin; Li, Jianfeng; Yang, Jing; Progress of Machining Technology; December 2004, pp. 724-729; In English; See also 20050070885

Contract(s)/Grant(s): Z2003F01; 20030422105; Copyright; Avail: Other Sources

In coal water slurry (CWS) burning, the nozzle is the most critical component and is eroded continuously by the abrasive action of CWS. Erosive wear of the nozzle is influenced by various factors such as its material properties, microstructure, nozzle geometry, the mass flow and temperature, etc. In this study, CNW-2 ceramic composite and YG8 cemented carbide were produced for the use of nozzle materials. The erosive wear of the nozzles was compared by determining the erosion rates. Results showed that the hardness of the nozzle material plays an important role with respect to its erosive wear in CWS burning processing. The CNW-2 ceramic nozzles exhibited lower erosion rates, while the YG8 cemented carbide nozzles with relatively low hardness showed higher erosion rates under the same test conditions. Analysis of the eroded bore surface of the nozzles demonstrated that the YG8 cemented carbide nozzle exhibited brittle fracture and polishing induced removal process, while the primary wear mechanisms of CNW-2 ceramic nozzle exhibited brittle fracture, polishing, thermal cracking and collapsing.

Author

Slurries; Erosive Burning; Wear; Nozzle Geometry; Mass Flow; Abrasives

20050071111 Institute of Industrial Technology TNO, Eindhoven, Netherlands

Failure Investigation with Regard to Fracture of a Class 12.9 Socket Head Cap Bolt of a Tower of a Leopard 2 Tank

vanStiphout, H. A. M.; November 22, 2004; 20 pp.; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): A03/KL/144; TNO Proj. 007.63417/01.01

Report No.(s): TNO-42/04.012687/sec; TD2004-0432; Copyright; Avail: Other Sources

A failure investigation was performed into the cause of fracture of a socket head cap bolt from the tower of Leopard 2 tank. The fracture appeared during a routine check when a relatively new bolt was fastened with 300 Nm torque. The failure appeared to be caused by hydrogen embrittlement. Probably the bolt was charged with hydrogen during electrolytic galvanizing. As bolts of class 12.9 are extremely sensitive to hydrogen embrittlement, special precautions are necessary during galvanizing.

Author

Failure Analysis; Fracturing; Fuel Tanks; Bolts; Joints (Junctions)

20050071535 Building and Construction Research TNO, Delft, Netherlands

Local Structures

vandenEikhoff, J.; September 20, 2004; 80 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): A04/KM/113/13951; TNO Proj. 006.48225

Report No.(s): TD-2004-0272; Rept-2004-CMC-R052; Copyright; Avail: Other Sources

Shock analyses of local structures like masts can be performed. It is insufficient to supply base displacements. An analysis shows that the frequency of the mean peak shifts upwards and there are too strong resonance peaks. For the lower frequencies there are three methods to get an improvement: 1) Add the adjacent bulkheads and hull up to the next F-deck; 2) Add a mass-springs-damper below the corners critically damped at a natural frequency of about 5 Hz. 3) Use Rayleigh Mass damping with an coefficient of about 250 for the plates and beams of the hull plating of the structure. For the higher frequencies the input displacement signal must be filtered with a filter frequency of about 110 Hz. The extreme velocities and accelerations in SRS's are reasonable with differences less than a factor 4. A further evaluation of this method is necessary, especially a comparison with experimental results. Three methods to smoothen camel-like shock spectra are presented. It is impossible to judge in an objective way which method is best. A further evaluation of the smoothing methods given for these shock spectra is mandatory. The results can be used in the design of superstructures and masts for future platforms.

Author

Shock Spectra; Ship Hulls; Hulls (Structures); Mechanical Engineering

20050071624 Cummins Engine Co., Inc., Columbus, IN, USA

Development of a Microwave Assisted Particulate Filter Regeneration System

Henrichsen, M.; Popuri, S.; 2004; In English

Report No.(s): DE2004-827991; No Copyright; Avail: National Technical Information Service (NTIS)

The need for active regeneration of diesel particulate filters and the advantages of microwave assisted regeneration are discussed. The current study has multiple objectives, which include developing a microwave assisted particulate filter regeneration system for future generation light-duty diesel applications, including PNGV type applications. A variable power 2.0 kW microwave system and a tuned waveguide were employed. Cavity geometry is being optimized with the aid of computational modeling and temperature measurements during microwave heating. A wall-flow ceramic-fiber filter (6262) with superior thermal shock resistance, high filtration efficiency, and high soot capacity was used. The microwave assisted particulate filter regeneration system has operated for more than 100 hours in an engine test-cell with a 5. 9-liter diesel engine with automated split exhaust flow and by-pass flow capabilities. Filter regeneration was demonstrated using soot loads up to 10 g/liter and engine exhaust at idling flow rates as the oxygen source. A parametric study to determine the optimal combination of soot loading, oxidant flow rate, microwave power and heating time is underway. Preliminary experimental results are reported.

NTIS

Diesel Engines; Exhaust Emission; Particulates; Filters

20050080283 Texas A&M Univ., College Station, TX USA

Pseudoelastic SMA Spring Elements for Passive Vibration Isolation: Part I -Modeling

Kilan, Mughees M.; Lagoudas, Dimitris C.; Mayes, John J.; Henderson, Benjamin K.; Jun. 2004; 28 pp.; In English

Report No.(s): AD-A428936; No Copyright; Avail: CASI; A03, Hardcopy

In this work, the effect of pseudoelastic response of shape memory alloys (SMAs) on passive vibration isolation has been investigated. This study has been conducted by developing, modeling, and experimentally validating a SMA-based vibration isolation device. This device consists of layers of preconstrained SMA tubes undergoing pseudoelastic transformations under transverse dynamic loading. These SMA tubes are referred to as SMA spring elements in this study. To accurately model the nonlinear hysteretic response of SMA tubes present in this device, at first a Preisach model (an empirical model based on system identification) has been adapted to represent the structural response of a single SMA tube. The modified Preisach model has then been utilized to model the SMA-based vibration isolation device. Since this device also represents a nonlinear hysteretic dynamical system, a physically based simplified SMA model suitable for performing extensive parametric studies on such dynamical systems has also been developed. Both the simplified SMA model and the Preisach model have been used to perform experimental correlations with the results obtained from actual testing of the device. Based on the studies conducted, it has been shown that SMA-based vibration isolation devices can overcome performance trade-offs inherent in typical softening spring-damper vibration isolation systems. This work is presented as a two-part paper. Part I of this study presents the modification of the Preisach model for representing SMA pseudoelastic tube response together with the implemented identification methodology. Part I also presents the development of a physically based simplified SMA model followed by model comparisons with the actual tube response. Part II covers extensive parametric study of a pseudoelastic SMA spring-mass system using both models developed in Part I.
DTIC
Elastic Properties; Hysteresis; Shape Memory Alloys; Vibration; Vibration Isolators

20050080713 Illinois Univ., Chicago, IL, USA
Face Gear Drive With Helical Involute Pinion: Geometry, Generation by a Shaper and a Worm, Avoidance of Singularities and Stress Analysis
Litvin, Faydor L.; Fuentes, Alfonso; Gonzalez-Perez, Ignacio; Piscopo, Alessandro; Ruzziconi, Paolo; February 2005; 62 pp.; In English
Contract(s)/Grant(s): NAG3-2450; WBS-22-714-09-15; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/CR-2005-213443; ARL-CR-557; E-14979; No Copyright; Avail: CASI; A04, Hardcopy

A new type of face-gear drive with intersected axes of rotation formed by a helical involute pinion and conjugated face-gear has been investigated. Generation of face-gears by a shaper free of undercutting and pointing has been investigated. A new method of grinding or cutting of face-gears by a worm of special shape has been developed. A computerized design procedure has been developed to avoid undercutting and pointing by a shaper or by a generating worm. Also, a method to determine the limitations of the helix angle magnitude has been developed. The method provides a localization of the bearing contact to reduce the shift of bearing contact caused by misalignment. The analytical method provides a simulation of the meshing and contact of misaligned gear drives. An automatic mesh generation method has been developed and used to conduct a 3D contact stress analysis of several teeth. The theory developed is illustrated with several examples.
Author
Shapers; Gear Teeth; Transmissions (Machine Elements); Stress Analysis; Singularity (Mathematics); Helices; Mechanical Engineering

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QUALITY ASSURANCE AND RELIABILITY

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

20050070921 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Failure Analysis Of CNC Lathes
Chen, Diansheng; Wang, Tianmiao; Wei, Hongxing; Chen, Jia; Progress of Machining Technology; December 2004, pp. 418-423; In English; See also 20050070885; Copyright; Avail: Other Sources

To improve the reliability of CNC lathes made in china, a reliability database of CNC lathes has been established based on the failure data collected during field reliability test. The failure position, failure mode and failure cause were analyzed by using the order of priority diagram; we found that the weak subsystems of CNC lathes were spindle assembly, hydraulic system, main transmission system and turret. The failure distribution model of CNC lathes was established, the failure data was fitted to the Weibull distribution, and the reliability functions were obtained.
Author
Failure Analysis; Lathes; Reliability Analysis; Hydraulic Equipment; Field Tests

20050070953 Anshan Univ. of Science and Technology, Liaoning, China

Study on the Wear Lifetime of the Driving Wheel

Wang, Fenghui; Wan, Zhanhong; Gao, Xingqi; Jiao, Anyuan; Progress of Machining Technology; December 2004, pp. 990-995; In English; See also 20050070885; Copyright; Avail: Other Sources

The wear is the principal failure type of the driving wheel pulling bundling wires. The mathematical model of calculating service life of the driving wheel is developed according to the modern conception of friction and wear mechanism as well as the general law about the steel-steel wear. It is experimentally proved on our ADK-A type bundling machine that this model is practical for the sliding contact wear such as between the driving wheel and the bundling wire.

Author

Service Life; Predictions; Wheels; Wear

20050071039 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Integrated Quality Information System for Collaborative Quality Management in Global Manufacture

Tang, Xiaoqing; Progress of Machining Technology; December 2004, pp. 7-12; In English; See also 20050070885; Copyright; Avail: Other Sources

In global economy environment, manufacturing industries are challenged by world market and modern enterprise morphologies, such as supply chain, expanded enterprise and virtual enterprise, etc. To meet the more requirements on agility, globalization, distribution and collaboration, enterprise-wide quality management is facing great competition. Quality assurance system not only covers internal functional departments in enterprise, and is expanding to the external parties, as customers, partners and suppliers. So, an enterprise's core competencies or leadership capabilities in quality assuring has to be strengthened by the complementary capabilities of partners. The traditional quality assurance technologies have to be innovated. As tools used by enterprises to support quality management - quality information management systems (QIS) have to take into account to capture quality information from both sides of internal and external parties, and to facilitate communication environment, and in order to sharing of quality information among enterprises, customers and suppliers. A model based on enterprise-wide QIS is stretched out. 'Intranet/Extranet/Internet based Quality Information Management System (IEI-QIS)' was put forward. The concept model and functional model of quality information management system based on Internet/Extranet/Intranet (IEI-QIS) are proposed, which is able to integrate quality information from the enterprise, product customers and suppliers, and serve as powerful tools to benefit quality management in an expanded enterprise or supply chain.

Author

Systems Integration; Management Information Systems; Information Management; Computer Networks; Manufacturing; Quality Control

20050071102 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Studies into the Acceleration Phase of Debris from an Exploding Ammunition Storage

Wentzel, C. M.; Verbeek, H. J.; December 2004; 86 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): A01/KL/421; TNO Proj. 014.11908

Report No.(s): PML-2004-A55; TD-2004-0055; Copyright; Avail: Other Sources

A continuous effort is being done on an international scale to improve existing hazard computation tools related to ammunition storage hazard due to an explosion. One possibility is to introduce physical rather than empirical models, especially for the debris related hazard. One obvious physical quantity where an adequate model is still lacking is the launch velocity of both primary (e.g. 'bomb steel') and secondary (structural debris such as brick and reinforced concrete) individual fragments. In response to this need, the so-called 'DLV' (Dynamic Launch Velocity) approach has been applied over the last decade, studying at a small scale the velocity increase as a function of the loading density parameter. accounting for venting effects in several configurations (roof launch up to roof+4 walls launch). From studying the results of experiments on the one hand and the trend for the launch velocity calculations (DLV) on the other, one main conclusion was drawn: There is evidence that significant non-uniform debris eject velocities do occur over the whole of the loading density range; this fact remains insufficiently explained and are therefore as-yet un-modelled.

Derived from text

Acceleration (Physics); Debris; Explosions; Computation

20050080708 NASA Glenn Research Center, Cleveland, OH, USA

Nondestructive Evaluation of Thermal Barrier Coatings by Mid-Infrared Reflectance

Eldridge, Jeffrey I; Spuckler, Charles M.; Nesbitt, James A.; Martin, Richard E.; January 07, 2005; 8 pp.; In English; 29th

International Conference on Advanced Ceramics and Composites, 23-28 Jan. 2005, Cocoa Beach, FL, USA; No Copyright; Avail: CASI; A02, Hardcopy

The application of mid-infrared reflectance (MIR) imaging to monitor damage in thermal barrier coatings (TBCs) has been extended from a previously demonstrated area-averaged spectroscopic analysis tool to become a practical imaging tool that provides the spatial resolution needed to quickly identify localized regions of TBC damage by visual inspection, Illumination optics and image collection procedures were developed to produce illumination-normalized flatfield reflectance images after subtraction of the background thermal emission. MIR reflectance images were collected with a bandpass filter centered at a wavelength of 4 microns, which provided the optimum balance between good sensitivity to buried cracks and coating erosion, but with a desirable sensitivity to TBC sintering and absorption from ambient gases. Examples are presented of the application of MIR reflectance imaging to monitor damage progression in plasma-sprayed 8wt% yttria-stabilized zirconia (8YSZ) TBCs subjected to either furnace cycling or alumina particle jet erosion. These results show that MIR reflectance imaging can reliably track the progression of buried delamination cracks produced by thermal cycling and can also be used to determine when any local section of the TBC has eroded beyond an acceptable limit. Modeling of the effects of buried cracks and erosion on reflectance will be presented to show the dependence of damage sensitivity to TBC thickness. Author

Nondestructive Tests; Thermal Control Coatings; Infrared Imagery; Yttria-Stabilized Zirconia

39
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*.

20050070734 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

The Calculation of Critical Load on Plastic Structure by Using Southwell Method

Sebayang, Darwin; Journal of Aerospace Technology, Volume 1, No. 2; December 2003, pp. 6-14; In Malay-Indonesian; See also 20050070732; Copyright; Avail: Other Sources

The structure of the cylinder can be found in the structure of a rocket, an aircraft or a chimney. The stabilility of the cylinder is very important to know the capability cylinder to support the load. It is required to give a load up to plastic region in order to optimize the load capability of the material. Therefore it is required to obtain the prosedure to calculate the plastic buckling. Herewith it is shown the Southwell s Method to calculate the plastic buckling of the cylinder made of the non linear material. The approximation based on the Ramberg-Osgood is used to illustrate the stress-strain diagram. The diagram of Karman is used to obtain the Modulus of elasticity which is valid for the plastic region. The result based on this method are cos are satisfactory. This method can be used to calculate the critical load of the Lapan s rocket by considering the plasticity of the material and the structure can be lighter.

Author

Critical Loading; Plastic Properties; Cylinders; Structural Analysis; Rocket Engines

20050071560 Nevada Univ., Reno, NV, USA

Seismic Performance of RC Bridge Columns Reinforced with Two Interlocking Spirals

Correal, J. F.; Saiidi, M. S.; Sanders, D. H.; Aug. 2004; 470 pp.; In English

Report No.(s): PB2005-102226; CCEER-04-06; No Copyright; Avail: CASI; A20, Hardcopy

Interlocking spirals are used in bridge columns not only because they provide more effective confinement than rectangular hoops but also because interlocking spirals simplify the column fabrication. The behavior of columns with interlocking spirals has been studied only to a limited extent. A study was conducted at University of Nevada, Reno, on the seismic behavior of double interlocking spirals columns to determine the effect of some of the more critical parameters. Experimental and analytical studies were conducted on six large scale concrete columns with double interlocking spirals. The primary test variables were the levels shear stress and the limits of the horizontal distance between the centers of the spirals. The specimens were tested under increasing amplitudes of the Sylmar record from the 1994 Northridge Earthquake, in the strong direction of the columns until failure. The tests revealed that the Caltrans upper spirals spacing limit of 1.5 times the radius is satisfactory even under high shear. However, supplementary cross ties are needed to prevent premature vertical shear cracking. The analytical studies included push-over analysis, development of a plastic shear stiffness model, and development of design

recommendation for cross ties. The proposed shear stiffness model improved the calculated shear deformation.
NTIS
Seismology; Fabrication; Bridges (Structures); Dynamic Structural Analysis; Spirals

20050080410 Army Construction Engineering Research Lab., Champaign, IL USA
Tri-Directional Seismic Analysis of an Unreinforced Masonry Building with Flexible Diaphragms
Sweeney, Steven C.; Horney, Matthew A.; Orton, Sarah L.; Apr. 2004; 91 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-622784AT41
Report No.(s): AD-A429179; ERDC/CERL-TR-04-6; No Copyright; Avail: Defense Technical Information Center (DTIC)

To understand the susceptibility that buildings with flexible diaphragm systems have to earthquakes, their seismic response to tri-axial base motions is assessed. The research centers on a tri-directional analytical study of a two-story half-scale unreinforced masonry (URM) structure. The study investigates the effect of tri-axial base motions on response of the structure. It determines how individual component behavior, such as a pier or floor diaphragm, affects the behavior of the entire building system. This project achieves a greater understanding of the tri-directional seismic response of URM building systems with flexible diaphragms. Analysis is conducted on the components of the structure and the building system. The masonry piers and the wood diaphragms are analyzed to determine component behaviors. The building system is analyzed using equivalent static, response spectrum, linear time history, and pushover analysis. Each analysis method includes careful consideration of the directions of load application. Seismic loads are applied independently along each coordinate axis and simultaneously along all three directions. Evaluations of the response of the building system under tri-directional loads found that simultaneous tri-directional seismic motions influence the response of the building system. Maximum responses for two or more directional components can combine to produce a result greater than if a single direction were considered. Furthermore, the interconnectivity of walls in a masonry box building may cause significant changes in wall vertical forces due to global overturning of the building. This change in vertical force and combined base shears can occur simultaneously, leading to significant damage in a building whose lateral resistance is highly dependant on vertical compressive stress. (16 tables, 64 figures, 22 refs.)
DTIC
Buildings; Earthquakes; Masonry

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*.

20050070872 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Wind and Temperature Spectrometer (WTS) in the Atmospheric Neutral Density Experiment (ANDE) Satellite
Herrero, F. A.; Vancil, B.; Nicholas, A.; Zaruba, C.; Beasley, L.; September 22, 2004; 4 pp.; In English; Fall AGU Meeting, 14 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

Miniaturization efforts in new spectrometers for ionosphere/thermosphere investigations of the ion-drifts and neutral winds and corresponding temperatures make possible very light (about 250 g) packages consuming less than 0.4 W. Previously described, our approach measures the angular and energy distributions of neutral atoms and molecules (or ions) in two perpendicular planes; using those distributions to determine the full wind vector, the temperature and the relative densities of O and N2, as required for the ANDE mission. The measurements require two separate electron impact ion sources each with its own electron beam cathode. We have developed a low-temperature thermionic emission cathode that delivers 1 mA electron current at 80 mW power, making it possible to operate neutral wind-temperature experiments for the first time with powers less than 0.5 W. Advances in the ion optics of the energy-angle spectrometer enhance the energy resolution-aperture product more than a factor of 3 to enable energy resolutions of a few percent with large apertures. With these technology improvements it is now possible to obtain the full neutral wind vector, temperature and O/N2, density ratio once per second in a 250g/0.4W package with sensitivity up to about 500 km altitude in the thermosphere. We will describe the WTS as deployed in ANDE and show simulated data with the non-linear least squares analysis to illustrate expected performance of the WTS in the estimated errors in the three components of the wind, the temperature, and the relative densities.
Author
Spectrometers; Wind Velocity; Atmospheric Density; Atmospheric Temperature

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*.

20050070841 NASA Goddard Space Flight Center, Greenbelt, MD, USA
AIRS Data Subsetting Service at the Goddard Earth Sciences (GES) DISC/DAAC
Vicente, Gilberto A.; Qin, Jianchun; Li, Jason; Gerasimov, Irina; Savtchenko, Andrey; [2004]; 2 pp.; In English; American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources

The AIRS mission, as a combination of the Atmospheric Infrared Sounder (AIRS), the Advanced Microwave Sounding Unit (AMSU) and the Humidity Sounder for Brazil (HSB), brings climate research and weather prediction into 21st century. From NASA' Aqua spacecraft, the AIRS/AMSU/HSB instruments measure humidity, temperature, cloud properties and the amounts of greenhouse gases. The AIRS also reveals land and sea- surface temperatures. Measurements from these three instruments are analyzed . jointly to filter out the effects of clouds from the IR data in order to derive clear-column air-temperature profiles and surface temperatures with high vertical resolution and accuracy. Together, they constitute an advanced operational sounding data system that have contributed to improve global modeling efforts and numerical weather prediction; enhance studies of the global energy and water cycles, the effects of greenhouse gases, and atmosphere-surface interactions; and facilitate monitoring of climate variations and trends. The high data volume generated by the AIRS/AMSU/HSB instruments and the complexity of its data format (Hierarchical Data Format, HDF) are barriers to AIRS data use. Although many researchers are interested in only a fraction of the data they receive or request, they are forced to run their algorithms on a much larger data set to extract the information of interest. In order to better server its users, the GES DISC/DAAC, provider of long-term archives and distribution services as well science support for the AIRS/AMSU/HSB data products, has developed various tools for performing channels, variables, parameter, spatial and derived products subsetting, resampling and reformatting operations. This presentation mainly describes the web-enabled subsetting services currently available at the GES DISC/DAAC that provide subsetting functions for all the Level 1B and Level 2 data products from the AIRS/AMSU/HSB instruments.
Author
Advanced Microwave Sounding Unit; Air Land Interactions; Atmospheric Temperature; Earth Sciences; Gas Temperature; Cloud Physics; Data Systems

20050070865 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Registration and Fusion of Multiple Source Remotely Sensed Image Data
LeMoigne, Jacqueline; January 2004; 1 pp.; In English; 2004 AGU Fall Meeting, 13-16 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Earth and Space Science often involve the comparison, fusion, and integration of multiple types of remotely sensed data at various temporal, radiometric, and spatial resolutions. Results of this integration may be utilized for global change analysis, global coverage of an area at multiple resolutions, map updating or validation of new instruments, as well as integration of data provided by multiple instruments carried on multiple platforms, e.g. in spacecraft constellations or fleets of planetary rovers. Our focus is on developing methods to perform fast, accurate and automatic image registration and fusion. General methods for automatic image registration are being reviewed and evaluated. Various choices for feature extraction, feature matching and similarity measurements are being compared, including wavelet-based algorithms, mutual information and statistically robust techniques. Our work also involves studies related to image fusion and investigates dimension reduction and co-kriging for application-dependent fusion. All methods are being tested using several multi-sensor datasets, acquired at EOS Core Sites, and including multiple sensors such as IKONOS, Landsat-7/ETM+, EO1/ALI and Hyperion, MODIS, and SeaWIFS instruments. Issues related to the coregistration of data from the same platform (i.e., AIRS and MODIS from Aqua) or from several platforms of the A-train (i.e., MLS, HIRDLS, OMI from Aura with AIRS and MODIS from Terra and Aqua) will also be considered.
Author
Multisensor Fusion; Remote Sensors; Image Analysis; Pattern Registration

20050070879 NASA Goddard Space Flight Center, Greenbelt, MD, USA
ICESat Observations of Inland Surface Water Stage, Slope, and Extent: a New Method for Hydrologic Monitoring
Harding, David J.; Jasinski, Michael F.; [2004]; 1 pp.; In English; Fall American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

River discharge and changes in lake, reservoir and wetland water storage are critical terms in the global surface water balance, yet they are poorly observed globally and the prospects for adequate observations from in-situ networks are poor (Alsdorf et al., 2003). The NASA-sponsored Surface Water Working Group has established a framework for advancing satellite observations of river discharge and water storage changes which focuses on obtaining measurements of water surface height (stage), slope, and extent. Satellite laser altimetry, which can achieve centimeter-level elevation precision for single, small laser footprints, provides a method to obtain these inland water parameters and contribute to global water balance monitoring. Since its launch in January, 2003 the Ice, Cloud, and land Elevation Satellite (ICESat), a NASA Earth Observing System mission, has achieved over 540 million laser pulse observations of ice sheet, ocean surface, land topography, and inland water elevations and cloud and aerosol height distributions. By recording the laser backscatter from 80 m diameter footprints spaced 175 m along track, ICESat acquires globally-distributed elevation profiles, using a 1064 nm laser altimeter channel, and cloud and aerosol profiles, using a 532 nm atmospheric lidar channel. The ICESat mission has demonstrated the following laser altimeter capabilities relevant to observations of inland water: (1) elevation measurements with a precision of 2 to 3 cm for flat surfaces, suitable for detecting river surface slopes along long river reaches or between multiple crossings of a meandering river channel, (2) from the laser backscatter waveform, detection of water surface elevations beneath vegetation canopies, suitable for measuring water stage in flooded forests, (3) single pulse absolute elevation accuracy of about 50 cm (1 sigma) for 1 degree sloped surfaces, with calibration work in progress indicating that a final accuracy of about 12 cm (1 sigma) will be achieved for clear atmosphere conditions, suitable for detection of stage changes through time, (4) ability to precisely point the spacecraft so as to position the laser profile on the Earth the surface with a cross-track accuracy of 50 m (1 sigma), enabling small water bodies and specific locations to be targeted and re-observed through time, (5) adequate signal levels from specular water surfaces up to 5 degrees off-nadir, enabling complete global access to any location on the Earth's surface from the ICESat repeat orbit by off-nadir pointing, and (6) day and night operation with successful laser ranging to the Earth's surface through thin to moderate cloud cover, enabling more frequent measurements than can be achieved by passive optical sensors. Here we illustrate these capabilities by showing ICESat observations through time for selected river and lake locations.

Author

Ice, Cloud and Land Elevation Satellite; Inland Waters; Satellite Observation; Hydrology; Remote Sensing; Satellite Altimetry

20050070880 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Full-waveform, Laser Altimeter Measurements of Vegetation Vertical Structure and Sub-canopy Topography in Support of the North American Carbon Program

Blair, B.; Hofton, M.; Rabine, D.; Padden, P.; Rhoads, J.; [2004]; 2 pp.; In English; Fall American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Full-waveform, scanning laser altimeters (i.e. lidar) provide a unique and precise view of the vertical and horizontal structure of vegetation across wide swaths. These unique laser altimeters systems are able to simultaneously image sub-canopy topography and the vertical structure of any overlying vegetation. These data reveal the true 3-D distribution of vegetation in leaf-on conditions enabling important biophysical parameters such as canopy height and aboveground biomass to be estimated with unprecedented accuracy. An airborne lidar mission was conducted in the summer of 2003 in support of preliminary studies for the North America Carbon Program. NASA's Laser Vegetation Imaging Sensor (LVIS) was used to image approximately 2,000 sq km in Maine, New Hampshire, Massachusetts and Maryland. Areas with available ground and other data were included (e.g., experimental forests, FLUXNET sites) in order to facilitate numerous bio- and geophysical investigations. Data collected included ground elevation and canopy height measurements for each laser footprint, as well as the vertical distribution of intercepted surfaces (i.e. the return waveform). Data are currently available at the LVIS website (http://lvis.gsfc.nasa.gov/). Further details of the mission, including the lidar system technology, the locations of the mapped areas, and examples of the numerous data products that can be derived from the return waveform data products are available on the website and will be presented. Future applications including potential fusion with other remote sensing data sets and a spaceborne implementation of wide-swath, full-waveform imaging lidar will also be discussed.

Author

North America; Vegetation; Remote Sensing; Altimetry; Optical Radar; Airborne Radar

20050080398 North Carolina State Univ., Raleigh, NC USA

Nonlinear Solvers for Subsurface Flow Problems

Kelley, C. T.; Jenkins, E. W.; Kavanagh, Kathleen R.; Berger, Charlie; Howington, Stacy; Jul. 2002; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-99-1-0186

Report No.(s): AD-A429158; ARO-39199.11-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

The aims of this project are development of linear and nonlinear solvers and temporal integration methods in the context of 3D simulations of subsurface flow and transport. In the period covered by this report, the Principal Investigator and his students completed the initial phase of development of a two-level preconditioner, applied those results to unsaturated and multiphase flow problems, and derived condition number estimates. They also have applied their work on simulation to problems in optimal design. The project focused on numerical methods for solving linear and nonlinear equations and related problems in time-dependent simulations. The motivating application was simulation of flow through porous media, in particular the unsaturated zone in the subsurface. The nature of the nonlinearities and the physical properties of the equations make standard methods for solution of equations perform in ways not predicted by current theory. The objective was to understand these effects and design and analyze new solvers. By doing this the new solvers can be incorporated in production codes and adapt to changes in the solution as the simulation progresses. This ability to adapt is crucial to an efficient simulation. The basic research issues in nonlinear equation solvers arise from the nature of the nonlinearities. These do not have the smoothness properties that a traditional Newton's method code requires to converge in the usual way. The group performed research directed toward an understanding of how the nonlinearity can be approximated in a way that improves the performance of the solver and, at the same time, does not affect the accuracy of the simulation. The nonlinearities also affect the way in which the nonlinear solver and the time-dependent part of the simulator communicate. This communication is important for temporal adaptation. A list of 15 publications and conference presentations is included. (19 refs.)
DTIC
Computational Fluid Dynamics; Fluid Flow; Nonlinear Systems; Nonlinearity; Porous Materials; Time Dependence

20050080400 Colorado School of Mines, Golden, CO USA
Estimation of Transport Parameters Using Forced Gradient Tracer Tests in Heterogeneous Aquifers
Illangasekare, Tissa H.; Rajaram, Harihar; Mar. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0195
Report No.(s): AD-A429160; ARO-39220-EV.1; No Copyright; Avail: Defense Technical Information Center (DTIC)

The evaluation of risk to the environment by subsurface contamination remains one of the major challenges to the Army. Numerical models such as the U. S. Army's Groundwater Modeling System that simulate water flow and chemical transport are increasingly used in remediation design and analysis. This research contributes toward a better understanding of field-testing methods to obtain model parameters. The focus was on both reactive and sorptive parameters. The experimental component of the study was conducted in a three-dimensional, intermediate-scale test tank to obtain accurate data on the behavior of nonreactive and sorptive tracers. This database was used to validate a numerical model, which was then used to analyze behavior over a wider range of scales. A large number of hydraulic and tracer tests were performed in the test aquifer, in three different mean flow configurations: uniform flow, radially divergent flow, and convergent flow. This is a very unique data set that will be available to other researchers. It will help to evaluate models and stochastic theories of up scaled flow and transport. In a related study, a fundamental theoretical analysis of the relationship between surface properties of rock fractures and effective behavior of transport was carried out. The results of both studies are of theoretical and practical significance. This report summarizes the most important results of research in the two areas: intermediate-scale experiments on non-reactive and reactive transport in heterogeneous porous media, and transport with wall reactions in fractures. A list of 18 published papers, conference papers, and papers about to be published is included. (2 refs.)
DTIC
Aquifers; Computational Fluid Dynamics; Contamination; Cracks; Gradients; Heterogeneity; Sediment Transport; Water Flow

20050080426 Duke Univ., Durham, NC USA
Desert Pavement Studies
Haff, Peter K.; Glass, Lesley; Strudley, Mark; Nov. 2003; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-1-0191
Report No.(s): AD-A429222; ARO-39218.8-EV; No Copyright; Avail: Defense Technical Information Center (DTIC)

Combining plan view information from aerial photography showing details of stream channels on desert pavement surfaces with process-based erosion models, a high-resolution, synthetic topography DEM (with resolution similar to that of the photograph) is constructed. This topographic information is used to route water to small channels (usually unresolved on standard topographic maps) on the pavement surface that support most of the vegetation. Estimates of water discharge in these channels are combined with field data to estimate quantitatively the response of vegetation to specified changes in infiltration,

climate, or other causes of changes in runoff. A regional riparian response index is derived. (17 figures)
DTIC
Channel Flow; Deserts; Drainage; Environmental Surveys; Pavements; Vegetation; Water Flow

20050080428 Purdue Univ., West Lafayette, IN USA
Rapid and Affordable Generation of Terrain and Detailed Urban Feature Data
Mikhail, Edward M.; Feb. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAAH04-96-1-0444
Report No.(s): AD-A429224; ARO-36277.5-EV-MUR; No Copyright; Avail: Defense Technical Information Center (DTIC)

This project, which was scheduled to terminate in November 2001, was extended to January 2003 to allow more time for technology transfer. The last report covered the period from the beginning of the project through December 2001. It provided documentation of the following: all papers written to that date (46), number of personnel supported (36), number of degrees awarded (12 PhD and 10 Masters), and the various awards and recognitions received by the team. It gave concise summaries of 15 example research results that deal with a wide range of basic research from innovative mathematical modeling to the extraction of complex buildings, road grids, and cars, to effective visualization. The most significant accomplishment is the fact that the team of members from diverse research areas functioned as an integrated entity that resulted in accelerated progress. This report gives information subsequent to the last report, including papers, degrees, and particularly technology transfer.
DTIC
Image Processing; Imagery; Intelligence; Photogrammetry; Structural Engineering; Terrain

20050080430 Army Construction Engineering Research Lab., Champaign, IL USA
Geophysical Surveys in Archaeology: Guidance for Surveyors and Sponsors
Somers, Lewis E.; Hargrave, Michael L.; Simms, Janet E.; Dec. 2003; 130 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429240; ERDC/CERL SR-03-21; No Copyright; Avail: Defense Technical Information Center (DTIC)

The last few years have seen a significant increase in the use of geophysical techniques by archaeologists in the USA working in both academic settings and Cultural Resources Management (CRM). Since 1995. the Engineer Research and Development Center (ERDC) Construction Engineering Research Laboratory (CERL) has made a concerted effort to assist the Department of Defense (DoD) in making efficient use of geophysics in managing the cultural resources at a number of installations. This report provides a set of guidance documents and decision support tools to help CRM managers and field practitioners. particularly those working at DoD installations. make effective use of geophysical techniques. The ATAGS (Automated Tool for Archaeo-Geophysical Survey) software tool. described in this report. allows the user to develop an effective survey design or a geophysical survey at a particular site. ATAGS produces a detailed report that also provides guidance on project management. ATAGS is presently designed for use in the Midwest and Plains regions of the USA. Those working in the Mid-south and interior South will also find ATAGS useful. The survey designs are intended for geophysical instruments manufactured by Geoscan Research (USA). but can also be used (with minor revision) with all comparable instruments.
DTIC
Cultural Resources; Geophysics; Surveys

44
ENERGY PRODUCTION AND CONVERSION

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

20050061276 Abilene Christian Univ., TX, USA, Colorado Univ., Boulder, CO
Comparative Analysis of Homebuyer Response to New Zero Energy Homes. Preprint
Farhar, B. C.; Coburn, T. C.; Murphy, M.; Jul. 2004; In English
Report No.(s): DE2004-15008798; NREL/CP-550-35912; No Copyright; Avail: National Technical Information Service (NTIS)

A new development by SheaHomes at Scripps Highlands in San Diego, California, offers zero energy homes

(ZEHs)-highly energy-efficient homes with solar water heating and, in some, solar electricity as a standard feature-the first such offering in the USA. Early in 2004, mail questionnaires went to 271 homebuyers in the 306-home Scripps Highland community (ZEH and highly energy-efficient homes) and 98 homebuyers in an adjacent 103-home community (conventional homes) who had lived in their homes for at least 6 months. Two different builders offered these homes. Respondents in the conventional homes comprise the comparison sample. The questionnaires address perceptions and preferences relative to the recent new home purchases, and the role, if any, that energy efficiency and solar features might have played in these purchases. Also investigated are willingness to pay for energy features; preferences on whether energy features should be standard or optional; preferences on energy policies; perceived problems; aesthetics; homebuyer satisfaction and the reasons for it; environmentalism; and experience with the utility company. Respondents were asked to sign a release form for their utility company to provide data to the researchers on electricity and natural gas consumption. Utility data will be used to analyze whether statistically significant differences in energy consumption and energy costs might be attributed to the energy features of the new ZEH homes by comparing them with similar conventional homes, while controlling for climate, square footage, and number of occupants. This paper covers the preliminary findings from the survey and the analysis comparing responses from the ZEH and comparison sample homebuyers.
NTIS
Solar Heating; Energy Conservation; Costs

20050061278 Global Solar Energy LLC, Tucson, AZ, USA, ITN Energy Systems, Inc., Littleton, CO, USA
Tolerance of Three-Stage CIGS Deposition to Variations Imposed by Roll-to-Roll Processing. Phase 2, Annual Report May 2003-May 2004
Beck, M. E.; Repins, I. L.; 2004; In English
Report No.(s): DE2004-15008789; NREL/SR-520-36378; No Copyright; Avail: National Technical Information Service (NTIS)

Global Solar Energy, Inc. (GSE) and lower-tier subcontractor ITN Energy Systems, Inc. (ITN) are addressing process tolerance issues in this program. The definition and resolution of process tolerance issues satisfy many of the goals of the Thin Film Photovoltaics Partnerships Program (TFPPP). First, the investigation is likely to identify acceptable ranges for critical deposition parameters. This will have the benefit of providing upper and lower control limits for in-situ process monitoring components, thus increasing average efficiency as well as yield of product. Second, the exploration may uncover insensitivities to some processing procedures, allowing manufacture of modules at increased throughput and decreased cost. The exploration allows a quantitative evaluation of the trade-offs between performance, throughput, and costs. Third, the proposed program also satisfies the TFPPP goal of establishing a wider research and development base for higher-efficiency processing. Four th, the acquisition of data defining sensitivity to processing has important implications for the required accuracy of process sensors and control. Finally, the program helps the photovoltaic community advance toward a better understanding of CIGS growth, a longer-term goal of the TFPPP.
NTIS
Thin Films; Photovoltaic Conversion; Solar Energy

20050061281 National Renewable Energy Lab., Golden, CO
Parabolic Trough Solar Power Plant Simulation Model
Price, H.; Jan. 2003; In English
Report No.(s): DE2004-15003230; NREL/CP-550-33209; No Copyright; Avail: National Technical Information Service (NTIS)

As interest for clean renewable electric power technologies grows, a number of parabolic trough power plants of various configurations are being considered for deployment around the globe. It is essential that plant designs be optimized for each specific application. The optimum design must consider the capital cost, operations and maintenance cost, annual generation, financial requirements, and time-of-use value of the power generated. Developers require the tools for evaluating tradeoffs between these various project elements. This paper provides an overview of a computer model that is being used by scientists and developers to evaluate the tradeoff between cost, performance, and economic parameters for parabolic trough solar power plant technologies. An example is included that shows how this model has been used for a thermal storage design optimization.
NTIS
Design Optimization; Parabolic Reflectors; Solar Simulation; Computerized Simulation

20050061310 RWE Schott Solar, Inc., Billerica, MA, USA

Plug and Play Components for Building-Integrated PV Systems. Phase 1: Final Report, 20 February 2002-19 February 2003

Russell, M. C.; Jul. 2004; In English

Report No.(s): DE2004-15008786; NREL/SR-520-36246; No Copyright; Avail: National Technical Information Service (NTIS)

RWE Schott Solar, Inc. is developing innovative new products to facilitate the broad use of its PV systems in the current markets. This report summarizes the progress made by the company in these developments. This work was conducted under NREL's PV Manufacturing R&D Project, subcontract No. NDO-2-30628-05. The project is a two-phase effort. The first phase consists of development and testing of a novel new flat-roof PV array mounting system, development and UL listing of new PV array source circuit combiner boxes for the company's PV systems, testing and evaluation of fasteners used to secure mounting brackets to residential roofs and the development of a simplified PV system interconnection device for residential applications. Significant progress has been achieved. A major focus of this effort has been the development of the company's new free-standing (FS) system for mounting large PV arrays on flat-roof buildings.

NTIS

Research and Development; Systems Integration

20050071586 West Virginia Univ., Morgantown, WV, USA

Nanostructure Arrays for Multijunction Solar Cells. Final Subcontract Report 12 May 1999-11 July 2002

Das, B.; 2004; In English

Report No.(s): DE2004-15007874; NREL/SR-520-36101; No Copyright; Avail: National Technical Information Service (NTIS)

This project developed the process technologies for the fabrication of high-efficiency multijunction photovoltaic cells using semiconductor nanostructure arrays. This project focused on and solved the technical challenges that need to be addressed for the implementation of such devices. Specific issues addressed include (1) improved pore ordering on thin-film templates, (2) synthesis of II-VI semiconductor nanostructures by both AC and DC deposition, (3) an in-situ barrier-layer engineering process that allow the fabrication of superior-quality materials and improved template/substrate interface, (4) characterization techniques for templates, (5) process technology for creating stacked layers of nanostructures, (6) process throughput and improved apparatus, (7) modeling tools, (8) use of glass substrates, and (9) a nonlithographic surface texturing technique for silicon PV cells. An important outcome of this project is the demonstration of the fabrication technique on glass substrates. This breakthrough provides the possibility of covering buildings with''transparent'' solar cells fabricated on architectural glass. The accomplishments of this project position it well for the next phase of research, namely, creation and optimization of the nanostructure-based PV cells.

NTIS

Photovoltaic Cells; Solar Cells; Semiconductors (Materials)

20050071588 Shell Solar Industries, Camarillo, CA, USA

PV Manufacturing R&D--Integrated CIS Thin-Film Manufacturing Infrastructure. Phase 1 Technical Report, 2 August 2002-31 October 2003

Tarrant, D. E.; Gay, R. R.; Jun. 2004; In English

Report No.(s): DE2004-15007875; NREL/SR-520-36247; No Copyright; Avail: National Technical Information Service (NTIS)

This subcontract report describes Shell Solar Industries (SSI), formerly Siemens Solar Industries, pursuing research and development of CuInSe2-based thin-film PV technology since 1980. In the 1980s, SSI demonstrated a 14.1%-efficient 3.4-cm2 active-area cell; unencapsulated integrated modules with aperture efficiencies of 11.2% on 940 cm2 and 9.1% on 3900 cm2; and an encapsulated module with 8.7% efficiency on 3883 cm2 (verified by NREL). Since these early achievements, SSI has made outstanding progress in the initial commercialization of high-performance thin-film CIS technology. Line yield has been increased from about 60% in 2000 to about 85% in 2002. This major accomplishment supports attractive cost projections for CIS.

NTIS

Solar Cells; Manufacturing

20050071592 Thermo Technologies, Waltham, MA, USA, Mid-Atlantic Social Security Center, Philadelphia, PA, USA
Evacuated-Tube Heat-Pipe Solar Collectors Applied to the Recirculation Loop in a Federal Building. Preprint
Walker, A.; Mahjouri, F.; Stiteler, R.; Jun. 2004; In English
Report No.(s): DE2004-15007935; NREL/CP-710-36149; No Copyright; Avail: National Technical Information Service (NTIS)

This paper describes the design, simulation, construction, and initial performance of a solar water heating system (a 360-tube evacuated-tube heat-pipe solar collector, 54 m2 in gross area, 36 m2 in net absorber area) installed at the top of the hot water recirculation loop in the Social Security Administration's Mid-Atlantic Center in Philadelphia. When solar energy is available, water returning to the hot water storage tank is heated by the solar array. This new approach, in contrast to the more conventional approach of preheating incoming water, is made possible by the thermal diode effect of heat pipes and low heat loss from evacuated-tube solar collectors. The simplicity of this approach and its low installation costs support the deployment of solar energy in existing commercial buildings, especially where the roof is some distance away from the water heating system, which is often in the basement. Initial performance measurements of the system are reported.
NTIS
Heat Pipes; Buildings; Solar Heating

20050080272 Pennsylvania State Univ., University Park, PA USA
High Performance Electroactive Polymers for Naval Underwater Acoustic Applications
Zhang, Qiming; Dec. 2004; 34 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0418
Report No.(s): AD-A428917; No Copyright; Avail: CASI; A03, Hardcopy

Program objective was to develop electroactive polymers with performance superior than current materials for Navy transducers an electromechanical transduction (i.e. smart skins) applications. Three approaches were proposed and 2 of them were investigated (the 3rd approach, which makes use of the polar-vector reorientation of liquid crystal polymers to generate high electromechanical efficiency, was not pursued due to funding limit). First, utilized the large strain associated with the molecular conformation change between different forms (polar and non-polar) to generate high electromechanical responses. New class of electroactive polymers, i.e. electrostrictive PVDF based polymers, have been developed and at the end of this program, a large quantity of the electrostrictive P(VDF-TrFE-CFE) terpolymer can be produced (^2kg/batch), making it possible for the future prototype device development. Explored approach of using the delocalized electrons in organic materials to significantly raise the dielectric constant of polymeric materials; thus, polymeric materials with dielectric constant higher than 1,000 have been realized. Polymeric materials exhibit.
DTIC
Electroactive Polymers; High Polymers; Liquid Crystals; Underwater Acoustics

20050080366 Rockwell International Corp., Thousand Oaks, CA USA
Frictionless Linear Electrical Generator for Harvesting Motion Energy
Cheung, Jeffrey T.; Nov. 2004; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA972-03-C-0025
Report No.(s): AD-A429110; No Copyright; Avail: Defense Technical Information Center (DTIC)

A key limitation in a buoy-based oceanographic monitoring systems is the lack of a reliable power source with long operational lifetime. Battery packs suffer from the replacement cost and inconvenience. Traditional renewable energy devices do not fully address the need due to their poor performance in the hostile marine environment (e.g. solar cells) or size and cost (e.g. OWEC systems) To fill this important niche, we have developed a new technology that combines the uses of an ultra low friction surface treatment with an efficient linear generator. The small device can be deployed anywhere on the ocean surface without anchoring to the seabed. The friction between the sliding magnetic stacks and the inner wall of the generator is negligibly low. This not only reduces the frictional loss but also increases the system sensitivity to capture energy from the slightest movement. As magnets slide across induction coils in a tube, random AC outputs are produced. They are then rectified and regulated into stable DC output to charge a battery with an overall net efficiency of over 50% over a wide temperature range. Small prototype devices have been field-tested at near shore under mild wave conditions to produce close to 1 Watt of power and it can be scaled up to higher power capacity. The completely sealed structure makes the system corrosion resistant. The ultra low friction surface and simple design make the device mechanically robust without any sign of mechanical degradation after months of continuous operation.
DTIC
Linear Systems

20050080441 Logistics Management Inst., McLean, VA USA

Resource Costs of Supplying Power to a Battlefield

Canes, Michael E.; Sep. 2004; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429328; LMI-IR319R1; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study develops a method for identifying the resources necessary to supply electric power to a battlefield. It applies the method to a particular military unit, the Stryker Brigade Combat Team, in 1-year and 1-month scenarios. Gen-sets currently supply most battlefield electric power, but they require considerable logistics resources, and the Army wants to become leaner and more mobile, so it is examining alternative means of power supply, such as hybrid electric vehicles. The report finds that, in the long term, the cost of power from hybrids is greater than that from gen-sets, but in the short term, it depends on the transport used to move assets to the battlefield. By air, hybrids are the less costly option, but by sea or prepositioning, gen-sets are less expensive. export power is only one feature of hybrids, however. greater vehicle fuel economy and added range (among others) add military utility The study approach applies to any medium-sized power source and other forces and scenarios. With it, one can identify the support resources required by any power-exporting technology and can estimate its per-unit costs. Thus, the report offers a means of comparing potential sources with gen-sets, hybrids, or any other power export system.

DTIC

Costs; Supplying

20050080594 Center for Army Analysis, Fort Belvoir, VA USA

Strategic Energy Resource Investment Optimization for the US Army

Jones, Hugh; Anker, David; Mathur, Kumud; Aug. 2004; 81 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429071; CAA-R-04-30; No Copyright; Avail: Defense Technical Information Center (DTIC)

Energy security for Army installations is growing in importance. Following 9/11, significant efforts have been employed to safeguard airports, nuclear facilities, transportation hubs, seaports and military installations from both terrorist activities and natural disasters. During time of national emergency, the military is always counted on as first responders to any crisis situation as well as to deploy to foreign lands during wartime. The ability to conduct these missions is of paramount importance, none the least of which is to be able to safeguard the electric energy and electric distribution system required to perform these missions from an installation base. This analysis examines the cost and benefits associated with energy security options for the following three installations in the northwest installation management region: (1)Ft. Lewis, Washington, (2)Fort Carson, Colorado and (3)Ft. Riley, Kansas.

DTIC

Emergencies

20050080597 Center for Army Analysis, Fort Belvoir, VA USA

Strategic Energy Resource Investment Optimization for the US Army (Serious - A), Appendix D

Anker, David S.; Aug. 2004; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429208; CAA-R-04-30A-Append-D; No Copyright; Avail: Defense Technical Information Center (DTIC)

The main analytical tool in the SERIOUS-A project for determining investment strategies for providing electrical power to critical mission facilities at an installation by distributed generation (DG) is integer linear programming (IP). The solutions of the IP formulations determine, for each facility, what type of generator to use and when in the investment planning period to purchase the generator. The objective functions in the IP formulations include cost and security value. In this Appendix to the SERIOUS-A report, the definition of security value is developed further to include (1) information about how individual facilities support the installation s mission and (2) properties of types of electrical generator such as reliability and emissions data. The revised methodology is applied to one installation, Ft. Riley.

DTIC

Military Operations; Strategy

20050080707 NASA Glenn Research Center, Cleveland, OH, USA

Overview of NASA Magnet and Linear Alternator Research Efforts

Geng, Steven M.; Schwarze, Gene E.; Nieda, Janis M.; January 2005; 15 pp.; In English; Space Technology and Applications International Forum (STIF-2005), 13-17 Feb. 2005, Albuquerque, NM, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS-22-972-20-01

Report No.(s): NASA/TM-2005-213411; STAIF-2005-093; E-14928; No Copyright; Avail: CASI; A03, Hardcopy

The Department of Energy, Lockheed Martin, Stirling Technology Company, and NASA Glenn Research Center are developing a high-efficiency, 110 watt Stirling Radioisotope Generator (SRG110) for NASA Space Science missions. NASA Glenn is conducting in-house research on rare earth permanent magnets and on linear alternators to assist in developing a free-piston Stirling convertor for the SRG110 and for developing advanced technology. The permanent magnet research efforts include magnet characterization, short-term magnet aging tests, and long-term magnet aging tests. Linear alternator research efforts have begun just recently at GRC with the characterization of a moving iron type linear alternator using GRC's alternator test rig. This paper reports on the progress and future plans of GRC's magnet and linear alternator research efforts. Author

Energy Technology; Linear Alternators; Stirling Cycle; General Overviews; NASA Programs; Permanent Magnets

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ENVIRONMENT POLLUTION

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

20050061211 ADA-ES, Littleton, CO, USA

Field Test Program to Develop Comprehensive Design, Operating, and Cost Data for Mercury Control Systems. Final Site Report for Pleasant Prairie Power Plant Unit 2 Sorbent Injection into a Cold-Side ESP for Mercury Control

2004; In English

Report No.(s): DE2004-828578; No Copyright; Avail: National Technical Information Service (NTIS)

With the Nation's coal-burning utilities facing the possibility of tighter controls on mercury pollutants, the U.S. Department of Energy is funding projects that could offer power plant operators better ways to reduce these emissions at much lower costs. Mercury is known to have toxic effects on the nervous system of humans and wildlife. Although it exists only in trace amounts in coal, mercury is released when coal burns and can accumulate on land and in water. In water, bacteria transform the metal into methylmercury, the most hazardous form of the metal. Methylmercury can collect in fish and marine mammals in concentrations hundreds of thousands times higher than the levels in surrounding waters. One of the goals of DOE is to develop technologies by 2005 that will be capable of cutting mercury emissions 50 to 70 percent at well under one-half of today's costs. ADA Environmental Solutions (ADA-ES) is managing a project to test mercury control technologies at full scale at four different power plants from 2000 - 2003. The ADA-ES project is focused on those power plants that are not equipped with wet flue gas desulfurization systems. ADA-ES has developed a portable system that will be tested at four different utility power plants. Each of the plants is equipped with either electrostatic precipitators or fabric filters to remove solid particles from the plant's flue gas. ADA-ES's technology will inject a dry sorbent, such as activated carbon, which removes the mercury and makes it more susceptible to capture by the particulate control devices. A fine water mist may be sprayed into the flue gas to cool its temperature to the range where the dry sorbent is most effective. PG&E National Energy Group is providing two test sites that fire bituminous coals and both are equipped with electrostatic precipitators and carbon/ash separation systems. Wisconsin Electric Power Company is providing a third test site that burns Powder River Basin (PRB) coal and has an electrostatic precipitator for particulate control. Alabama Power Company will host a fourth test at its Plant Gaston, which is equipped with a hot-side electrostatic precipitator and a downstream fabric filter.

NTIS

Coal; Emission; Mercury (Metal)

20050061212 ADA-ES, Littleton, CO, USA

Field Test Program to Develop Comprehensive Design, Operating, and Cost Data for Mercury Control Systems. Final Site Report for E.C. Gaston Plant Unit 3 Sorbent Injection into COHPAC for Mercury Control

2004; In English

Report No.(s): DE2004-828573; No Copyright; Avail: National Technical Information Service (NTIS)

With the Nation's coal-burning utilities facing the possibility of tighter controls on mercury pollutants, the U.S. Department of Energy is funding projects that could offer power plant operators better ways to reduce these emissions at much lower costs. Mercury is known to have toxic effects on the nervous system of humans and wildlife. Although it exists only in trace amounts in coal, mercury is released when coal burns and can accumulate on land and in water. In water, bacteria transform the metal into methylmercury, the most hazardous form of the metal. Methylmercury can collect in fish and marine mammals in concentrations hundreds of thousands times higher than the levels in surrounding waters. One of the goals of DOE is to develop technologies by 2005 that will be capable of cutting mercury emissions 50 to 70 percent at well under one-half of today's costs. ADA Environmental Solutions (ADA-ES) is managing a project to test mercury control technologies at full

scale at four different power plants from 2000 - 2003. The ADA-ES project is focused on those power plants that are not equipped with wet flue gas desulfurization systems. ADA-ES has developed a portable system that will be tested at four different utility power plants. Each of the plants is equipped with either electrostatic precipitators or fabric filters to remove solid particles from the plant's flue gas. ADA-ES's technology will inject a dry sorbent, such as activated carbon, which removes the mercury and makes it more susceptible to capture by the particulate control devices. A fine water mist may be sprayed into the flue gas to cool its temperature to the range where the dry sorbent is most effective. PG&E National Energy Group is providing two test sites that fire bituminous coals and both are equipped with electrostatic precipitators and carbon/ash separation systems. Wisconsin Electric Power Company is providing a third test site that burns Powder River Basin (PRB) coal and has an electrostatic precipitator for particulate control. Alabama Power Company will host a fourth test at its Plant Gaston, which is equipped with a hot-side electrostatic precipitator and a downstream fabric filter.
NTIS
Mercury (Metal); Pollution Control; Combustion

20050061218 Forschungszentrum Karlsruhe G.m.b.H., Eggenstien-Leopoldshafen, Germany
Protection of Operators and Environment the Safety Concept of the Karlsruhe Vitrification Plant VEK
Fleisch, J.; Kuttruf, H.; Lumpp, W.; Pfeifer, W.; Roth, G.; 2002; 12 pp.; In English
Report No.(s): DE2004-828353; No Copyright; Avail: Department of Energy Information Bridge

The Karlsruhe Vitrification Plant (VEK) plant is a milestone in decommissioning and complete dismantling of the former Karlsruhe Reprocessing Plant WAK, which is in an advanced stage of disassembly. The VEK is scheduled to vitrify approx. 70 m3 of the highly radioactive liquid waste (HLW) resulting from reprocessing. Site preparation, civil work and component manufacturing began in 1999. The building will be finalized by mid of 2002, hot vitrification operation is currently scheduled for 2004/2005. Provisions against damages arising from construction and operation of the VEK had to be made in accordance with the state of the art as laid down in the German Atomic Law and the Radiation Protection Regulations. For this purpose, the appropriate analysis of accidents and their external and internal impacts were investigated.
NTIS
Radiation Protection; Radioactive Wastes; Nuclear Radiation

20050061225 Florida Solar Energy Center, Cape Canaveral, FL
Thermocatalytic CO(sub 2)-Free Production of Hydrogen from Hydrocarbon Fuels
2004; In English
Report No.(s): DE2004-828215; No Copyright; Avail: National Technical Information Service (NTIS)

The main objective of this project is the development of an economically viable thermocatalytic process for production of hydrogen and carbon from natural gas or other hydrocarbon fuels with minimal environmental impact. The three major technical goals of this project are: (1) to accomplish efficient production of hydrogen and carbon via sustainable catalytic decomposition of methane or other hydrocarbons using inexpensive and durable carbon catalysts, (2) to obviate the concurrent production of CO/CO2 byproducts and drastically reduce CO2 emissions from the process, and (3) to produce valuable carbon products in order to reduce the cost of hydrogen production.
NTIS
Catalysts; Carbon; Hydrocarbons; Hydrogen Fuels

20050061229 Process Control Solutions, Inc., Tallahassee, FL, USA
Improved Process Control of Industrial Wood Waste Boilers
2004; In English
Report No.(s): DE2004-828213; No Copyright; Avail: National Technical Information Service (NTIS)

This project's principal aim was the conceptual and feasibility stage development of improved process control methods for wood-waste-fired water-tube boilers operating in industrial manufacturing applications (primarily pulp and paper). Wood-waste boilers have unique process control challenges due to the highly variable nature of the fuel, the boiler design required to burn this type of fuel, and the frequent load swings required to meet changing process steam demands. Despite advances in controls technology and microprocessor-based control systems, these challenges are not being met in any uniformly effective manner in the pulp and paper industry as a whole. To stabilize operation and reduce vulnerability to wood-waste fuel variations, it is common practice to supplement fossil fuels (usually oil or natural gas) and to run excess air

at unnecessarily high levels. Additionally, air distribution in the combustion zone, which affects combustion efficiency and, especially, emissions, is rarely optimal.
NTIS
Boilers; Combustion Efficiency; Industrial Wastes; Wood

20050061234 Department of Energy, Washington, DC
Problems and Task of Training at Courses for Enhancement of Qualification in the Radioactive Waste Management Area
2002; In English
Report No.(s): DE2004-828210; No Copyright; Avail: National Technical Information Service (NTIS)

Requirements to the professional competence of the personnel engaged in the area of the radioactive waste management are increased. Higher school cannot supply the branch with the qualified personnel; therefore special attention should be given to the system of staff retraining and to the increase of their qualification. In that paper the analysis of SIA Radon experience on the organization and carrying out training at courses of qualification improvement is represented. The main criterion of the analysis is the research of an education efficiency. Also here the basic directions of the training process improving are submitted as well as the requirements that should be considered when forming the teaching staff and trainees groups.
NTIS
Waste Management; Radioactive Wastes; Education

20050061242 Vanderbilt Univ., Nashville, TN, USA
Rethinking the Hanford Tank Waste Program
Parker, F. L.; Clark, D. E.; Morcos, N.; 2002; 14 pp.; In English
Report No.(s): DE2004-828657; No Copyright; Avail: Department of Energy Information Bridge

The program to treat and dispose of the highly radioactive wastes stored in underground tanks at the U. S. Department of Energy's Hanford site has been studied. A strategy/management approach to achieve an acceptable (technically sound) end state for these wastes has been developed in this study. This approach is based on assessment of the actual risks and costs to the public, workers, and the environment associated with the wastes and storage tanks. Close attention should be given to the technical merits of available waste treatment and stabilization methodologies, and application of realistic risk reduction goals and methodologies to establish appropriate tank farm cleanup milestones. Increased research and development to reduce the mass of non-radioactive materials in the tanks requiring sophisticated treatment is highly desirable. The actual cleanup activities and milestones, while maintaining acceptable safety standards, could be more focused on a risk-to-benefit cost effectiveness, as agreed to by the involved stakeholders and in accordance with existing regulatory requirements. If existing safety standards can be maintained at significant cost savings under alternative plans but with a change in the Tri-Party Agreement (a regulatory requirement), those plans should be carried out. The proposed strategy would also take advantage of the lessons learned from the activities and efforts in the first phase of the two-phased cleanup of the Hanford waste tank farms.
NTIS
Radioactive Wastes; Radioactive Materials; Storage Tanks; Waste Treatment

20050061243 National Inst. for Occupational Safety and Health, Washington, DC, USA
Evaluation of the 'Fresh Air Exhaust (trademark)System to Reduce Carbon Monoxide Exposure during Motor Boating and Wake Surfing
Marlow, D. A.; Guishard, C.; Patterson, A.; Earnest, G. S.; Aug. 2004; 50 pp.; In English
Report No.(s): PB2005-101288; NIOSH-171-35A; No Copyright; Avail: CASI; A03, Hardcopy

On May 24 and 25, 2004, researchers from the National Institute for Occupational Safety and Health (NIOSH) conducted an evaluation of carbon monoxide (CO) emissions and exposures on a gasoline-powered, inboard ski boat that was equipped with a Fresh Air Exhaust (FAE) carbon monoxide control system. The FEA system is a recently developed device that can be used on inboard ski boats to reroute engine exhaust from directly behind the boat near the water surface to approximately 14 inches below the water directly behind the propeller. The manufacturer has collected data showing that this device effectively removes CO from the air in the vicinity of the stern of the boat, as well as at numerous distances behind the boat. The current evaluations occurred on a ski boat operating on Lake Austin, Austin, Texas with and without the FAE system.
NTIS
Boats; Carbon Monoxide; Exhaust Gases; Exposure; Wakes

20050061244 Environmental Protection Agency, Washington, DC

ABCs of Asbestos in Schools

Aug. 2003; 24 pp.; In English

Report No.(s): PB2005-102561; EPA/745-K/93-017; No Copyright; Avail: CASI; A03, Hardcopy

The Environmental Protection Agency (EPA) is releasing this updated document in conjunction with the National Parent Teacher Association (PTA) and the National Education Association (NEA) due to an ongoing concern about asbestos in elementary and secondary schools nationwide. This pamphlet can help parents and teachers answer questions and learn the facts about asbestos in schools. It also outlines the responsibilities of school boards and other school officials to protect school children and employees from possible exposure to asbestos.

NTIS

Pollution Control; Asbestos; Schools; Education

20050061273 Department of Energy, Washington, DC, USA

Thermal Evaluation of the Fort Saint Vrain Codisposal Waste Package

Scheider, A.; Jul. 2001; 46 pp.; In English

Report No.(s): DE2004-805680; No Copyright; Avail: Department of Energy Information Bridge

The objective of this calculation is to evaluate the thermal response of the Fort Saint Vrain (FSV) Codisposal Waste Package (WP) design under nominal Monitored Geologic Repository conditions. The objective of the calculation is to provide thermal parameter information to support the FSV waste package design. The information provided by the sketches is that of the potential design of the type of WP considered in this calculation, and all obtained results are valid for that design only. This calculation is associated with the WP design and was performed by the Waste Package Design group in accordance with the 'Technical Work Plan for: Waste Package Design Description for LA'. AP-3.124, 'Calculations' is used to perform the calculation and develop the document. The sketches attached to this calculation provide the potential dimensions and materials for the SDHLW (Defense High Level Waste)/DOE (Department of Energy) Long WP.

NTIS

Radioactive Wastes; Containers; Thermal Analysis

20050061274 Bechtel Nevada Corp., Las Vegas, NV, USA

Waste Package and Material Testing for the Proposed Yucca Mountain High Level Waste Repository

Doering, T. W.; Pasupathi, V.; 2002; 14 pp.; In English

Report No.(s): DE2004-805694; No Copyright; Avail: Department of Energy Information Bridge

Over the repository lifetime, the waste package containment barriers will perform various functions that will change with time. During the operational period, the barriers will function as vessels for handling, emplacement, and waste retrieval (if necessary). During the years following repository closure, the containment barriers will be relied upon to provide substantially complete containment, through 10,000 years and beyond. Following the substantially complete containment phase, the barriers and the waste package internal structures help minimize release of radionuclides by aqueous- and gaseous-phase transport. These requirements have lead to a 'defense-in-depth design philosophy. A multi-barrier design will result in a lower breach rate distributed over a longer period of time, thereby ensuring the regulatory requirements are met.

NTIS

Radioactive Wastes; Containment; Waste Management; Radioactive Isotopes

20050061308 Department of Energy, Washington, DC, USA

Drop Calculation of HLW Canister and PU Can-in-Canister

Mastilovic, S.; Jul. 2001; 132 pp.; In English

Report No.(s): DE2004-790311; No Copyright; Avail: Department of Energy Information Bridge

The objective of this calculation is to determine the structural response of the standard high-level waste (HLW) canister and the canister containing the cans of immobilized plutonium (Pu) ('can-in-canister' (CIC) throughout this document) subjected to drop DBEs (design basis events) during the handling operation. The evaluated DBE in the former case is 7-m (23-ft) vertical (flat-bottom) drop. In the latter case, two 2-ft (0.61-m) corner (oblique) drops are evaluated in addition to the 7-m vertical drop. These Pu CIC calculations are performed at three different temperatures: room temperature (RT) (20 C), T = 200 F = 93.3 C , and T = 400 F = 204 C ; in addition to these the calculation characterized by the highest maximum stress intensity is performed at T = 750 F = 399 C as well. The scope of the HLW canister calculation is limited to reporting the calculation results in terms of: stress intensity and effective plastic strain in the canister, directional residual strains at the

canister outer surface, and change of canister dimensions. The scope of Pu CIC calculation is limited to reporting the calculation results in terms of stress intensity, and effective plastic strain in the canister. The information provided by the sketches from Reference 26 is that of the potential CIC design considered in this calculation, and all obtained results are valid for this design only. This calculation is associated with the Plutonium Immobilization Project and is performed by the Waste Package Design Section in accordance with Reference 24. It should be noted that the 9-m vertical drop DBE, included in Reference 24, is not included in the objective of this calculation since it did not become a waste acceptance requirement. AP-3.124, 'Calculations', is used to perform the calculation and develop the document.
NTIS
Plutonium; Radioactive Wastes; Containers

20050061312 Amersham International Ltd., UK
Decommissioning of a Caesium-137 Sealed Source Production Facility
Abbott, H.; 2003; 18 pp.; In English
Report No.(s): DE2004-826192; No Copyright; Avail: Department of Energy Information Bridge
Amersham owns a former Cesium-137 sealed source production facility. They commissioned RWE NUKEM to carry out an Option Study to determine a strategy for the management of this facility and then the subsequent decommissioning of it. The decommissioning was carried out in two sequential phases. Firstly robotic decommissioning followed by a phase of manual decommissioning. This paper describes the remote equipment designed built and operated, the robotic and manual decommissioning operations performed, the Safety Management arrangements and summaries the lessons learned. Using the equipment described the facility was dismantled and decontaminated robotically. Some 2300kg of Intermediate Level Waste containing in the order of 4000Ci were removed robotically from the facility.
NTIS
Cesium 137; Decommissioning; Robots; Environmental Cleanup; Industrial Plants

20050061330 Science Applications International Corp., Germantown, MD, USA, Science Applications International Corp., Albuquerque, NM, USA
Property Valuation and Radioactive Materials Transportation: A Legal, Economic and Public Perception Analysis
Holm, J. A.; Thrower, A. W.; Widmayer, D. A.; Portner, W. E.; 2003; 20 pp.; In English
Report No.(s): DE2004-827119; No Copyright; Avail: Department of Energy Information Bridge
The shipment of transuranic (TRU) radioactive waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico raised a serious socioeconomic issue - the potential devaluation of property values due to the transportation of TRU waste from generator sites to the disposal facility. In 1992, the New Mexico Supreme Court held in City of Santa Fe v. Komis that a loss in value from public perception of risk was compensable. This issue has become an extremely important one for the development of the Yucca Mountain repository in Nevada for disposal of spent nuclear fuel and high-level radioactive waste. Much research has been conducted about the potential impacts of transportation of spent fuel and radioactive waste. This paper examines the pertinent studies conducted since the Komis case. It examines how the public debate on radioactive materials transportation continues and is now focused on transportation of high-level waste and spent nuclear fuel to the proposed Yucca Mountain repository. Finally, the paper suggests a path forward DOE can take to address this issue.
NTIS
Radioactive Materials; Transportation; Economic Analysis

20050061332 Idaho National Engineering and Environmental Lab., Idaho Falls, ID
Environmental Management Science Program Research Projects to Improve Decontamination and Decommissioning of U.S. Department of Energy Facilities
Phillips, A. M.; 2003; 16 pp.; In English
Report No.(s): DE2004-827111; No Copyright; Avail: Department of Energy Information Bridge
This paper describes fourteen basic science projects aimed at solving decontamination and decommissioning (D&D) problems within the U.S. Department of Energy (DOE). Funded by the Environmental Science Management Program (EMSP), these research projects address D&D problems where basic science is needed to expand knowledge and develop solutions to help DOE meet its cleanup milestones. EMSP uses directed solicitations targeted at identified Environmental Management (EM) needs to ensure that research results are directly applicable to DOE's EM problems. The program then helps transition the projects from basic to applied research by identifying end-users and coordinating proof-of-principle field tests. EMSP recently funded fourteen D&D research projects through the directed solicitation process. These research projects

will be discussed, including description, current status, and potential impact. Through targeted research and proof-of-principle tests, it is hoped that EMSP's fourteen D&D basic research projects will directly impact and provide solutions to DOE's D&D problems.
NTIS
Decontamination; Decommissioning; Research Projects; Environment Management

20050070882 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact of Urban Surfaces on Precipitation Processes
Shepherd, J. M.; [2004]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by two United Nations organizations, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess the 'risk of human-induced climate change'. Such reports are used by decision-makers around the world to assess how our climate is changing. Its reports are widely respected and cited and have been highly influential in forming national and international responses to climate change. The Fourth Assessment report includes a section on the effects of surface processes on climate. This sub-chapter provides an overview of recent developments related to the impact of cities on rainfall. It highlights the possible mechanisms that buildings, urban heat islands, urban aerosols or pollution, and other human factors in cities that can affect rainfall.
Author
Climate Change; Cities; Environment Effects; Rain

20050071113 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Multi Spectral Smoke
vanRooijen, M. P.; Colpa, W.; Webb, R.; October 2004; 35 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): Proj. 014.15250
Report No.(s): TNO-PML-2004-A84; TD2004-0084; Copyright; Avail: Other Sources

The reaction of pyrotechnics generates electromagnetic radiation between the ultraviolet and infrared part of the spectrum at relatively high temperatures. The reaction products, the smoke particles, absorb or disperse the electromagnetic radiation. The conventional smoke is used to camouflage personal and/or platforms in the visible spectrum. Multispectral smoke is used in a wider range of the electromagnetic spectrum. The Dutch Army will replace their conventional smokes articles by multispectral smoke articles in the next years. In order to be able to assess the functioning of such articles specific knowledge is needed. This report is the result of a literature survey to several aspects of multispectral smokes in areas such as performance, environment, toxicity and lifetime. Also a brief review of the mechanisms to generate smoke, the physical chemical parameters of the smoke and the different types of smoke particles is given.
Author
Smoke; Camouflage; Pyrotechnics; Spectra; Electromagnetic Properties; Broadband

20050071581 Institute of Gas Technology, Des Plaines, IL
NOX Emission Reduction by Oscillating Combustion
Wagner, J. C.; 2004; In English
Report No.(s): DE2004-828180; No Copyright; Avail: National Technical Information Service (NTIS)

High-temperature, natural gas-fired furnaces, especially those fired with preheated air, produce large quantities of NO(sub x) per ton of material processed. Regulations on emissions from industrial furnaces are becoming increasingly more stringent. In addition, competition is forcing operators to make their furnaces more productive and/or efficient. Switching from preheated air to industrial oxygen can increase efficiency and reduce NO(sub x), but oxygen is significantly more costly than air and may not be compatible with the material being heated. What was needed, and what was developed during this project, is a technology that reduces NO(sub x) emissions while increasing furnace efficiency for both air- and oxy-fired furnaces. Oscillating combustion is a retrofit technology that involves the forced oscillation of the fuel flow rate to a furnace. These oscillations create successive, fuel-rich and fuel-lean zones within the furnace. Heat transfer from the flame to the load increases due to the more luminous fuel-rich zones, a longer overall flame length, and the breakup of the thermal boundary layer. The increased heat transfer shortens heat up times, thereby increasing furnace productivity, and reduces the heat going up the stack, thereby increasing efficiency. The fuel-rich and fuel-lean zones also produce substantially less NO(sub x) than firing at a constant excess air level. The longer flames and higher heat transfer rate reduces overall peak flame temperature and thus reduces additional NO(sub x) formation from the eventual mixing of the zones and burnout of combustibles from

the rich zones. This project involved the development of hardware to implement oscillating combustion on an industrial scale, the laboratory testing of oscillating combustion on various types of industrial burners, and the field testing of oscillating combustion on several types of industrial furnace.
NTIS
Air Pollution; Pollution Control; Nitrogen Oxides; Electric Power Plants; Coal

20050071594 Argonne National Lab., IL, USA
Superconducting Open-Gradient Magnetic Separation for the Pretreatment of Radioactive or Mixed Waste Vitrification Feeds
Nunez, L.; Kaminsky, M. D.; Doctor, R. D.; Crawfor, C.; Ritter, J. A.; Dec. 1999; 212 pp.; In English
Report No.(s): DE2004-828169; No Copyright; Avail: Department of Energy Information Bridge

An open-gradient magnetic separation (OGMS) process is being considered to separate deleterious elements from radioactive and mixed waste streams prior to vitrification or stabilization. By physically segregating solid wastes and slurries based on the magnetic properties of the solid constituents, this potentially low-cost process may serve the U.S. Department of Energy (DOE) by reducing the large quantities of glass produced from defense-related high-level waste (HLW). Furthermore, the separation of deleterious elements from low-level waste (LLW) also can reduce the total quantity of waste produced in LLW immobilization activities. Many HLW 'and LLW waste' streams at both Hanford and the Savannah River Site (SRS) include constituents deleterious to the durability of borosilicate glass and the melter many of the constituents also possess paramagnetism. For example, Fe, Cr, Ni, and other transition metals may limit the waste loading and affect the durability of the glass by forming spinel phases at the high operating temperature used in vitrification. Some magnetic spinel phases observed in glass formation are magnetite (Fe,O,), chromite (FeCrO,), and others ((Fe, Ni, Mg, Zn, Mn)(Al, Fe, Ti, Cr)O,) as described elsewhere.
NTIS
Radioactive Wastes; Waste Treatment; Waste Management; Separation

20050071596 Colorado State Univ., Fort Collins, CO, USA, Oklahoma State Univ., Stillwater, OK, USA
In-Situ, Long Term Monitoring System for Radioactive Contaminants
Durham, J. S.; McKeever, S. W. S.; Akerlrod, M. S.; Oct. 2002; In English
Report No.(s): DE2004-820568; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents the results of the first phase of the project entitled 'In-situ, Long-term Monitoring System for Radioactive Contaminants.' Phase one of this effort included four objectives, each with specific success criteria. The first objective was to produce dosimetry grade fibers and rods of aluminum oxide. The success criterion for this milestone was the production of aluminum oxide rods and fibers that have a minimum measureable dose (MMD) of 100 mrem or less. This milestone was completed and the MMD for the rods was measured to be 1.53 mrem. Based on the MMD, the ability of the sensor to measure Cs-137, Sr-90/Y-90, and(sup 99)Tc was evaluated. It was determined that the sensor can measure the release limit of these radionuclides (50 pCi/qu cm in 150 h, 200 h, and 54,000 h, respectively. The monitor is adequate for measuring Cs-137 and Sr-90/Y-90 but is unsuitable for measuring Tc-99 in soil. The second objective was to construct a prototype sensor (dosimeter and fiber optic channel). There were three success criteria for this milestone: (1) Perform measurements with the sensor for both gamma and beta radiation with a standard deviation of 10% or less; (2) Demonstrate the ability of the sensor to discriminate between gamma and beta radiation; and (3) Obtain similar or relatable results for differing lengths of fiber optic cable.
NTIS
Radioactive Contaminants; Technetium Isotopes; Beta Particles; Dosage

20050071597 Sensor Research and Development Corp., Orono, ME, USA
Cavity Ring-Down Spectroscopy Mercury Continuous Emission Monitor. Quarterly Technical Progress Report for the Period Starting April 1, 2003 Ending June 30, 2003
Carter, C. C.; 2004; In English
Report No.(s): DE2004-821847; No Copyright; Avail: National Technical Information Service (NTIS)

Previous work on the detection of mercury using the cavity ring-down (CRD) technique has concentrated on the detection and characterization of the desired mercury transition. Interferent species present in flue gas emissions have been tested as well as a simulated flue gas stream. Additionally, work has been done on different mercury species such as the elemental and oxidized forms. The next phase of the effort deals with the actual sampling system. This sampling system will be responsible

for acquiring a sample stream from the flue gas stack, taking it to the CRD cavity where it will be analyzed and returning the gas stream to the stack. In the process of transporting the sample gas stream every effort must be taken to minimize any losses of mercury to the walls of the sampling system as well as maintaining the mercury in its specific state (i.e. elemental, oxidized, or other mercury compounds). SRD first evaluated a number of commercially available sampling systems. These systems ranged from a complete sampling system to a number of individual components for specific tasks.
NTIS
Cavities; Mercury Compounds; Spectroscopy

20050071600 Environmental Protection Agency, Washington, DC, USA
Sampling and Analysis of Consumer Garden Products that Contain Vermiculite
Aug. 2000; 210 pp.; In English
Report No.(s): PB2005-102573; EPA-744/R-00/010; No Copyright; Avail: CASI; A10, Hardcopy

The Environmental Protection Agency has conducted sampling of vermiculite products, primarily those used in gardening, to determine if products currently on the market contain asbestos, and if so, whether consumers are at risk from using these products. To evaluate the risk posed by compounds such as asbestos, EPA needs to determine if the contaminant is present in certain products and also whether people come in contact with sufficient quantities to cause harm. Asbestos poses a risk to people if fibers become airborne and are inhaled into the lungs. The results of this investigation indicate that the potential exposure to asbestos from vermiculite products poses only a minimal health risk to consumers, although workers may face more serious risks. Vermiculite is produced from mined ore and is used in agricultural and horticultural products as well as in insulation and construction applications. As a first step in the process, the Agency purchased and began testing a limited number of vermiculite products available in garden stores in the Seattle area to determine if they were contaminated with asbestos. Sixteen products were tested using widely-recognized standard protocols and asbestos was detected in five of them. However, only three of these contained enough asbestos to allow EPA to quantify the percentage of asbestos reliably.
NTIS
Vermiculite; Asbestos

20050071601 Louisiana State Univ., Baton Rouge, LA, USA
High Efficiency Desulfurization of Synthesis Gas
Yi, K. B.; Podlaha, E. J.; Harrison, D. P.; 2004; In English
Report No.(s): DE2004-824758; No Copyright; Avail: National Technical Information Service (NTIS)

Mixed metal oxides containing CeO2 and ZrO2 are being studied as high temperature desulfurization sorbents capable of achieving the DOE Vision 21 target of 1 ppmv or less H2S. The research is justified by recent results in this laboratory that showed that reduced CeO2, designated CeO(n) (1.5 less than n less than 2.0), is capable of achieving the 1 ppmv target in highly reducing gas atmospheres. The addition of ZrO2 has improved the performance of oxidation catalysts and three-way automotive catalysts containing CeO2, and should have similar beneficial effects on CeO2 desulfurization sorbents. An electrochemical method for synthesizing CeO2-ZrO2 was developed and the products were characterized by XRD and TEM during year 01. Nanocrystalline particles having a diameter of about 5 nm and containing from approximately 10 mol% to 80 mol% ZrO2 were prepared. XRD showed the product to be a solid solution at low ZrO2 contents with a separate ZrO2 phase emerging at higher ZrO2 levels. Unfortunately, the quantity of CeO2-ZrO2 that could be prepared electrochemically was too small to permit full testing in our desulfurization reactor. Also during year 01 a laboratory-scale fixed-bed reactor was constructed for desulfurization testing. All components of the reactor and analytical systems that may be exposed to low concentrations of H2S are constructed of quartz, Teflon, or silcosteel. Reactor product gas composition as a function of time is determined using a Varian 3800 gas chromatograph equipped with a pulsed flame photometric detector (PFPD) for measuring low H2S concentrations ((approx) 10 ppmv) and a thermal conductivity detector (TCD) for higher concentrations of H2S.
NTIS
Cerium Oxides; Desulfurizing; Gas Composition; Hydrogen Sulfide; Zirconium Oxides

20050071602 Environmental Protection Agency, Research Triangle Park, NC
Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003
Dec. 2004; In English
Report No.(s): PB2005-102571; EPA-454/R-04/002; No Copyright; Avail: National Technical Information Service (NTIS)

EPA considers fine particle pollution it's most pressing air quality problem, and the Agency is taking a number of steps

that will reduce particle emissions and formation. These efforts range from EPA's Acid Rain program and regulations reducing emissions from fuels and diesel engines, to implementation of the Agency's first fine particle standards and a proposed rule to reduce particle-forming emissions from power plants. In this report, EPA explores characteristics of particle pollution in the USA; Analyzes particle pollution for 2003 (the most recent year of data); Summarizes recent and long-term trends; investigates the relationship between air quality and emissions; and reviews some current programs and future prospects for reducing particle pollution levels. In addition, text boxes in this report present information on more specialized areas of interest, such as the PM Supersite project, episodic events, satellite monitoring, and the relationship of particle pollution to other air pollutants.
NTIS
Air Pollution; Air Quality; Pollution Monitoring; Particle Emission

20050071603 Academy for Educational Development, Inc., Washington, DC, USA
Energy Environment Policy and Training Program, Terminal Report, June 10, 2004, Manila, Philippines
Jun. 10, 2004; 134 pp.; In English
Report No.(s): PB2005-102518; No Copyright; Avail: CASI; A07, Hardcopy

The Energy Environment Training Program (EEPTP) was a positive, direct, and joint response of the USAlD and the GRP to both existing and emerging challenges faced by the country in promoting and facilitating policy and structural reforms in the energy-environment sector. The GRP passed two laws to address separate but interdependent concerns of the sector: (1) the Clean Air Act (CAA), which was enacted into law in 1999 and (2) the Electric Power Industry Reform Act (EPIRA), enacted in 2001. USAlD and GRP Frst responded to these challenges in the sector with the design, development, and delivery of the Philippine's Climate Change Mitigation Program (PCCMP, February 1998-September 2002), EEPTP's predecessor. As in the PCCMP, the DOE was the lead government partner implementing agency of EEPTP.
NTIS
Energy Policy; Air Quality; Climate Change

20050071612 Lawrence Livermore National Lab., Livermore, CA, USA
Hydrologic and Geochemical Controls on the Transport of Radionuclides in Natural Undisturbed Arid Environments as Determined by Accelerator Mass Spectrometry Measurements
Nimz, G. J.; Caffee, M. W.; McAninch, K. J.; Apr. 2000; In English
Report No.(s): DE2004-827420; No Copyright; Avail: National Technical Information Service (NTIS)

This project developed low-level analytical methods for the measurement of radionuclides by accelerator mass spectrometry. The contaminant radionuclides potentially measurable by AMS include: 14C, 36Cl, 59Ni, 63Ni, 90Sr, 93Zr, 99Tc, 129I, 239Np, 239Pu, and other actinides. We chose to concentrate on 36Cl, 99Tc, 90Sr, and 129I. These nuclides were globally distributed as fallout during the era of atmospheric nuclear testing, and occur today in almost every environment. They also are prominent contaminant nuclides at a variety of DOE sites. There is a need to develop these low-level methods to observe the migration of radionuclides in natural environments. There are at least three advantages of this: (1) the ability to conduct migration studies in locations most like those of concern to public health, e.g., a 'far-field' environment; (2) migration research does not have to be conducted at sites of multiple contamination, e.g., by VOC's, which can produce hard-to-interpret results; and (3) it becomes unnecessary to collect research samples that are themselves radioactive waste and are therefore difficult to handle and dispose of in the laboratory. Our approach of examining globally distributed, fallout radionuclides provides another advantage: (4) since the nuclides are globally distributed, migration research can be conducted in any chosen environment.
NTIS
Mass Spectroscopy; Pollution Transport; Radioactive Isotopes

20050071613 Golder Associates, Inc., Redmond, WA, USA
General Requirements for Simulation Models in Waste Management
Miller, I.; Kossik, R.; Voss, C.; 2003; 16 pp.; In English
Report No.(s): DE2004-827428; No Copyright; Avail: Department of Energy Information Bridge

Most waste management activities are decided upon and carried out in a public or semi-public arena, typically involving the waste management organization, one or more regulators, and often other stakeholders and members of the public. In these environments, simulation modeling can be a powerful tool in reaching a consensus on the best path forward, but only if the models that are developed are understood and accepted by all of the parties involved. These requirements for understanding

and acceptance of the models constrain the appropriate software and model development procedures that are employed. This paper discusses requirements for both simulation software and for the models that are developed using the software. Requirements for the software include transparency, accessibility, flexibility, extensibility, quality assurance, ability to do discrete and/or continuous simulation, and efficiency. Requirements for the models that are developed include traceability, transparency, credibility/validity, and quality control. The paper discusses these requirements with specific reference to the requirements for performance assessment models that are used for predicting the long-term safety of waste disposal facilities, such as the proposed Yucca Mountain repository.
NTIS
Waste Management; Waste Disposal; Computerized Simulation

20050071621 Electric Power Research Inst., Palo Alto, CA, USA, National Energy Technology Lab., Pittsburgh, PA
Enhanced Control of Mercury by Wet Flue Gas Desulfurization Systems Site 3 Topical Report
2004; In English
Report No.(s): DE2004-828035; No Copyright; Avail: National Technical Information Service (NTIS)

The U.S. Department of Energy and EPRI have co-funded this project to improve the control of mercury emissions from coal-fired power plants equipped with wet flue gas desulfurization (FGD) systems. The project investigated catalytic oxidation of vapor-phase elemental mercury to a form that is more effectively captured in wet FGD systems. If successfully developed, the process could be applicable to over 90,000 MW of utility generating capacity with existing FGD systems and to future FGD installations. Field tests have been conducted to determine whether candidate catalyst materials remain active towards mercury oxidation after extended flue gas exposure. Catalyst life will have a large impact on the cost effectiveness of this potential process. A mobile catalyst test unit has been used to test the activity of four different catalyst materials for a period of up to six months at each of three utility sites. Catalyst testing was completed at the first site, which fires Texas lignite, in December 1998 and at the second test site, which fires a Powder River Basin subbituminous coal in the fall of 1999. Testing at the third site, which fires a medium- to high-sulfur bituminous coal, began in June 2000 and was completed at the end of January 2001. This Topical Reports includes results from Site 3; results from Sites 1 and 2 were reported previously.
NTIS
Pollution Control; Catalysts; Combustion

20050071637 Hampton Univ., VA, USA
Development of a Novel Catalyst for No Decomposition
Akyurtlu, A.; Akyurtlu, J. F.; 2004; In English
Report No.(s): DE2004-825388; No Copyright; Avail: National Technical Information Service (NTIS)

Air pollution arising from the emission of nitrogen oxides as a result of combustion taking place in boilers, furnaces and engines, has increasingly been recognized as a problem. New methods to remove NO(sub x) emissions significantly and economically must be developed. The current technology for post-combustion removal of NO is the selective catalytic reduction (SCR) of NO by ammonia or possibly by a hydrocarbon such as methane. The catalytic decomposition of NO to give N(sub 2) will be preferable to the SCR process because it will eliminate the costs and operating problems associated with the use of an external reducing species. The most promising decomposition catalysts are transition metal (especially copper)-exchanged zeolites, perovskites, and noble metals supported on metal oxides such as alumina, silica, and ceria. The main shortcoming of the noble metal reducible oxide (NMRO) catalysts is that they are prone to deactivation by oxygen. It has been reported that catalysts containing tin oxide show oxygen adsorption behavior that may involve hydroxyl groups attached to the tin oxide. This is different than that observed with other noble metal-metal oxide combinations, which have the oxygen adsorbing on the noble metal and subsequently spilling over to the metal oxide. This observation leads one to believe that the Pt/SnO(sub 2) catalysts may have a potential as NO decomposition catalysts in the presence of oxygen. This prediction is also supported by some preliminary data obtained for NO decomposition on a Pt/SnO(sub 2) catalyst in the PI's laboratory. The main objective of the proposed research is the evaluation of the Pt/SnO(sub 2) catalysts for the decomposition of NO in simulated power plant stack gases with particular attention to the resistance to deactivation by O(sub 2), CO(sub 2), and elevated temperatures.
NTIS
Air Pollution; Decomposition; Exhaust Gases; Technology Assessment; Nitrogen Oxides

20050071643 Chew (M. H.) and Associates, Livermore, CA, USA, Nevada Commission on Nuclear Projects, Carson City, NV, USA

Meet the Maximally Exposed Member of the Public: The Service Station Attendant for Spent Fuel Going to Yucca Mountain

Collins, H. E.; Halstead, R. J.; 2002; 16 pp.; In English

Report No.(s): DE2004-827661; No Copyright; Avail: Department of Energy Information Bridge

According to the 1999 Draft Environmental Impact Statement (DEIS) for the proposed Yucca Mountain repository site, members of the public along transportation routes by which spent nuclear fuel (SNF) and high-level radioactive waste (HLW) is shipped will receive annual radiation doses less than 100 mrem/yr, the international (ICRP) and national (Department of Energy, Nuclear Regulatory Commission) radiation limit for members of the public. For the ''Mostly Truck'' national transportation scenario, the DEIS specifically concludes that the maximally exposed member of the public, a service station attendant along the primary shipping route will receive no more than 100 mrem/yr, or 2.4 rem over 24 years. Based on the assumptions in the DEIS scenarios, however, it is highly likely that service station attendants along shipping routes will be called upon to fuel and service the rigs carrying SNF and HLW to Yucca Mountain. After reevaluating the DEIS, and making realistic alternative assumptions where necessary, the authors conclude that these attendants are likely to receive substantially more than 100 mrem/yr external dose, and perhaps several times that dose (up to 500 mrem/yr), unless mitigating measures are adopted. This is particularly true in Western states where refueling opportunities are limited, and the distances between fuel sources in rural areas may be up to 100 miles.

NTIS

Spent Fuels; Nuclear Fuels; Routes; Transportation

20050071644 Booz-Allen and Hamilton, Inc., Washington, DC, USA

Illuminating the Decision Path: The Yucca Mountain Site Recommendation

Know, E.; Slothouber, L.; 2003; 14 pp.; In English

Report No.(s): DE2004-827642; No Copyright; Avail: Department of Energy Information Bridge

On February 14, 2002, U.S. Secretary of Energy Spencer Abraham provided to the President the Recommendation by the Secretary of Energy Regarding the Suitability of the Yucca Mountain Site for a Repository Under the Nuclear Waste Policy Act of 1982. This Recommendation, along with supporting materials, complied with statutory requirements for communicating a site recommendation to the President, and it did more: in 49 pages, the Recommendation also spoke directly to the Nation, illuminating the methodology and considerations that led toward the decision to recommend the site. Addressing technical suitability, national interests, and public concerns, the Recommendation helped the public understand the potential risks and benefits of repository development and placed those risks and benefits in a meaningful national context.

NTIS

Radioactive Wastes; Risk

20050071645 Shaw Environmental and Infrastructure, Inc., Albuquerque, NM, USA, Hyde (J. M.) Consulting, Cary, NY, USA

Implementation of Revision 19 of the Trupact-II Safety Analysis Report at Rocky Flats Environmental Technology Site

D'Amico, E.; O'Leary, J.; Bell, S.; Djordjevic, S.; Givens, C.; 2003; In English

Report No.(s): DE2004-827639; No Copyright; Avail: National Technical Information Service (NTIS)

The U.S. Nuclear Regulatory Commission on July 27, 2001 approved Revision 19 of the TRUPACT-II Safety Analysis Report (SAR) and the associated TRUPACT-II Authorized Methods for Payload Control (TRAMPAC). Key initiatives in Revision 19 included matrix depletion, unlimited mixing of shipping categories, a flammability assessment methodology, and an alternative methodology for the determination of flammable gas generation rates. All U.S. Department of Energy (DOE) sites shipping transuranic (TRU) waste to the Waste Isolation Pilot Plant (WIPP) were required to implement Revision 19 methodology into their characterization and waste transportation programs by May 20, 2002. An implementation process was demonstrated by the Rocky Flats Environmental Technology Site (RFETS) in Golden, Colorado. The three-part process used by RFETS included revision of the site-specific TRAMPAC, an evaluation of the contact-handled TRU waste inventory against the regulations in Revision 19, and design and development of software to facilitate future inventory analyses.

NTIS

Flammable Gases; Flammability; Characterization; Payload Control

20050071648 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Respiratory Protection During Civil Risks: Legal Rules and Recognised Sources of Risk
Sabel, H. W. R.; October 2004; 131 pp.; In Dutch
Contract(s)/Grant(s): A02/KL/450; TNO Proj. 014.14502
Report No.(s): PML-2004-A71; TD-2004-0071; Copyright; Avail: Other Sources

This report describes a literature survey on a wide scale of non-military sources of risks in respect to breathing air. This survey was performed within the project 'Respiratory protection in case of civil risks' and in this report first the national and international rules of law, guides and standards are considered. Next, the mode of risk assessment during exposure are discussed, followed by a survey of all kind of special hazardous toxical substances with their specific characteristics which can be present in breathing air.
Author
Air Pollution; Respiratory Diseases; Risk; Public Health; Public Law; International Law

20050080376 Illinois Univ., Urbana, IL USA
Activated Carbon Fiber Cloth Electrothermal Swing Adsorption System
Sullivan, Patrick D.; Rood, Mark J.; Grevillot, George; Wander, Joseph D.; Hay, K. J.; Jun. 2004; 14 pp.; In English
Report No.(s): AD-A429126; AFRL-ML-TY-TP-2004-4538; No Copyright; Avail: CASI; A03, Hardcopy

Capture and recovery of hazardous air pollutants (HAPs) and volatile organic compounds (VOCs) from gas streams using physical adsorption onto activated carbon fiber cloth (ACFC) is demonstrated on the bench-scale. This system is regenerated electrothermally, by passing an electric current directly through the ACFC. The adsorbate desorbs from the ACFC, rapidly condenses on the inside walls of the adsorber, and then drains from the adsorber as a pure liquid. Rapid electrothermal desorption exhibits such unique characteristics as extremely low purge gas flow rate, rapid rate of ADFC heating, rapid mass transfer kinetics inherent to ACFC, and in-vessel condensation. An existing system was scaled up 500%, and the new system was modeled using material and energy balances. ... These results allow the modeling of electrothermal desorption of organic vapors from gas streams with in-vessel condensation to optimize operating conditions of the system during regeneration of the adsorbent.
DTIC
Activated Carbon; Adsorption; Air Pollution; Carbon Fibers; Fabrics

20050080613 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Chemical Burden of the Aquatic Eco System in the Waddenzee Due to Shooting Trials
vanHam, N. H. A.; vanderWal, J. T.; Blankendaal, V. G.; vanDokkum, H. P.; December 2004; 56 pp.; In Dutch
Contract(s)/Grant(s): A01/CO/438; TNO Proj. 014.16297
Report No.(s): TD-2004-0048; PML-2004-A48; Copyright; Avail: Other Sources

In or near the Netherlands Waddenzee wetlands area an airforce shooting range (Vliehors) and an army shooting range (Marnewaard) are situated. In consequence of the practice on these ranges ammunition gets into the aquatic environment. On behalf of the Netherlands Ministry of Defence TNO has analyzed the eventual resulting effects on the aquatic environment. Based on the known chemical composition of the various types of ammunition and the maximum number of ammunitions that can get into the aquatic environment the maximal burden has been calculated. This is compared to the environmental burden originating from other sources. The comparison clarifies that the extra burden originating from the ammunition is marginal. It is therefore concluded that negative effects of these ammunition on the aquatic environment are not to be expected.
Author
Environment Effects; Wetlands; Ammunition; Ecosystems; Explosives

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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*.

20050061209 Deutsche Gesellschaft zum Bau und Betrieb von Endlagern fuer Abfallstoffe m.b.H., Peine, Germany
Decommissioning and Closure of the Morsleben Deep Geological Repository the Final Step
Ripkens, M.; Biurrun, E.; 2002; 12 pp.; In English
Report No.(s): DE2004-828628; No Copyright; Avail: Department of Energy Information Bridge

In Germany, a deep geologic repository for low and intermediate-level waste has been in operation since 1971. This repository, which is located in the territory of former Eastern Germany, became a Federal Facility in the wake of German reunification in 1990. Since then, waste from all of Germany was disposed of until a stop ordered by BfS in 1998. The site is now in the process of being decommissioned and later closed down. This process includes updating the concept for guaranteeing appropriate waste isolation for as long as the waste remains a hazard. During the licensing procedure being currently conducted, in line with German requirements for repository sites, the site operator must provide convincing proof of the facility's long-term safety. Thereafter, implementation of the decommissioning and closure concept will follow. It is estimated that the licensing procedure will take until the year 2006. The decommissioning and closure process itself will require about 10 years. Reliable costs estimates are not yet available. This paper briefly covers the history of the Morsleben radioactive waste repository and provides a draft update on the status of the licensing procedure.
NTIS
Radioactive Wastes; Decommissioning; Geology

20050061233 Rochester Univ., NY
High Background Radiation Area in Ramsar Iran: Geology, Norm, Biology, Lnt, and Possible Regulatory Fun
Karam, P. A.; 2002; In English
Report No.(s): DE2004-828212; No Copyright; Avail: National Technical Information Service (NTIS)

The city of Ramsar Iran hosts some of the highest natural radiation levels on earth, and over 2000 people are exposed to radiation doses ranging from 1 to 26 rem per year. Curiously, inhabitants of this region seem to have no greater incidence of cancer than those in neighboring areas of normal background radiation levels, and preliminary studies suggest their blood cells experience fewer induced chromosomal abnormalities when exposed to 150 rem challenge doses of radiation than do the blood cells of their neighbors. This paper will briefly describe the unique geology that gives Ramsar its extraordinarily high background radiation levels. It will then summarize the studies performed to date and will conclude by suggesting ways to incorporate these findings (if they are borne out by further testing) into future radiation protection standards.
NTIS
Background Radiation; Radiation Protection; Dosage

20050070877 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Speed Networking and Large-scale Simulation in Geodynamics
Kuang, Weijia; Gary, Patrick; Seablom, Michael; Truszkowski, Walt; Odubiyi, Jide; Jiang, Weiyuan; Liu, Dong; [2004]; 1 pp.; In English; American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Large-scale numerical simulation has been one of the most important approaches for understanding global geodynamical processes. In this approach, peta-scale floating point operations (pflops) are often required to carry out a single physically-meaningful numerical experiment. For example, to model convective flow in the Earth's core and generation of the geomagnetic field (geodynamo), simulation for one magnetic free-decay time (approximately 15000 years) with a modest resolution of 150 in three spatial dimensions would require approximately 0.2 pflops. If such a numerical model is used to predict geomagnetic secular variation over decades and longer, with e.g. an ensemble Kalman filter assimilation approach, approximately 30 (and perhaps more) independent simulations of similar scales would be needed for one data assimilation analysis. Obviously, such a simulation would require an enormous computing resource that exceeds the capacity of a single facility currently available at our disposal. One solution is to utilize a very fast network (e.g. 10Gb optical networks) and available middleware (e.g. Globus Toolkit) to allocate available but often heterogeneous resources for such large-scale computing efforts. At NASA GSFC, we are experimenting with such an approach by networking several clusters for geomagnetic data assimilation research. We shall present our initial testing results in the meeting.
Author
Geodynamics; Computerized Simulation; Computer Networks

20050070881 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Time Variable Gravity from Local Mascon Analysis of GRACE Data
Lemoine, Frank G.; Luthcke, Scott B.; Klosko, Steven M.; Rowlands, David; Chinn, Douglas S.; McCarthy, John J.; Cox, Christopher M.; Williams, Terry A.; Pavlis, Despina E.; [2004]; 1 pp.; In English; Fall American Geophysical Union Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We have analyzed GRACE Level 1-B data in 2003 and assessed a new approach for extracting time variable gravity that

isolates the gravity signal in both time and space. The Level-1B satellite-to-satellite range rate (KBRR) data and accelerometry are processed in daily arcs using the precise orbit products produced by the GRACE team from GPS to calibrate both the accelerometer and KBRR data. We then adjusted select components of the intersatellite baseline vector for each data segment isolated to the region of interest. Herein, we solved for mass anomalies in 45 deg x 45 deg blocks over the Amazon and the nearby Atlantic Ocean and estimate mass flux in units of cm of water over each block. We show with this approach that we can recover mass anomalies on a submonthly basis with 10 to 15 day temporal resolution. We discuss the important issues related to this solution, including the size of the mascon blocks, the weight given to the temporal and spatial constraint used to stabalize the solutions, as well as the optimal correlation in time and distance. We compare the the mascon results with solutions obtained from the more standard approach using spherical harmonics and with independent hydrology models and lake data. This technique demonstrates that sub-monthly medium wavelength mass flux phenomena are well sensed by the hyper-precise line of sight velocity data produced from GRACE.
Author
Earth Gravitation; Mascons; Gravimetry; Gravity Anomalies; Temporal Distribution; Periodic Variations

20050071074 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Topography of the Flattest Surface on Earth: using ICESAT, GPS, and MISR to Measure Salt Surface Topography on Salar de Uyuni, Bolivia
Comstock, Robert L.; Bills, Bruce G.; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Salt flats are aptly named: they are composed largely of salt, and are maintained as nearly equipotential surfaces via frequent flooding. The salar de Uyuni, on the Altiplano in southwestern Bolivia, is the largest salt flat on Earth, with an area of 9,800 sq km. Except for a few bedrock islands, it has less than 40 cm of relief. The upper-most salt unit averages 5 m thick and contains 50 cu km of nearly pure halite. It includes most of the salt that was in solution in paleolake Minchin, which attained a maximum area of 60,000 sq km and a maximum depth of 150 m, roughly 15 kyr ago. Despite approx. 10 m of differential isostatic rebound since deposition, the salar surface has been actively maintained as an extraordinarily flat and smooth surface by annual flooding during the rainy season. We have used the strong optical absorption properties of water in the visible band to map spatial variations in water depth during a time when the salar was flooded. As water depth increases, the initially pure white surface appears both darker and bluer. We utilized MISR images taken during the interval from April to November 2001. The red and infra-red bands (672 and 867 nm wavelength) were most useful since the water depth is small and the absorption at those wavelengths is quite strong. Nadir pointed MISR images have 275 m spatial resolution. To aid in our evaluation of water depth variations over the saiar surface, we utilized two sources of direct topographic measurements: several ICESAT altimetry tracks cross the area, and a 40x50 km GPS grid was surveyed to calibrate ICESAT. A difficulty in using these data types is that both give salt surface elevations relative to the ellipsoid, whereas the water surface will, in the absence of wind or tidal disturbances, follow an equipotential surface. Geoid height is not known to the required accuracy of a few cm in the central Andes. As a result, before comparing optical absorption from MISR to salt surface topography from GPS or ICESAT, we removed the longest wavelengths from both.
Author
Flats (Landforms); Topography; Halites; Satellite Altimetry; Inland Waters; Shallow Water; Equipotentials; Water Depth

20050071075 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Validation of GLAS Range Measurement over Salar de Uyuni, Bolivia
[2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

NASA's Geoscience Laser Altimeter System (GLAS) on the Ice, Cloud and land Elevation Satellite (ICESat) is Earth's first polar-orbiting satellite laser altimeter. Its primary purpose is to measure ice sheet elevation change, with a scientific requirement of detecting changes as low as 1.5 centimeters per year. This goal requires precise calibration and validation of the instrument. One approach for validating the GLAS range measurement involves comparison with a land reference target. Dry salt lakes are ideal for this purpose since they are large, stable, easily surveyed using kinematic GPS, and have albedos similar to that of ice. We selected the largest dry salt lake in the world, the salar de Uyuni in Bolivia, as a reference target for GLAS. In September 2002 we surveyed a 54 x 45 kilometer area of the salar with car-mounted kinematic GPS, using the data to construct a DEM of the surface. To date there have been six ICESat passes across our survey area, along two intersecting tracks. The first two passes occurred during 'Laser 2A' operation (September to November 2003), the second two during 'Laser 2B' operation (February to March 2004), and the final two during 'Laser 2C' (June to July 2004). We compare GLAS elevations from all six passes with the salar de Uyuni DEM, showing how differing conditions between passes affected

the performance of the GLAS instrument and providing an estimate of the relative and absolute accuracy of the range measurement. To check our results, we also compare the GLAS elevations along the same tracks with the mean sea-surface derived from TOPEX over the ocean on either side of South America.
Author
Bolivia; Geophysics; Ice, Cloud and Land Elevation Satellite; Laser Altimeters; Rangefinding

20050071085 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Modeling the Salar de Uyuni, Bolivia as an Equipotential Surface of Earth's Gravity Field
Borsa, Adrian; Bills, Bruce; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004; No Copyright; Avail: Other Sources; Abstract Only

The salar de Uyuni is a massive dry salt lake that lies at the lowest point of an internal/drainage basin in the Bolivian Altiplano. Its topography is remarkable for its extraordinary flatness over almost a full degree of latitude and longitude. We surveyed a 54 x 45 km region of the salar with kinematic GPS in September, 2002 and found a topographic range of only 80 cm over the entire surveyed area. Furthermore, the survey revealed distinct surface features with several dominant wavelengths and orientations. Some of these appear to be aligned with orographic features that intersect the salar, leading us to conjecture that they are the surface expression of high-density mountains that have been buried by low-density basin sediments. Over the oceans, a similar correspondence between basin bathymetry and surface topography is exploited to map the seafloor using sea-surface satellite altimetry measurements, with the sea surface following geoid undulations due to the underwater mass distribution. On the salar, annual flooding creates a shallow lake whose surface also lies on a equipotential surface shaped by the distribution of underlying mass. The link to the actual salar surface is via the dissolution and redeposition of salt by the lake waters, which appears to push the system to an equilibrium of constant water depth and the coincidence of the shapes of the lake surface and bottom. To test our hypothesis about the origin of the surface features on the salar, we compare our GPS survey elevations with the equipotential surface generated from local gravity measurements in conjunction with gravity and potential values from the EGM96 global geopotential model. 50% of the variance of the GPS elevations can be explained by equipotential surface undulations from the EGM96 model alone, and an additional 40% is explained by the shorter-wavelength equipotential surface derived from local gravity. We examine the unexplained 10% of elevation variance from the standpoint of errors in the equipotential surface calculation and possible unmodelled surface processes.
Author
Earth Gravitation; Flats (Landforms); Gravimetry; Satellite Altimetry

20050071088 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Southern Alaska Glaciers: Spatial and Temporal Variations in Ice Volume
Sauber, J.; Molnia, B. F.; Lutchke, S.; Rowlands, D.; Harding, D.; Carabajal, C.; Hurtado, J. M.; Spade, G.; [2004]; 2 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Although temperate mountain glaciers comprise less than 1% of the glacier-covered area on Earth, they are important because they appear to be melting rapidly under present climatic conditions and, therefore, make significant contributions to rising sea level. In this study, we use ICESat observations made in the last 1.5 years of southern Alaska glaciers to estimate ice elevation profiles, ice surface slopes and roughness, and bi-annual and/or annual ice elevation changes. We report initial results from the near coastal region between Yakutat Bay and Cape Suckling that includes the Malaspina and Bering Glaciers. We show and interpret ice elevations changes across the lower reaches of the Bagley Ice Valley for the period between October 2003 and May 2004. In addition, we use off-nadir pointing observations to reference tracks over the Bering and Malaspina Glaciers in order to estimate annual ice elevation change. Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) and Shuttle Radar Topography Mission (SRTM) derived DEMs are used to estimate across track regional slopes between ICESat data acquisitions. Although the distribution and quantity of ICESat elevation profiles with multiple, exact repeat data is currently limited in Alaska, individual ICESat data tracks, provide an accurate reference surface for comparison to other elevation data (e.g. ASTER and SRTM X- and C-band derived DEMs). Specifically we report the elevation change over the Malaspina Glacier's piedmont lobe between a DEM derived from SRTM C-band data acquired in Feb. 2000 and ICESat Laser #2b data from Feb.-March 2004. We also report use of ICESat elevation data to enhance ASTER derived absolute DEMs. Mountain glaciers generally have rougher surfaces and steeper regional slopes than the ice sheets for which the ICESat design was optimized. Therefore, rather than averaging ICESat observations over large regions or relying on crossovers, we are working with well-located ICESat footprint returns to estimate glacier ice elevations and surface

characteristics. Additional information is included in the original extended abstract.
Author
Alaska; Glaciers; Melting; Mountains

20050071091 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Results in ICESat Geolocation Parameter Calibration from Range Residual Analysis
Luthcke, Scott B.; Rowlands, David D.; Carabajal, Claudia C.; Williams, Terry A.; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The Ice, Cloud and land Elevation Satellite (ICESat), launched on January 12, 2003, carries the Geoscience Laser Altimeter System (GLAS), which has a primary measurement of short-pulse laser-ranging to the Earths surface at 1064 nm wavelength at a rate of 40 pulses per second. The instrument has collected (at the time of this writing) over 540 million observations of the Earth's surface including precise elevation measurements of the ice sheets, sea ice roughness and thickness, ocean and land surface elevations and surface reflectivity. The accurate geolocation of GLASs surface returns, the spots from which the laser energy reflects on the Earths surface, is a critical issue in the scientific application of these data. Pointing, ranging, timing and orbit errors must be compensated to accurately geolocate the laser altimeter surface returns. Towards this end, the laser range observations can be fully exploited in an integrated residual analysis to accurately calibrate these geolocation/instrument parameters. The ICESat laser altimeter data have been simultaneously processed as direct altimetry from ocean sweeps and around-the-world scans along with dynamic crossovers in order to calibrate pointing ranging and timing. The analysis has resolved complex time varying signal resulting from thermal variations of instrument pointing and boresite shadowing. The calibration methodology and current calibration results are discussed along with future efforts and current geolocation accuracies.
Author
Calibrating; Geophysics; Ice, Cloud and Land Elevation Satellite; Ocean Surface; Position (Location)

20050071092 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GRACE KBR and Accelerometer Data Reduction and Calibration
Rowlands, David D.; Lutheke, Scott B.; Klosko, Steven M.; Lemoine, Frank G.; Williams, Terry A.; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, Ca, USA
Report No.(s): AGU-09605266; Copyright; Avail: Other Sources; Abstract Only

The Gravity Recovery and Climate Experiment (GRACE), launched on March 17, 2002, represents the state-of-the-art in geodetic observations of the static and time varying components of the Earth's geopotential field. The fundamental measurement used to observe gravity is the inter-satellite range and range rate between two coplanar, low altitude satellites obtained from a K-band ranging (KBR) system. In addition to the K-band ranging system, each satellite possess a Super-STAR Accelerometer, a GPS receiver/antenna package, Star Cameras and a Laser Retro Reflector (LRR) to complete the compliment of science instruments. The GRACE project has now released two years of Level 1B data derived from the science instruments and sensors. An integral component of our time variable gravity research is the reduction, calibration and analyses of these Level 1B data. In particular we have analyzed several months of K-band ranging (KBR1B), accelerometry (ACC1B) and GPS navigation (GNAV1B) data. Accelerometer calibration and KBR data reduction methodology and results will be presented. We discuss the impact of these analyses on the recovery of time variable gravity.
Author
Accelerometers; Calibrating; Climate; Data Reduction; Gravitation

20050071609 Navy Center for Acquisition Research, Monterey, CA, USA
Influence of Idealized Heterogeneity on Convective Planetary Boundary Layers Coupled to the Land Surface
Patton, E. G.; Sullivan, P. P.; Moeng, C. H.; May 2004; In English
Report No.(s): PB2005-101267; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the development and results of numerical experiments investigating the influence of 2-30 km strip-like heterogeneity on wet and dry convective boundary layers coupled to the land surface. The strip-like heterogeneity is shown to dramatically alter the structure of the free-convective boundary layer by inducing significant organized circulations that modify turbulent statistics. The coupling with the land-surface modifies the circulations compared to previous studies using fixed surface forcing. Total boundary layer turbulence kinetic energy increases significantly for surface heterogeneity at

scales between lambda/zi=4 and 9, however entrainment rates for all cases are largely unaffected by the strip-like heterogeneity.
NTIS
Atmospheric Boundary Layer; Free Convection; Heterogeneity; Turbulence; Air Land Interactions

20050080377 Air Force Research Lab., Hanscom AFB, MA USA
Estimating the Amplitude Scintillation Index From Sparsely Sampled Phase Screen Data
Beach, T. L.; Pedersen, T. R.; Strks, M. J.; Su, S.-Y; Sep. 2004; 18 pp.; In English
Report No.(s): AD-A429128; AFRL-VS-HA-TR-2004-1203; No Copyright; Avail: CASI; A03, Hardcopy

Phase screen techniques are commonly used to model scintillation of radio signals passing through a disturbed ionosphere, but observational phase or in situ density from both archival and real-time sources is often sampled at rates well below the resolution desired. Previous phase screen resolution criteria do not address the computation of the amplitude scintillation index (S4), which is widely used in scintillation monitoring systems, for practical applications that rely on coarsely sampled phase data. We investigate the accuracy of S4 estimates from sparsely populated one-dimensional phase screen models through systematic removal of samples from high-resolution discrete phase screen models in novel numerical experiments. We also provide analytic approximation for the weak-scatter case and study the effects of antialias filtering. This 'subsampling' analysis shows that 2-5 samples per Fresnel radius (rF) are usually sufficient to compute S4 to within 90% of its true value, depending on the form of the phase spectral density function (SDF) and the strength of scattering. We make initial application of the subsampling techniques to data-based phase screens for studying equatorial ionospheric scintillation with generally satisfactory results. Finally, we outline the use of the techniques developed in this paper to other practical problems, including SDF determination and computing irradiance patterns.
DTIC
Estimating; Sampled Data Systems; Satellite Communication; Scintillation

20050080386 Defence Science and Technology Organisation, Salisbury, Australia
The Operation of a Three Wavelength Nephelometer and Some Measurements Made at Jabiru During 2002
Carr, S. B.; Burridge, M. A.; Nov. 2004; 29 pp.; In English
Report No.(s): AD-A429140; DSTO-TN-0594; DODA-AR-013-268; No Copyright; Avail: CASI; A03, Hardcopy

The operation of a three wavelength integrating nephelometer is explained and summarized. This instrument was purchased by ISRD for studies of atmospheric aerosols which play an important role in the propagation of electro-magnetic radiation from the UV through to the mid wave W. Preliminary results are also reported on the aerosol scattering coefficient measurements made during the months of September through November 2002 at Jabiru in Kakadu National Park. This data will form the initial part of a long term aerosol monitoring program in the region to be conducted jointly by DSTO and CSIRO. The instrument has been re-installed at Jabiru from about mid September 2004 on an ongoing basis to enable data to be collected on the seasonal variation in aerosol properties. Details on the instrument's performance on an aircraft during experiments conducted during 2003 will be presented in separate reports.
DTIC
Aerosols; Nephelometers; Scattering

20050080416 Science Applications International Corp., San Diego, CA USA
Research on Seismic Calibration of the International Monitoring System in Northern Eurasia
Kent, Gerald I.; Nov. 2004; 572 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DSWA01-98-C-0029
Report No.(s): AD-A429209; SAIC-03/3006; DTRA-TR-02-8; No Copyright; Avail: Defense Technical Information Center (DTIC)

The main goals of the 'Russian Seismoacoustic Research for CTBT Monitoring' project were: Calibration of seismic stations of the Russian Academy of Sciences (RAS) included in the International Monitoring System (IMS), Development of travel time data for calibration studies in northern Eurasia, Collection data on peaceful nuclear explosions (PNEs) in the former Soviet Union, The Geophysical Survey (GS) of RAS and the Complex Seismological Expedition (CSE) of the Joint Institute of Physics of the Earth of the RAS, collected Northern Eurasian data on time arrivals for regional seismic phases. Tables for Pn, Pg, Sn and Lg waves have been updated. From travel-time residual analysis, we conclude that the LASPEI-91 predicted travel times are substantially biased in comparison with those predicted by Source Specific Station Corrections developed in this report. We review recently published and historical data on the parameters of PNEs' in the former Soviet

Union. The seismic locations of the International Seismological Center (ISC) for some PNEs' show large misallocations (greater than 101cm) according to newly found information on these PNEs' actual locations. For ISC estimates of origin times for some PNEs' in the paper of Sultanov et. al., 1999, we provide adjusted data.
DTIC
Asia; Calibrating; Europe; Seismology

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20050061116 Meteorological Satellite Center, Tokyo, Japan
Meteorological Satellite Center Technical Note
December 2004; ISSN 0388-9653; 30 pp.; In English; In Japanese; Original contains color and black and white illustrations; Copyright; Avail: Other Sources

Meteorological Satellite Center (MSC) has developed a high-density Atmospheric Motion Vector (AMV) product to suffice the recommendation by the Co-ordination Group of Meteorological Satellite (CGMS), that is the standardization of AMV in terms of retrieval method, quality information and the format of dissemination. MSC started the operation of the product at 12 UTC 22 May 2003. The most significant change of the derivation process from the previous one is the introduction of automatic quality control. The Quality Indicator (QI) method developed at EUropean organization for the exploitation of METeorological SATellite (EUMETSAT) and the Recursive Filter Function(RFF) method developed at University of Wisconsin - Co-operative Institute for Meteorological Satellite Studies (UW-CIMSS) are used for the quality control process. In addition, the internal among the candidate grid points in the target selection process was made smaller as half as before to yield the finer spatial resolution AMVs. The high-density AMVs with the quality information of QI and RFF are coded into the World Meteorological Organization (WMO) code form FM 94 BUFR (Binary Universal Form for the Representation of meteorological data) and disseminated to users within 1 hour from the observation. The results of comparison between high-density AMVs and radiosonde winds show the accuracy of the high density AMVs is almost the same levels as that of previous MSC's AMV which human operators had the quality checked. The ranges of Root Mean Square error of Vector Difference (RMSVD) are 8 to 10 m/s for infra-red vectors, 3 to 5 m/s for visible vectors and 8 to 9 m/s for water vapor vectors. Further development on some parts of AMV algorithm is underway such as height assignment and pattern matching which should lead to the improvement of the accuracy.
Author
Atmospheric Models; Atmospheric Circulation; Wind (Meteorology)

20050061326 NASA Langley Research Center, Hampton, VA USA
Technical Training on High-Order Spectral Analysis and Thermal Anemometry Applications
Maslov, A. A.; Shiplyuk, A. N.; Sidirenko, A. A.; Bountin, D. A.; Sep. 2003; 1 pp.; In English
Report No.(s): AD-A427723; No Copyright; Avail: CASI

The topics of thermal anemometry and high-order spectral analyses were the subject of the technical training. Specifically, the objective of the technical training was to study: (i) the recently introduced constant voltage anemometer (CVA) for high-speed boundary layer; and (ii) newly developed high-order spectral analysis techniques (HOSA). Both CVA and HOSA are relevant tools for studies of boundary layer transition and stability.
DTIC
Anemometers; Education; Spectrum Analysis; Thermodynamic Properties; Velocity Measurement

20050061343 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mineralogy of Fine-Grained Rims in the ALH 81002 CM Chondrite
Lauretta, D. S.; Hua, X.; Buseck, P. R.; Geochim. Cosmochim. Acta 64; 2000; Volume 64, pp. 3263-3273; In English
Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources

No abstract available
Chondrites; Meteorites; Rims

20050070876 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Observing the Global Water Cycle from Space

Hildebrand, P. H.; [2004]; 1 pp.; In English; AGU Fall Meeting, 12-16 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

This paper presents an approach to measuring all major components of the water cycle from space. Key elements of the global water cycle are discussed in terms of the storage of water-in the ocean, air, cloud and precipitation, in soil, ground water, snow and ice, and in lakes and rivers, and in terms of the global fluxes of water between these reservoirs. Approaches to measuring or otherwise evaluating the global water cycle are presented, and the limitations on known accuracy for many components of the water cycle are discussed, as are the characteristic spatial and temporal scales of the different water cycle components. Using these observational requirements for a global water cycle observing system, an approach to measuring the global water cycle from space is developed. The capabilities of various active and passive microwave instruments are discussed, as is the potential of supporting measurements from other sources. Examples of space observational systems, including TRMM/GPM precipitation measurement, cloud radars, soil moisture, sea surface salinity, temperature and humidity profiling, other measurement approaches and assimilation of the microwave and other data into interpretative computer models are discussed to develop the observational possibilities. The selection of orbits is then addressed, for orbit selection and antenna size/beamwidth considerations determine the sampling characteristics for satellite measurement systems. These considerations dictate a particular set of measurement possibilities, which are then matched to the observational sampling requirements based on the science. The results define a network of satellite instrumentation systems, many in low Earth orbit, a few in geostationary orbit, and all tied together through a sampling network that feeds the observations into a data-assimilative computer model.

Author

Satellite Observation; Precipitation Measurement; Ground Water; Atmospheric Temperature; Geosynchronous Orbits

20050070878 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Variability and Extremes of Precipitation in the Global Climate as Determined by the 25-Year GEWEX/GPCP Data Set

Adler, R. F.; Gu, G.; Curtis, S.; Huffman, G. J.; Bolvin, D. T.; Nelkin, E. J.; [2005]; 1 pp.; In English; 85th AMS Annual Meeting, 9-13 Jan. 2005, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The Global Precipitation Climatology Project (GPCP) 25-year precipitation data set is used to evaluate the variability and extremes on global and regional scales. The variability of precipitation year-to-year is evaluated in relation to the overall lack of a significant global trend and to climate events such as ENSO and volcanic eruptions. The validity of conclusions and limitations of the data set are checked by comparison with independent data sets (e.g., TRMM). The GPCP data set necessarily has a heterogeneous time series of input data sources, so part of the assessment described above is to test the initial results for potential influence by major data boundaries in the record. Regional trends, or inter-decadal changes, are also analyzed to determine validity and correlation with other long-term data sets related to the hydrological cycle (e.g., clouds and ocean surface fluxes). Statistics of extremes (both wet and dry) are analyzed at the monthly time scale for the 25 years. A preliminary result of increasing frequency of extreme monthly values will be a focus to determine validity. Daily values for an eight-year are also examined for variation in extremes and compared to the longer monthly-based study.

Author

Secular Variations; Precipitation (Meteorology); Climate; Extremum Values

20050071095 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Effects of Aerosol on Atmospheric Dynamics and Hydrologic Processes during Boreal Spring and Summer

Lau, William K. M.; Kim, M. K.; Chin, Mian; Kim, K. M.; [2005]; 1 pp.; In English; 85th AMS Annual Meeting, 9-13 Jan. 2005, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Global and regional climate impacts of present-day aerosol loading during boreal spring are investigated using the NASA finite volume General Circulation Model (fvGCM). Three-dimensional distributions of loadings of five species of tropospheric aerosols, i.e., sulfate, black carbon, organic carbon, soil dust, and sea salt are prescribed from outputs of the Goddard Ozone Chemistry Aerosol Radiation and Transport model (GOCART). The aerosol loadings are used to calculate the extinction coefficient, single scattering albedo, and asymmetric factor at eleven spectral wavelengths in the radiative transfer code. We find that aerosol-radiative forcing during boreal spring excites a wavetrain-like pattern in tropospheric temperature and geopotential height that emanates from Northern Africa, through Eurasia, to northeastern Pacific. Associated with the teleconnection is strong surface cooling over regions with large aerosol loading, i.e., China, India, and Africa. Low-to-mid tropospheric heating due to shortwave absorption is found in regions with large loading of dust (Northern Africa, and central

East Asia), and black carbon (South and East Asia). In addition pronounced surface cooling is found over the Caspian Sea and warming over Eurasian and northeastern Asia, where aerosol loadings are relatively low. These warming and cooling are components of teleconnection pattern produced primarily by atmospheric heating from absorbing aerosols, i.e., dust from North Africa and.black carbon from South and East Asia. Effects of aerosols on atmospheric hydrologic cycle in the Asian monsoon region are also investigated. Results show that absorbing aerosols, i.e., black carbon and dust, induce large-scale upper-level heating anomaly over the Tibetan Plateau in April and May, ushering in an early onset of the Indian summer monsoon. Absorbing aerosols also enhance lower-level heating and anomalous ascent over northern India, intensifying the Indian monsoon. Overall, the aerosol-induced large-scale surface temperature cooling leads to a reduction of monsoon rainfall over the East Asia continent, and adjacent oceanic regions.
Author
Aerosols; Atmospheric General Circulation Models; Atmospheric Temperature; Climatology; Radiative Transfer; Attenuation Coefficients; Radiation Transport

20050071099 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Insights into Tropospheric Ozone from the INTEX Ozonesonde Network Study (IONS)
Thompson, Anne M.; Witte, J. C.; Kucsera, T. L.; Merrill, J. T.; Morris, G.; Newchurch, M. J.; Oltmans, S. J.; Schmidlin, F. J.; Tarasick, D. J.; [2004]; 1 pp.; In English; 2004 Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Ozone profile data from soundings integrate models, aircraft and other ground-based measurements for better interpretation of atmospheric chemistry and dynamics. A well-designed network of ozonesonde stations, with consistent sampling, can answer questions not possible with short campaigns or current satellite technology. The SHADOZ (Southern Hemisphere Additional Ozonesondes) project, for example, has led to these findings about tropical ozone: definition of the zonal tropospheric wave-one pattern in equatorial ozone, characterization of the 'Atlantic ozone paradox' and establishment of a link between tropical Atlantic and Indian Ocean pollution. Building on the SHADOZ concept, a short-term ozone network was formed in July-August 2004 to coordinate ozonesonde launches during the ICARTT/INTEX/NEAQS (International Consortium on Atmospheric Research on Transport and Transformation)/Intercontinental Transport Experiment/New England Air Quality Study. In IONS (INTEX Ozonesonde Network Study), more than 250 soundings, with daily frequency at half the sites, were launched from eleven North American stations and an oceanographic ship in the Gulf of Maine. Although the goal was to examine pollution influences under stable high-pressure systems and transport associated with 'warm conveyor belt' flows, the INTEX study region was dominated by a series of weak frontal system that mixed aged pollution with stratospheric ozone in the middle troposphere. Deconvoluting ozone sources provides new insights into ozone in the transition between mid-latitude and polar air.
Author
Ozone; Atmospheric Chemistry; Tropospheric Waves; Air Quality; Atmospheric Circulation

20050071610 Geological Survey, Austin, TX, USA
Empirical, Dimensionless, Cumulative-Rainfall Hyetographs Developed from 1959-86 Storm Data for Selected Small Watersheds in Texas
Williams-Sether, T.; Asquith, W. H.; Thompson, D. B.; Cleveland, T. G.; Fang, X.; Aug. 2004; 136 pp.; In English
Report No.(s): PB2005-102634; USGS-SIR-2004-5075; No Copyright; Avail: CASI; A07, Hardcopy

A database of incremental cumulative-rainfall values for storms that occurred in urban and small rural watersheds in north and south central Texas during the period 1959 to 1986 was used to develop empirical, dimensionless, cumulative-rainfall hyetographs. Storm-quartile classifications were determined from the cumulative- rainfall values, which were divided into data groups on the basis of storm-quartile classification (first, second, third, fourth, and first through fourth combined), storm duration (0 to 6, 6 to 12, 12 to 24, 24 to 72, and 0 to 72 hours), and rainfall amount (1 inch or more). Removal of long leading tails, in effect, shortened the storm duration and, in some cases, affected the storm-quartile classification. Therefore, two storm groups, untrimmed and trimmed, were used for analysis. The trimmed storms generally are preferred for interpretation. For a 12- hour or less trimmed storm duration, approximately 49 percent of the storms are first quartile. For trimmed storm durations of 12 to 24 and 24 to 72 hours, 47 and 38 percent, respectively, of the storms are first quartile. For a trimmed storm duration of 0 to 72 hours, the first-, second-, third-, and fourth-quartile storms accounted for 46, 21, 20, and 13 percent of all storms, respectively. The 90th-percentile curve for first-quartile storms indicated about 90 percent of the cumulative rainfall occurs during the first 20 percent of the storm duration. The 10th-percentile curve for first-quartile storms indicated about 30 percent of the cumulative rainfall occurs during the first 20 percent of the storm duration. The 90th-percentile curve for fourth-quartile storms indicated about 33 percent of the cumulative rainfall occurs during the first 20 percent of the storm

duration. The 10th-percentile curve for fourth-quartile storms indicated less than 5 percent of the cumulative rainfall occurs during the first 20 percent of the storm duration. Statistics for the empirical, dimensionless, cumulative-rainfall hyetographs are presented in the report along with hyetograph curves and tables. The curves and tables presented do not present exact mathematical relations but can be used to estimate distributions of rainfall with time for small drainage areas of less than about 160 square miles in urban and small rural watersheds north and south central in Texas.
NTIS
Storms; Dimensionless Numbers; Drainage

20050071636 Kentucky Univ., Lexington, KY, Kentucky Transportation Cabinet, Frankfort, KY
Revision of the Rainfall-Intensity Duration Curves for the Commonwealth of Kentucky
Dupont, B. S.; Allen, D. L.; Mar. 2000; In English
Report No.(s): PB2005-102675; KTC-00-18; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the study was to revise and update the already existing Rainfall Intensity-Duration-Frequency Curves for the Commonwealth of Kentucky. There were basically four steps in the process: determine the Areas of Influence; gather data from those areas; analyze the data; and produce the curves. During the course of the project, it was determined that two major revisions in the procedures were necessary. The first revision was to change the way the Areas of Influence were determined; and the second revision was to utilize some data that was generated mathematically. As a result, there are now only four curves that represent the state instead of nine.
NTIS
Rain; Frequencies

20050071641 Desert Research Inst., Reno, NV, USA, Iowa State Univ. of Science and Technology, Ames, IA, USA
Collaborative Research on Road Weather Observations and Predictions by Universities, State DOTs and National Weather Service Forecast Offices
Johnson, V.; Koracin, D.; Gallus, W.; Fitzjarrald, D. R.; Knight, P.; Sep. 2004; In English
Report No.(s): PB2005-102665; No Copyright; Avail: National Technical Information Service (NTIS)

The Federal Highway Administration (FHWA) Road Weather Management program partnered with the National Weather Service (NWS) to sponsor five research projects through the Cooperative Program for Operational Meterology, Education, and Training (COMET). The goal was to create teams of personel from State departments of transportation (DOT), NWS Weather Forecast Offices (WFO), and universities to foster collaborative and productive relationships between meterological and transportation agencies. These teams were to use data from Road Weather Information Systems (RWIS) to improve the utilization of these data in both weather and transportation operations and to create new predictive algorithms for use in road maintenance activities. Such advances in road weather management ultimately will improve mobility on the roads, and DOT productively in operations.
NTIS
Research Projects; Weather Forecasting; Roads; Transportation Networks

20050080342 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Hurricane Relief Operations in the Caribbean: Is the Use of the Military in Hurricane Relief Operations
Robinson, George N.; Jun. 2004; 82 pp.; In English
Report No.(s): AD-A429074; No Copyright; Avail: Defense Technical Information Center (DTIC)

Considering meteorological projections, the frequency and magnitude of hurricanes in the Caribbean appear more probable in the future. Correspondingly, this necessitates a more organized response to such threats of devastation. Additional hurricane relief operations increase resource consumption and reduce already scarce resources that are required for competing foreign and domestic policy objectives. This study examines hurricane relief operations to determine if there is an appropriate role for the Armed Forces of the Caribbean in managing the response to hurricanes in the Caribbean Islands. The author examines the existing Caribbean agreement that established the Caribbean Disaster Response Agency (CDERA) and compares it to an agreement that exists in the USA of America, the Emergency Management Assistance Compact (EMAC) . This comparison reveals organizational structural strengths and deficiencies that may facilitate or impede the role of the Caribbean military in providing assistance to the civil authorities during hurricane relief missions. Finally, it studies the deficiency that exists in the Caribbean military's ability to perform hurricane relief missions and the counter arguments against an appropriate role of the Caribbean military. The author concludes that there is an appropriate role for the Armed Forces of the Caribbean

in hurricane relief operations and recommends a new policy approach for achieving this objective. (2 tables, 2 figures, 40 refs.)
DTIC
Armed Forces; Caribbean Region; Emergencies; Hurricanes; Management Methods; Military Operations; Policies; West Indies

20050080352 Desert Research Inst., Reno, NV USA
Multispectral Remote Sensing and COAMPS Model Analysis Methods for Marine Cloud Structure, Entrainment Processes and Refractivity Effects
Wetzel, Melanie A.; Chai, Steven K.; Koracin, Darko R.; Dec. 2004; 19 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0295
Report No.(s): AD-A429089; No Copyright; Avail: CASI; A03, Hardcopy

The primary goal of this research is advancement in the utilization of satellite remote sensing methods with mesoscale simulation models for improved prediction of marine stratus and boundary layer structure. Related goals include the study of marine stratus evolution and analysis of microwave refractivity at the interface of the cloudy marine layer and the free troposphere. High accuracy for short-term prediction of cloud and inversion structure in marine environments is required for Navy operations, particularly in the vicinity of stratus and fog decks. Knowledge related to the probable evolution of cloud fractional cover, cloud liquid water profiles, the presence of precipitation and microwave ducting conditions are essential for effective logistical decision-making. Our research objectives focus on the optimum utilization of parameter fields from the Navy's COAMPS and other mesoscale forecasting models with geostationary satellite data for monitoring and predicting the short-term physical characteristics of the marine boundary layer cloud and thermodynamic conditions.
DTIC
Air Water Interactions; Cloud Physics; Clouds (Meteorology); Detection; Entrainment; Marine Environments; Marine Meteorology; Mesometeorology; Mesoscale Phenomena; Numerical Analysis; Prediction Analysis Techniques; Refraction; Refractivity; Remote Sensing; Stratus Clouds; Weather Forecasting

20050080401 Pennsylvania State Univ., University Park, PA USA
Ensemble Forecasting with the Ensemble Transform Kalman Filter
Wang, Xugueng; Aug. 2004; 84 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0106
Report No.(s): AD-A429161; No Copyright; Avail: CASI; A05, Hardcopy

The ensemble transform Kalman filter (ETKF) initial ensemble perturbation generation scheme is introduced and compared with the simple and masked breeding schemes. Instead of directly multiplying each forecast perturbation with a rescaling factor to generate the initial perturbations as in the breeding schemes, the ETKF generates initial perturbations by postmultiplying the forecast perturbations by a transformation matrix. This matrix is chosen to ensure that the ensemble-based analysis error convariance matrix would be equal to the true analysis error convariance if the convariance matrix of the raw forecast perturbations were equal to the true forecast error convariance matrix and the data assimilation scheme were optimal. For small ensembles (^100), the computational expense of the ETKF ensemble generation is only slightly greater than that of the masked breeding scheme.
DTIC
Forecasting; Kalman Filters

48
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*.

20050070842 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Real Data and Rapid Results: Ocean Color Data Analysis with Giovanni (GES DISC Interactive Online Visualization and ANalysis Infrastructure)
Acker, J. G.; Leptoukh, G.; Kempler, S.; Gregg, W.; Berrick, S.; Zhu, T.; Liu, Z.; Rui, H.; Shen, S.; [2004]; 2 pp.; In English; AGU Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) has taken a major step addressing the challenge of using archived Earth Observing System (EOS) data for regional or global studies by developing an

infrastructure with a World Wide Web interface which allows online, interactive, data analysis: the GES DISC Interactive Online Visualization and ANalysis Infrastructure, or 'Giovanni.' Giovanni provides a data analysis environment that is largely independent of underlying data file format. The Ocean Color Time-Series Project has created an initial implementation of Giovanni using monthly Standard Mapped Image (SMI) data products from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) mission. Giovanni users select geophysical parameters, and the geographical region and time period of interest. The system rapidly generates a graphical or ASCII numerical data output. Currently available output options are: Area plot (averaged or accumulated over any available data period for any rectangular area); Time plot (time series averaged over any rectangular area); Hovmeller plots (image view of any longitude-time and latitude-time cross sections); ASCII output for all plot types; and area plot animations. Future plans include correlation plots, output formats compatible with Geographical Information Systems (GIs), and higher temporal resolution data. The Ocean Color Time-Series Project will produce sensor-independent ocean color data beginning with the Coastal Zone Color Scanner (CZCS) mission and extending through SeaWiFS and Moderate Resolution Imaging Spectroradiometer (MODIS) data sets, and will enable incorporation of Visible/lnfrared Imaging Radiometer Suite (VIIRS) data, which will be added to Giovanni. The first phase of Giovanni will also include tutorials demonstrating the use of Giovanni and collaborative assistance in the development of research projects using the SeaWiFS and Ocean Color Time-Series Project data in the online Laboratory for Ocean Color Users (LOCUS). The synergy of Giovanni with high-quality ocean color data provides users with the ability to investigate a variety of important oceanic phenomena, such as coastal primary productivity related to pelagic fisheries, seasonal patterns and interannual variability, interdependence of atmospheric dust aerosols and harmful algal blooms, and the potential effects of climate change on oceanic productivity.
Derived from text
Ocean Color Scanner; Data Processing; Climate Change; Imaging Techniques; Sea-Viewing Wide Field-of-View Sensor; Water Color

20050071073 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dynamics of the Cold Water Event off the Southeast Coast of the USA in the Summer of 2003: An Application of NASA's Remote Sensing Data to Coastal Studies
Yuan, Dongliang; Savtchenko, Andrey; Li, Chunyan,; [2004]; 1 pp.; In English; AGU Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The Moderate Resolution Imaging Spectroradiometer (MODIS) instruments onboard of Terra and Aqua satellites provide, for the first time, concurrent measurements of sea surface temperature (SST) and ocean color, which are suitable for coastal upwelling studies. The accuracy, the 1-km spatial resolution, and the almost complete daily coverage of the MODIS data compared with historical measurements make it advantageous for resolving important coastal fronts of chlorophyll concentration and temperature. The cold SST anomaly during summer 2003 off the coast of the South Atlantic Bight is an event that is comprehensively covered by NASA's MODIS and SeaWinds satellite observations. These data combined with in situ tide gauge, mooring, and ship measurements can be used to identify important dynamics responsible for the anomalous cold water event. The analysis of the data suggests that coastal upwelling occurs in the climatological summer forced by the climatological southerlies over the South Atlantic Bight area in summer. However, the strong buoyancy barrier in summer prevents the cold water below the thermocline from reaching the ocean surface. In summer 2003, the southwesterlies in July through August were extraordinarily strong and persistent, which generated the upwelling currents strong enough to overcome the buoyancy resistance. The results of this analysis demonstrate the possibility of monitoring and forecasting the event using combination of the satellite and in situ observations. The MODIS data are archived and distributed by the NASA's Goddard Earth Science (GES) Distributed Active Archive Center (DAAC). The data can be accessed via the URL http://wwv.daac.gsfc.nasa.gov/MODIS.
Author
MODIS (Radiometry); Cold Water; Coastal Water; Ocean Dynamics; Atlantic Ocean

20050071097 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Oceanic Tidal Mixing As a Contributor to Milankovitch-scale Climate Change
Munk, Walter; Bills, Bruce; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

We propose that changes in the magnitude of oceanic tidal mixing on long time scales is an important, but previously unrecognized, contributor to global climate change. it is well known that Earth's orbital and rotational state changes significantly on 10(exp 4)-10(exp 5) year time scales, and that this influences the spatial and temporal pattern of incident radiation. It is widely supposed that climatic variations on these same time scales are, in large part, a response of the

ocean-atmosphere-cryosphere system to this radiative forcing. Our proposal is that variations in the luni-solar tidal potential, induced by these same orbital and rotational variations, influences oceanic mixing and thus modulates meridional heat transport, by amounts which are competitive with the radiative forcing. There are some obvious differences between tidal potential and insolation. First is that the Sun and Moon both contribute to tides, whereas the radiation is entirely of solar origin. Second is that the Earth is transparent to gravity but opaque to radiation. Clipping associated with this opacity makes the radiation pattern temporal spectrum rather more complex than the tidal spectrum. A third point is that solar radiation directly delivers energy to Earth's surface whereas tidal mixing will only expedite lateral transport of heat in association with oceanic thermohaline circulation. The diurnal average insolation pattern is best parameterized via a Fourier series in time of year and Legendre polynomials in sine of latitude. Our present focus will be on the annual average terms. The Legendre degree n=0 term describes the global average insolation, and is nearly constant. The degree n=l term describes differences between northern and southern hemispheres, and the annual mean is zero. The degree n=2 term is the main contributor to the equator to pole variations, and varies with obliquity and orbital eccentricity, with the obliquity variation dominating. The lowest order decomposition of the tidal potential recognizes 3 constituents: semi-diurnal, diurnal, and long period, with solar and lunar contributions to each. Our present focus will be on long term variations in the mean square amplitude of the semi-diurnal constituent, with averaging over all the short period variations. For the solar tide that includes the day and year. For the lunar tide it includes the day, month, year, and the apsidal (8.85 year) and nodal (18.6 year) periods. We present calculations of the variations in radiative and tidal forcing for the past 3 million years. The two signals are quite similar. Both vary by approximately 1% of their respective mean values, are dominated by obliquity variations, and exhibit only secondary influence from orbital eccentricity.

Author

Climate Change; Lunar Tides; Oceanography; Geophysics; Climatology

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*.

20050061203 Wyle Labs., Inc., Houston, TX, USA

Elevated Skin Blood Flow Influences Near Infrared Spectroscopy Measurements During Supine Rest

Lee, Stuart M. C.; Clarke, Mark S. F.; October 2004; 24 pp.; In English

Report No.(s): NASA/TP-2004-213149; S-942; IADS5-7.1; No Copyright; Avail: CASI; A03, Hardcopy

Near infrared spectroscopy is a non-invasive technique that allows determination of tissue oxygenation/blood flow based on spectrophotometric quantitation of oxy- and deoxyhemoglobin present within a tissue. This technique has gained acceptance as a means of detecting and quantifying changes in tissue blood flow due to physiological perturbation, such as that which is elicited in skeletal muscle during exercise. Since the NIRS technique requires light to penetrate the skin and subcutaneous fat in order to reach the muscle of interest, changes in skin blood flow may alter the NIRS signal in a fashion unrelated to blood flow in the muscle of interest. The aim of this study was to determine the contribution of skin blood flow to the NIRS signal obtained from resting vastus lateralis muscle of the thigh.

Author

Blood Flow; Musculoskeletal System; Near Infrared Radiation; Skin (Anatomy); Supine Position; Spectroscopy; Rest

20050070627 Houston Univ., TX, USA

Effects of Convective Transport of Solute and Impurities on Defect-Causing Kinetics Instabilities in Protein Crystalization

Vekilov, Peter G.; [2003]; 3 pp.; In English

Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: CASI

No abstract available

Crystal Defects; Protein Crystal Growth; Solutes

20050070628 Houston Univ., TX, USA
Effects of Convective Transport of Solute and Impurities on Defect-Causing Kinetics Instabilities in Protein Crystallization
Vekilov, Peter G.; [2003]; 3 pp.; In English
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Crystallization; Proteins

20050070629 NASA Marshall Space Flight Center, Huntsville, AL, USA
Solvent Entropy Contribution to the Free Energy of Protein Crystallization
Vekilov, P. G.; Petsev, D. N.; Yau, S.-T.; Feeling-Taylor, A.; [2002]; 3 pp.; In English; 9th International Conference on Crystallization of Biological Macromolecules, 21-26 Mar. 2002, Jena, Germany
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Entropy

20050070630 Houston Univ., TX, USA
Fundamental Aspects of Nucleation Theory in the Formation of Protein Condensed Phases
Vekilov, Peter G.; April 02, 2002; 3 pp.; In English
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Nucleation

20050070635 Houston Univ., TX, USA
Direct Visualization of Nucleus Structure and Nucleation Pathways in Apoferritin Crystallization
You, S.-T.; Petsev, D. N.; Vekilov, P. G.; 2001; 3 pp.; In English; 13th International Conference on Crystal Growth, Jul. 30 - Aug. 4, 2001, Kyoto, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Nucleation

20050070636 Houston Univ., TX, USA
Characteristic Lengthscales of the Protein Crystallization Processes: Where Can Gravity Affect Growth
Vekilov, P. G.; Yau, S.-T.; Lin, H.; 2001; 3 pp.; In English; 13th International Conference on Crystal Growth, Jul. 30 - Aug. 4, 2001, Kyoto, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Gravitational Effects

20050070637 Houston Univ., TX, USA
Dynamics of Pattern Formation on Protein Crystal Surfaces
Gliko, O.; Lin, H.; Yau, S.-T.; Reviakine, I.; Vekiloe, P. G.; 2003; 3 pp.; In English; 2003 Surfaces and Interfaces Conference, 29-31 Jan. 2003, Lille, France
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Proteins; Crystal Surfaces

20050070639 Houston Univ., TX, USA
Nucleation Dynamics of Protein Solid Phases
Galkin, O.; Vekilov, P. G.; 2002; 3 pp.; In English; 223 National Meeting of the American Chemical Society, 7-11 Apr. 2002, Orlando, FL, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Solid Phases; Proteins

20050070640 Houston Univ., TX, USA
Hydration Interactions Between Apoferritin Molecules and the Phase Behavior of the Solution
Vekilov, Peter G.; Petsev, D. N.; Brandon, S.; Katsonis, P.; [2003]; 2 pp.; In English; 225th National Meeting of the American Chemical Society, 22-27 Mar. 2003, Nw Orleans, LA, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Proteins; Phase Transformations

20050070644 Houston Univ., TX, USA
Characteristic Lengthscales of the Protein Crystallization Processes: Where can Gravity Affect Growth
Vekilov, P. G.; Yau, S.-T.; Lin, H.; Petsev, D.; Thomas, B.; 2000; 3 pp.; In English; Japan Space Utilization Promotion Center, Dec. 12, 2000, Tokyo, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Gravitational Effects

20050070645 Houston Univ., TX, USA
How do Molecules Arrange Themselves into Protein Crystals?
Vekilov, P. G.; Yau, S.-T.; Galkin, O.; Petsev, D.; Thomas, B.; 2000; 3 pp.; In English; Tohoku Univ. Seminar, Dec. 13, 2000, Sendai, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Crystallization

20050070646 Houston Univ., TX, USA
How do Molecules Arrange Themselves into Crystals?
Vekilov, P. G.; Yau, S.-T.; Galkin, O.; Petsev, D.; Thomas, B.; 2000; 3 pp.; In English; Hokaido National Industrial Research Inst. Seminar, Dec. 8, 2000, Sapporo, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Crystallization; Protein Crystal Growth

20050070647 Houston Univ., TX, USA
Does the Anisotropy of the Intermolecular Interactions Determine the Protein Crystal Symmetry?
Petsev, D. N.; Shah, M.; Galkin, O.; Wu, X.; Vekilov, P. G.; 2004; 3 pp.; In English; 2004 Annual Meeting of the American Crystallographic Association, 17-22 Jul. 2004, Chicago, IL, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Anisotropy; Symmetry; Molecular Interactions; Crystal Morphology

20050070648 Houston Univ., TX, USA
Nonlinear Dynamics and Pattern Formation on the Growth Interfaces of Protein Crystals
Vekilov, P. G.; Yau, S.-T.; Lin, H.; Gliko, O.; 2002; 3 pp.; In English; 223 National Meeting of the American Chemical Society, 7-11 Apr. 2002, Orlando, FL, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Interfaces

20050070649 Houston Univ., TX, USA
Control Strategy for Nucleation of Protein Solid Phases
Vekilov, P. G.; Galkin, O.; 2002; 3 pp.; In English; International Meeting on Particles 2002, 20-23 Apr. 2002, Orlando, FL, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Solid Phases; Protein Crystal Growth

20050070650 Houston Univ., TX, USA
Water Structuring and the Dynamics of Phase Transitions with Proteins
Vekilov, P. G.; 2004; 3 pp.; In English; 12th Texas Protein Folders' Meeting, 28-30 May 2004, Navasota, TX, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Phase Transformations; Proteins; Water

20050070651 Houston Univ., TX, USA
Two-step Mechanism for the Nucleation of Crystals from Solution
Vekilov, P. G.; Galkin, O.; Filobelo, L.; Pan, W.; Kolomeisky, A.; 2004; 3 pp.; In English; 14th International Conference on Crystal Growth, 9-14 Aug. 2004, Grenoble, France
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Nucleation

20050070739 Houston Univ., TX, USA
Mechanisms of Crystallization Form Solutions: A Short Cause
Vekilov, P. G.; 2001; 3 pp.; In English; Technology Research Center of Finland, 7-8 Jun. 2001, Helsinki, Finland
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Crystallization; Protein Crystal Growth; Solutions; Microgravity

20050070740 Houston Univ., TX, USA
Defect Formation During Crystallization of Ferritins: Molecular Mechanisms
Yau, S.-T.; Thomas, B. R.; Petsev, D. N.; Galkin, O.; Gliko, O; Vekilov, P. G.; 2002; 3 pp.; In English; 2002 American Crystallographic Association Meeting, 25-30 May 2002, San Antonio, TX, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Crystal Defects

20050070741 Houston Univ., TX, USA
Liquid-Liquid Separation in Solutions of Proteins: Implications for the Formation of Condensed Phases
Galkin, O.; Vekilov, P. G.; 2001; 3 pp.; In English; 13th International Conference on Crystal Growth, Jul. 30. - Aug. 4, 2001, Kyoto, Japan
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Liquid Phases; Protein Crystal Growth; Liquid-Liquid Interfaces; Condensing; Solutions

20050070742 Houston Univ., TX, USA
Fundamental Aspects of Nucleation Theory in the Formation of Protein Condensed Phases
Vekilov, P. G.; Materials Science Laboratory, National Institute of Standards and Technology; 2002; 3 pp.; In English; Materials Science Laboratory, National Institute of Standards and Technology, Sep. 17, 2002, Gaithersburg, MD, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Nucleation; Proteins

20050070743 Houston Univ., TX, USA
Intermolecular Interactions and the Thermodynamics and Kinetics of Phase Transitions in Protein Solutions
Vekilov, P. G.; Petsev, D. N.; Brandon, S.; Katsonis, P.; 2003; 3 pp.; In English; 2003 Annual Meeting of the American Crystallographic Association, 26-31 Jul. 2003, Covington, KY, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Molecular Interactions; Phase Transformations; Thermodynamics; Proteins; Kinetics

20050070744 Houston Univ., TX, USA
Atto- and Femto-Litter Droplets of Concentrated Protein Solutions: Liquid-Liquid Phase Separation
Shah, M.; Galkin, O.; Petsev, D. N.; Wu, M.; Vekilov, Peter G.; [2002]; 3 pp.; In English; Texas Nano-Vivo Summit, 1 Aug. 2002, Houston, TX, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Drops (Liquids); Proteins

20050070745 Houston Univ., TX, USA
Crystallization of Small and Large Molecules
Vekikov, P. G.; Petsev, D. N.; Yau, S.-T.; Chen, K.; 2001; 3 pp.; In English; 9th Inhalation Technology Seminar, Jun. 6, 2001, Orion Pharma, Espoo, Finland
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Crystallization; Molecules; Protein Crystal Growth; Microgravity

20050070746 Houston Univ., TX, USA
Mechanisms of Nucleation of the Deoxy-HBS Polymers
Galkin, O.; Vekilov, P. G.; 2003; 3 pp.; In English; Laboratory of Chemical Physics National Institute of Diabetes and Digestive and Kidney Diseases, 12 Sep. 2003, Bethesda, MD, USA
Contract(s)/Grant(s): NAG8-1854; No Copyright; Avail: Other Sources
No abstract available
Nucleation; Polymers; Deoxygenation

20050070747 Houston Univ., TX, USA
Miniaturized Scintillation Technique for Protein Solubility Determinations
Feeling-Taylor, R.; Banish, R. M.; Hirsch, R. Elison; Vekilov, P. G.; Rev. Sci. Instr.; 1999; Volume 70, pp. 2845-2849; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Scintillation; Proteins; Solubility

20050070748 Houston Univ., TX, USA
Mechanisms of Homogeneous Nucleation of Polymers of Sickle Cell Anemia Hemoglobin in Deoxy-State
Galkin, O.; Vekilov, P. G.; J. Mol. Biol.; 2004; Volume 336, pp. 43-59; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Nucleation; Hemoglobin; Anemias

20050070749 Houston Univ., TX, USA
Dynamics of Phase Transition in Proteins Solutions
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Molecules; Protein Crystal Growth; Statistics; Microgravity; Statistical Analysis

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Aggregates; Molecules; Solutions; Attachment

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Diffusion; Crystallization; Growth

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Crystals; Nucleation; Proteins

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Coefficients; Crystals; Impurities; Lysozyme; Proteins

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Diffusion; Kinetics; Phase Transformations; Molecules; Microgravity; Solid Phases; Solid Solutions

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Liquid-Liquid Interfaces; Proteins; Solutions; Dynamic Control; Microgravity

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Crystallization; Hemoglobin

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Crystallization; Surface Diffusion

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Proteins; Thermodynamics; Solutions

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Crystals; Impurities; Proteins

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Macromolecules; Protein Crystal Growth; Self Assembly; Microgravity

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Crystals; Nucleation; Thermodynamics; Kinetics

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Nucleation; Protein Crystal Growth; Homogeneity; Microgravity

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Anemias; Physical Chemistry; Microgravity

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Crystallization; Proteins; Molecules

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Proteins; Liquid Phases; Dynamic Characteristics

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Nucleation; Phase Control; Proteins

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Crystals; Molecules; Self Assembly; Thermodynamics

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Protein Crystal Growth; Microgravity

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Capillary Flow; Crystallization; Insulin

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Crystallization; Defects; Real Time Operation

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Crystallization; Defects; Molecular Properties

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Nucleation; Observation; Protein Crystal Growth

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Dynamic Control; Nucleation; Protein Crystal Growth

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Dynamic Control; Nucleation; Protein Crystal Growth

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Crystals; Optical Equipment; Interferometry; Fluid Dynamics

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Crystallography; Molecular Biology; Protein Crystal Growth

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Protein Crystal Growth; Real Time Operation; Molecular Dynamics

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Crystallization; Real Time Operation; Protein Crystal Growth; Molecular Dynamics

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Crystals; Nucleation; Proteins

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Condensing; Nucleation; Proteins

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Phase Transformations; Proteins

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Nucleation; Proteins; Solid Phases

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Crystal Growth; Proteins; Real Time Operation

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Protein Crystal Growth; Crystal Defects

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Protein Crystal Growth; Structural Analysis

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Condensing; Nucleation; Proteins

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Macromolecules; Real Time Operation; Self Assembly; Crystals

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Crystallization; Microgravity; Protein Crystal Growth

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Defects; Crystallization; Crystal Growth

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Impurities; Transport Theory

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Protein Crystal Growth; Crystallization; Crystal Surfaces; Surface Properties; Crystal Structure

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Dynamic Control; Phase Transformations; Protein Crystal Growth

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Protein Crystal Growth; Molecules

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Molecules; Phase Transformations

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Protein Crystal Growth; Crystallization

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Protein Crystal Growth; Crystallization; In Situ Measurement

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Nonlinearity; Protein Crystal Growth; Dynamic Characteristics

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Condensing; Proteins

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Crystallization; Protein Crystal Growth; Interferometry

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Bunching; Interferometry; Phase Transformations

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Crystallization; Protein Crystal Growth

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Diffusion; Molecular Dynamics

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Phase Transformations; Solutions; Reaction Kinetics; Proteins

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Protein Crystal Growth; Real Time Operation

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Protein Crystal Growth; Pattern Recognition; Evolution

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Crystal Growth; Nucleation; Solid Phases

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Protein Crystal Growth; Layers

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Molecules; Self Assembly; Thermodynamics

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Kinetics; Protein Crystal Growth; Mechanism

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Fundamental Aspects of Nucleation Theory Revealed in Experiments with Protein Solid Phases
Vekilov, Peter G.; Galkin, O.; Lui, X. Y., Editor; DeYoreo, J. J., Editor; Nanoscale Structure and Assembly at Solid-fluid Interfaces; 2004, pp. 105-144; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Nucleation; Proteins; Solid Phases

20050070824 Houston Univ., TX, USA
Principles of Crystal Nucleation and Growth
DeYoreo, J. J.; Vekilov, Peter G.; Biomineralization; 2003, pp. 57-93; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystal Growth; Nucleation; Proteins

20050070825 Houston Univ., TX, USA
Microscopic, Microscopic, Mesoscopic and Macroscopic Length Scales in the Kinetics of Phase Transformations with Proteins
Vekilov, Peter G.; DeYoreo, J. J., Editor; Lui, X. Y., Editor; Nanoscale Structure and Assembly at Solid-fluid Interfaces; 2004, pp. 145-200; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Kinetics; Phase Transformations; Proteins

20050070826 NASA Marshall Space Flight Center, Huntsville, AL, USA
Thermodynamics of the Hydrophobicity in Crystallization of Insulin
Vekilov, P. G.; Bergeron, L.; Filobelo, L. F.; Galkin, O.; 2003; 3 pp.; In English; 2003 Annual Meeting of the Meeting of the American Inst. of Chemical Engineers, 16-22 Nov. 2003, San Francisco, CA, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystallization; Hydrophobicity; Insulin; Thermodynamics

20050070827 Virginia Univ., Charlottesville, VA, USA
Water Structuring and the Dynamics of Protein Crystallization Processes
Vekilov, P. G.; October 1, 2004; 3 pp.; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Water; Crystallization; Dynamics

20050070828 Houston Univ., TX, USA
Molecular Mechanisms of Defect Formation
Vekilov, Peter G.; Methods in Enzymology: Macromolecular Crystallography; 2003; Volume 368, Part C, pp. 170-188; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Defects; Molecules; Mechanism

20050070829 NASA Marshall Space Flight Center, Huntsville, AL, USA
Stability of Step Trains in Protein Crystallization
Gliko, O.; Reviakine, I.; Lin, H.; Yau, S.-T.; Vekilov, P. G.; 2004; 3 pp.; In English; 14th International Conference on Crystal Growth, 9-14 Aug. 2004, Grenoble, France
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Stability; Microgravity; Crystallization

20050070830 Houston Univ., TX, USA
Solvent Entropy Effects in the Formation of Protein Solid Phases
Vekilov, Peter G.; Carter, C. W., Jr., Editor; Sweet, R. M., Editor; Methods in Enzymology; 2003; Volume 368, pp. 84-105; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Entropy; Proteins; Solid Phases; Solvents

20050070831 Houston Univ., TX, USA
Phase Transitions in Protein Solutions
Vekilov, Peter G.; [2004]; In English; Informal Statistical Physics Seminar, 7 Dec. 2004, College Park, MD, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Phase Transformations; Proteins

20050070832 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Role of Water Structuring in the Thermodynamics and Kinetics of Phase Transitions with Protein
Vekilov, P. G.; 2004; 3 pp.; In English; 2004 MRS Fall Meeting, 29 Nov. - Dec. 3, 2004, Boston, MA, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Kinetics; Phase Transformations; Proteins; Thermodynamics

20050070833 Houston Univ., TX, USA
Solvent Structuring around Protein Molecules and Dynamics of the Molecular Self-Assembly
Vekilov, Peter G.; Petsev, D. N.; Yau, S.-T.; Taylor, A. Feeling; 2001; In English; 2001 Annual Meeting of the American Institute of Chemical Engineers, 4-9 Nov. 2001, Reno, NV, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Molecules; Proteins; Self Assembly; Solvents

20050070834 Houston Univ., TX, USA
Dense Liquid Droplets As a Step Source for the Crystallization of Lumazine Synthase
Gliko, O.; Neumaier, N.; Fischer, M.; Haase, I.; Bacher, A.; Weinkauf, S.; Vekilov, Peter G.; [2004]; In English; 14th International Conference on Crystal Growth, 9-14 Aug. 2004, Grenoble, France
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystallization; Drops (Liquids); Proteins; Microgravity

20050070835 NASA Marshall Space Flight Center, Huntsville, AL, USA
Molecular-Level Thermodynamic and Kinetic Parameters for Crystalline
Yau, S.-T.; Petsev, D. N.; Vekilov, P. G.; 2001; 3 pp.; In English; 13th International Conference on Crystal Growth, Jul. 30 - Aug. 4, 2001, Kyoto, Japan
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystallinity; Thermodynamic Properties; Kinetics; Molecules

20050070836 Houston Univ., TX, USA
Molecular Mechanisms of Microheterogeneity-Induced Defect Formation in Ferritin Crystallization
Vekilov, Peter G.; Yau, S.-T.; Thomas, B. R.; Galkin, O.; Gliko, O.; 2001; In English; 13th International Conference on Crystal Growth, 30 Jul. - 4 Aug. 2001, Kyoto, Japan
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystallization; Crystal Defects; Proteins; Heterogeneity

20050070837 Houston Univ., TX, USA
Phase Transition in Protein Solutions: Dynamics and Control Strategies
Galkin, O.; Petsev, D. N.; Vekilov, Peter G.; [2001]; In English; Gordon Conference on Gravitational Effects in Physiochemical Systems, 8-13 Jul. 2001, New London, NH, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Phase Transformations; Proteins; Solutions; Dynamic Control; Microgravity

20050070843 NASA Marshall Space Flight Center, Huntsville, AL, USA
Solvent Entropy Effects in the Formation of Protein Solid Phases
Vekilov, P. G.; 2002; In English; 2002 Spring Materials Research Society Meeting, 1-5 Apr. 2002, San Francisco, CA, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Entropy; Proteins; Solid Phases; Solvents

20050070846
Control of the Size and Distribution of Atto- and Femto-litter Protein Droplets: Liquid-liquid Phase Separation
2002; In English; Biu-fuel Cells Workshop, 30 Jun. - 2 Jul. 2002, Washington, DC, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Proteins; Liquid-Liquid Interfaces; Phase Separation (Materials); Drops (Liquids); Size Distribution

20050070847 NASA Marshall Space Flight Center, Huntsville, AL, USA
Temperature-independent Solubility and Interactions Between Apoferritin Monomers and Dimers in Solution
Petsev, D. N.; Thomas, B. R.; Yau, S.-T.; Tsekova, D.; Nanev, C. N.; Wilson, W. W.; Vekilov, P. G.; J. Crystal Growth; 2001; Volume 232, pp. 27-29; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Proteins; Dimers; Monomers; Solubility

20050070852 Paris V Univ., France
Fundamental Aspects of Nucleation Theory in the Formation of Protein Condensed Phases
Vekilov, P. G.; January 28,2003; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Nucleation; Condensing; Proteins

20050070858 NASA Marshall Space Flight Center, Huntsville, AL, USA
Direct Determination of the Nucleation Rates of Protein Crystals
Galkin, O.; Vekilov, P. G.; J. Phys. Chem.; 1999; Volume 102, pp. 10965-10971; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Nucleation; Protein Crystal Growth

20050071007 Southeast Univ., Nanjing, China
Development of the Integrated Instrument for Polymerase Chain Reaction, Biochip Hybridization and Fluorescence Detection
Zhu, Jijun; Cheng, Jia; Liu, Quanjun; Liu, Aiyun; Wang, Hong; Lu, Zuhong; Progress of Machining Technology; December 2004, pp. 402-406; In English; See also 20050070885
Contract(s)/Grant(s): MOS-96-A23-04-08; NNSF-59905006; Copyright; Avail: Other Sources
An integrated instrument with second generation was developed in our laboratory, which can carry out polymerase chain reactions (PCR), biochip hybridization and fluorescence detection (PHFT). The instrument is capable of finishing all these three step processes in an automatic and integrated manner. The precision temperature controlling system is established in this instrument, which can increase at a ration of 20 C/s and decrease of 10 C/s by using the air heating and cooling mechanism. The run time is typically 4hr for the whole experiment, while it can also realize the fast PCR sequence. The instrument consists of three parts: precision temperature controlling system, automatic sample injection system and fluorescence detection. The chip is mounted on a two-dimension stage, which moves and passes through three function zones and finally fluorescence images are displayed on the PC computer, and detection information is given in the database.
Author
Chips; Fluorescence; Polymerase Chain Reaction; Bioengineering

20050071071 Houston Univ., TX, USA
Liquid-liquid Separation in Solutions of Normal and Sickle Cell Hemoglobin
Vekilov, Peter G.; Galkin, O.; Chen, K.; Nagel, R. L.; Hirsch, R. E.; Proceedings of National Academy of Sciences USA; 2002, pp. 8479-8483; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Hemoglobin; Sicknesses; Blood; Cells (Biology)

20050071076 NASA Marshall Space Flight Center, Huntsville, AL, USA
Step and Kink Dynamics in Inorganic and Protein Crystallization
Chernov, A. A,; DeYoreo, J. J.; Rashkovich, L. N.; Vekilov, P. G.; MRS Bulletin; [2004]; Volume 29, pp. 927-934; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Protein Crystal Growth; Inorganic Compounds; Step Functions

20050071077 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nonlinear Dynamics of Layer Growth and Consequences for Protein Crystal Perfection
Vekilov, P. G.; Rosenberger, F.; Lin, H.; Thomas, B. R.; J. Crystal Growth; [1999]; Volume 196, pp. 261-275; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystals; Nonlinearity; Proteins

20050071080 Houston Univ., TX, USA
The Physics of Protein Crystallization
Vekilov, Peter G.; Chernov, A. A.; Solid State Physics; 2002; Volume 57, pp. 1-147; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Space Processing; Protein Crystal Growth

20050071082 Houston Univ., TX, USA
Intermolecular Interactions, Nucleation and Thermodynamics of Crystallization of Hemoglobin C
Vekilov, Peter G.; Feeling-Taylor, A. R.; Petsev, D. N.; Galkin, O.; Nagel, R. L.; Hirsch, R. E.; Biophysical Journal; 2002; Volume 83, pp. 1147-1156; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Crystallization; Hemoglobin; Molecular Interactions; Nucleation; Thermodynamics

20050071083 Houston Univ., TX, USA
Thermodynamics of the Hydrophobicity in Crystallization of Insulin
Bergeron, L.; Filobelo, L.; Galkin, O.; Vekilov, Peter G.; Biophysics Journal; 2003; Volume 85, pp. 3935-3942; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: CASI
No abstract available
Thermodynamics; Crystal Defects; Hydrophobicity

20050080261 California Univ., Berkeley, CA USA
Undergraduate Training in Mammary Gland Biology and Breast Cancer
Bissell, Mina J.; May 2004; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0178
Report No.(s): AD-A427171; No Copyright; Avail: CASI; A03, Hardcopy
This program was designed to recruit qualified undergraduates with an interest in research, and to provide them with a highly interactive program that integrated the unique expertise available in our laboratories in the Life Sciences Division of the E.O. Lawrence Berkeley National Laboratory and the Department of Cell & Molecular Biology at the University of California, Berkeley, and to guide them towards developing an interest in investigating the underlying mechanisms involved in the development of breast cancer. Trainees in the first year of the program benefited from working in a dynamic environment that investigates issues at the forefront of breast cancer research. The students chose from projects investigating the effects of hormones on rodent mammary glands, working with human breast cells in culture, and dissecting transcription functional alterations in yeast. In the first category, students studied the current literature on hormones and breast cancer and worked with a postdoctoral fellow or a staff member conducting research in breast cancer in rodents. The research in the latter two categories of projects involved studies of processes known to function differently in normal and malignant breast cells. Projects were designed with a goal towards cohesive research objectives that were meaningful, educational, and attainable. DTIC
Breast; Cancer; Education; Mammary Glands; Medical Science

20050080263 Michigan Univ., Ann Arbor, MI USA
Automated Method for Analysis of Mammographic Breast Density - A Technique for Breast Cancer Risk Estimation
Chan, Heang-Ping; Jul. 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0326
Report No.(s): AD-A428513; No Copyright; Avail: CASI; A03, Hardcopy
The goal of this proposed project is to develop an automated technique to assist radiologists in estimating mammographic breast density. The computerized image analysis tool can provide a consistent and reproducible estimation of percent dense area on routine clinical mammograms, thereby contributing to the understanding of the relationship of mammographic density to breast cancer risk, detection, and prognosis, and the prevention and treatment of breast cancer. During this project year, we completed the observer performance study that compared the mammographic density on digital mammograms (DMs) and digitized film mammograms fDFMs) manually segmented by experienced radiologists. The average mammographic density on digital mammograms was found to be significantly lower than that on digitized mammograms as perceived by radiologists.

The lower density on DMs may improve the mammographic sensitivity for lesion detection on dense breasts. However, for patients with DFMs and DMs taken over time, comparison of serial mammograms for breast density changes will be problematic. We also performed a study to compare mammographic density segmented from DMs by our automated density segmentation program, referred to as Mammographic Density ESTimator (MDEST), with the average mammographic density manually segmented by four experienced radiologists. The mammographic density from DMs obtained by our automated MDEST program is highly correlated with the average mammographic density manually segmented by radiologists. The study therefore indicates the feasibility of using our MDEST program for estimation of mammographic density, although improvement is needed to further increase the segmentation accuracy. We will continue to improve the image analysis methods in the coming year.
DTIC
Breast; Cancer; Mammary Glands; Risk

20050080269 Pittsburgh Univ., Pittsburgh, PA USA
Remote Patient Management in a Mammographic Screening Environment in Underserved Areas
Gur, David; Sep. 2004; 54 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0410
Report No.(s): AD-A428909; No Copyright; Avail: CASI; A04, Hardcopy

Early detection of breast cancer is of significant interest to our society. Mammographic screening is gradually moving toward a 'distributed acquisition -centralized review' approach. Unfortunately, a relatively high recall rate using this approach increases patient anxiety as well as the cost and complexity of the diagnostic process. The purpose of this project is to evaluate in a multi-phase project the possible impact of a unique tele-mammography system that utilizes common carriers with wavelet-based data compression for image transmission, on the recall rate in remote locations where physicians are not available during mammographic procedures. The initial phases of the project encompasses the design, assembly, and technical testing of a multi-site tele-mammography system that enables the digitization, transmission, and display of wavelet compressed images, as well as associated text documents of a case combined with CAD results in less than 15 minutes. The possible impact of such a system is being evaluated during a step-by-step assessment in a multi-site study.
DTIC
Breast; Cancer; Computer Techniques; Diagnosis; Mammary Glands; Patients

20050080270 North Carolina Univ., Chapel Hill, NC USA
Automatic Organ Localization for Adaptive Radiation Therapy for Prostate Cancer
Joshi, Sarang C.; Foskey, Mark; Davis, Brad; May 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0134
Report No.(s): AD-A428913; No Copyright; Avail: CASI; A02, Hardcopy

The focus of this study is adaptive radiation therapy (ART) for prostate cancer, in which the treatment is to be adjusted over time, based on CT images acquired on the treatment table before each daily treatment. The goals are twofold: We seek to make ART for prostate cancer possible, and we seek to evaluate how useful it will be. As steps toward making it possible, we have developed software tools to localize the areas to be targeted or avoided, and to evaluate the motion of the tissue from day to day. We have produced a tool called ImMap that can perform these tasks, and are beginning to study its reliability and effectiveness. To evaluate the utility of ART, we are using a data set consisting of repeated CT scans from approximately 20 treatment days for five anonymous cancer subjects, along with manual segmentations of the prostate, bladder, and rectum for each subject and each day. We have evaluated the motion of the body due to setup error, and are preparing to evaluate the motions of the organs with respect to the body.
DTIC
Cancer; Organs; Position (Location); Prostate Gland; Radiation Therapy

20050080271 Texas Univ., Houston, TX USA
TARGET (Translational Approaches for the Reversal Genetic Evaluation and Treatment) of Lung Cancer
Hong, Waun K.; Khuri, Fadlo R.; Sep. 2004; 149 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0706
Report No.(s): AD-A428916; No Copyright; Avail: CASI; A07, Hardcopy

Smoking is a major cause for several types of cancer particularly lung cancer and cancers of the head and neck. Lung cancer is the leading cause of cancer death in both males and females in America, and is also the leading cause of cancer death

worldwide. In America, it accounts for 28.5% of cancer deaths and 6.5% of all deaths. An estimated 173,700 Americans will develop lung cancer in 2004 and 160,440 will die from it. The vast majority (85%) of patients with lung cancer have non-small cell lung cancer (NSCLC) and across all stages of NSCLC, only 13.6% of males and 17.2% of women survive 5 years from diagnosis. More than 50% of cases are diagnosed at a late stage, for which the 5-year survival is only about 3%. White the death rate from head and neck cancer is not as high as from lung cancer, it also remains a major problem. Thus, to reduce lung cancer Incidence and mortality, we believe that developing novel effective therapeutic strategies that target both current and former smokers who are at risk for development of cancer is vital to achieving tangible progress in patient care. TARGET is focused on a series of complementary projects designed to obtain data in the preclinical and clinical settings to help us further understand the epidemiology of lung cancer, the molecular biology, genetics and epigenetics of lung cancer in the context of tobacco-damaged aerodigestive tract tissue, and the anti-cancer activity of several promising new agents, and various treatment and drug delivery approaches in models of lung cancer and other aerodigestive tract tumors.
DTIC
Cancer; Genetics; Lungs; Targets

20050080273 Wisconsin Univ., Madison, WI USA
Regulated GDNF Delivery in Vivo Using Neural Stem Cells
Svendsen, Clive N.; Apr. 2004; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0122
Report No.(s): AD-A428919; No Copyright; Avail: CASI; A03, Hardcopy

The major aim of this proposal was to establish lines of neural stem cells secreting GDNF under a regulatable promoter system which may be used for future transplant therapies for PD. The tasks of the first year have been met. We have changed from using rodent and monkey stem cells to using human stem cells (hNSC) due to better growth and infection profiles for human cells. We have shown that hNSC can be infected with lenti-GDNF. GDNF released from the cells is functional on dopamine neurons and can be switched on and off by doxycycline. We have enhanced infection rates such that over 85% of cells express GDNF. We have selected high expressing lines and shown that they can be expanded in culture for over 20 weeks without losing the ability to produce GDNF in a regulated fashion. We have performed 6-OHDA lesions in rats to induce PD and shown loss of TH expression, survival of hNSC transplanted into these animals and expression of GDNF for up to 8 weeks (this is ahead of our predicted time frame) but are currently starting in vivo regulation studies. PET analysis has shown that the lesion can be detected with imaging and we are currently optimizing this protocol for use in the more detailed studies next year. Our pilot monkey work has been delayed due to problems growing the monkey stem cells. However, we have now scheduled the first surgery using hNSC for May 2004.
DTIC
In Vivo Methods and Tests; Stem Cells

20050080277 Dartmouth Coll., Hanover, NH USA
Three Dimensional Reconstruction Algorithm for Imaging Pathophysiological Signal within Breast Tissue Using Near Infrared Light
Dehghani, Hamid; Jul. 2004; 56 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0405
Report No.(s): AD-A428927; No Copyright; Avail: CASI; A04, Hardcopy

Optical tomography is a non-invasive imaging technique that can image properties of biological tissue. Measurements of light propagation through tissue can be used to calculate and reconstruct images of internal optical properties. Since the absorption and scattering of light in the tissue is a function its physiological state, the aim is to calculate maps of physiological parameters, which can be early markers of tumor development. Specifically the aim is to image total hemoglobin, oxygen saturation, water and lipid concentrations, as well as potentionally molecular concentrations when used with fluorescent markers. Cancerous regions within the breast have shown to be physiologically different from normal tissue. These include a higher amount of angiogenesis and higher metabolic rate as compared to normal tissue. These differences will result in a change in optical attenuation and scatter of light due to hemoglobin changes, which will cause a change in the measured tomographic boundary data. Light transport modeling of propagation in tissue can be used to calculate maps of optical changes within the breast, and therefore physiological maps of total hemoglobin and oxygen saturation.
DTIC
Algorithms; Breast; Cancer; Computer Aided Tomography; Imaging Techniques; Mammary Glands; Near Infrared Radiation

20050080278 Nebraska Univ., Omaha, NE USA

Expression and Promoter Methylation of p16Ink4A During Estrogen-Induced Mammary Carcinogenesis in the ACI Rat

Bartsch, Lois B.; Jul. 2004; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0466

Report No.(s): AD-A428929; No Copyright; Avail: CASI; A03, Hardcopy

Breast cancer is one of the leading causes of death for women in the USA and estrogen exposure has been hypothesized to be involved in the development of this cancer. Our lab is studying the ACI rat, an estrogen-induced breast cancer animal model to begin to elucidate estrogen's role in breast cancer. The ACI rat develops mammary cancer after prolonged exposure to l7beta-estradiol, while the BN and genetically related COP rats do no. We have identified several polymorphisms in the promoter region of p16cdkn2a between the ACI rat and either the BN or COP rats. Several of these polymorphisms are in key regions of transcriptional control for p16cdkn2a and similar polymorphisms have been identified in the human. In addition, we have shown in the ACI rat that the p16cdkn2a message levels are down regulated and that this down regulation is due to hypermethylation of the promoter region. Further research will focus on the determination of the role of these polymorphisms in the down regulation and methylation of p16cdkn2a and the timing of this down regulation and methylation.

DTIC

Breast; Cancer; Carcinogens; Estrogens; Mammary Glands; Methylation; Rats

20050080279 Melbourne Univ., Victoria, Australia

Stromal Gene Expression and Function in Primary Breast Tumors that Metastasize to Bone Cancer

Parker, Belinda; Anderson, Robin L.; Jul. 2004; 26 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0473

Report No.(s): AD-A428930; No Copyright; Avail: CASI; A03, Hardcopy

A clinically relevant syngeneic model of breast cancer metastasis has been used to determine gene expression alterations that occur both between primary breast cancers with varying metastatic potential and between matched primary and bone metastases. We have immunopurified epithelial and endothelial cell populations and profiled them separately to identify differentially expressed genes, some of which have not previously been associated with breast cancer metastasis. Expression profiles of vascular endothelium derived from primary tumors of varying metastatic potential identified aberrant expression of genes involved in angiogenesis, cell cycle progression, cytoskeletal structure and tumor suppression. Those altered in the primary tumor epithelium included developmental genes, metastasis suppressors and genes involved in cytoskeletal organization, cell cycle progression, apoptosis and transformation. The microarray data was confirmed by quantitative RT-QPCR. Further analysis of epithelium from matched spine metastases revealed some genes that were upregulated further at the metastatic site. These included stefin Al (inhibitor of cathepsin S) that was upregulated in highly metastatic primary epithelium and increased a further 9-fold in matched bone metastases. The expression in spine metastases was verified by in situ hybridization whilst the expression of stefin Al in subsets of tumor cells in invasive human breast cancer was confirmed by immunohistochemistry.

DTIC

Bones; Breast; Cancer; Gene Expression; Mammary Glands; Metastasis; Tumors

20050080280 Emory Univ., Atlanta, GA USA

Role of TMS1 Silencing in the Resistance of Breast Cancer Cells to Apoptosis

Parsons, Melissa J.; Vertino, Paula M.; Aug. 2004; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0578

Report No.(s): AD-A428931; No Copyright; Avail: CASI; A02, Hardcopy

Aberrant DNA methylation of promoter region CpG islands is associated with gene silencing and serves as an alternative to mutations in the inactivation of tumor suppressor genes in human cancers. Our lab has identified novel gene, TMS1, that is aberrantly methylated and silenced in human breast tumors. TMS1 is a bipartite signalling molecule that functions in the regulation of apoptosis and inflammation. It is our hypothesis that epigenetic silencing of TMS1 contributes to breast carcinogenesis by allowing cells to bypass normal apoptotic cues, and, as a consequence may cause cells to be more resistant to chemotherapeutic agents. The goals of this proposal are to study the role of TMS1 in breast cell apoptosis by developing breast cells stably knocked down for TMS1 expression using siRNA technology and to determine the impact of TMS1 loss on the response of breast cancer cells to anticancer agents and other apoptotic stimuli. Thus far, we have determined that overexpression of TMS1 induces a time-dependent apoptotic response characterized by cleavage of the initiator caspase-8, the downstream caspase-3, and the death substrate PARP. TMS1-induced apoptosis was blocked by inhibitors of caspase-8,

suggesting a role in death receptor mediated apoptosis. The death receptor ligands TNFalpha and TRAIL upregulate TMS1 expression in breast epithelial cells. The activation of TMS1 by death receptors is mediated at the level of transcription and requires the activity of the NF-kB and JNK signalling pathways. Upregulation of TMS1 by TNFalpha and TRAIL and subsequent activation of caspase-8 could function as an amplification loop necessary to achieve cell death by the death receptors in some cell types, including breast cells. These results may also have therapeutic implications in that the methylation status of TMS1 in human tumors may influence sensitivity to TRAIL, which is currently undergoing clinical trial.
DTIC
Apoptosis; Breast; Cancer; Mammary Glands; Methylation

20050080281 Connecticut Univ., Farmington, CT USA
Probing the Tyrosine Phosphorylation State in Breast Cancer by Src Homology 2 Domain Binding
Mayer, Bruce J.; Aug. 2004; 93 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0540
Report No.(s): AD-A428932; No Copyright; Avail: CASI; A05, Hardcopy

Improved molecular diagnostic methods that can classify tumors and predict their response to therapy have enormous potential to improve the effectiveness breast cancer treatments. The overall goal of this project is to develop a novel molecular diagnostic method, termed SH2 profiling, that can classify cell samples based on their global protein tyrosine phosphorylation state. The first aim is to use an existing SH2 profiling method, based on far-Western blotting, to analyze fresh surgical breast cancer samples. The second aim is to develop a more high-throughput quantitative reversed-phase SH2 profiling format, and test its usefulness in classifying breast cancer samples. The third aim is to develop histochemical SH2 profiling methods that can be used to analyze archived, formalin-fixed tissue sections, and perform pilot retrospective studies to determine whether SH2 binding patterns have potential prognostic value. In the past year we have made great progress in developing the reversed-phase array and histochemical SH2 profiling formats, and results suggest that these quantitative methods will be useful in classifying breast cancer samples. In the coming year, once HSRRB approval for use of human samples is secured, we will begin to apply these new methods to the analysis of actual breast cancer specimens.
DTIC
Breast; Cancer; Homology; Mammary Glands; Phosphorylation; Tyrosine

20050080282 Alabama Univ., Birmingham, AL USA
Proteomic Analysis of Genistein Mammary Cancer Chemoprevention
Lamartiniere, Coral A.; Jul. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0433
Report No.(s): AD-A428933; No Copyright; Avail: CASI; A02, Hardcopy

We have hypothesized that the phytoestrogen, genistein, exerts its chemopreventive actions by postnatally programming developmental modifications to genes/proteins that render the mammary gland less susceptible to cancer. The objective of this proposed research is to identify regulatory proteins responsible for conferring breast cancer protection. The specific aims are 1)to identify proteins that are differentially expressed in mammary glands of rats treated +/- the carcinogen, DMBA, and the chemopreventive agent, genistein, and 2) to collect proteins from interstitial fluid surrounding mammary glands of rats, and to identify and characterize the major proteins that are modulated by DMBA and genistein. Using 2-D gels and mass spectrometry, we have determined that GTP-cyclohyrolase 1, a protein that plays a prominent role in the production of tetrahydrobiopterin (BH4), is modulated by genistein. BH4 is an essential co-factor for the enzyme tyrosine hyroxylase. The latter is demonstrated to be up regulated at 50 days, but not at 21 days, hence, we postulate that tyrosine hydrolase expression is regulated via a programming mechanism. Up regulated tyrosine hydroxlase is associated with increased production of dopamine, the latter has been reported to inhibit angiogenesis. Aim 2 has been initiated.
DTIC
Breast; Cancer; Carcinogens; Mammary Glands; Proteome

20050080286 Virginia Univ., Charlottesville, VA USA
The Impact of Tyrosine Kinase Signaling on Breast Cancer Development
Marozkina, Nadzeya V.; Aug. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0253
Report No.(s): AD-A428942; No Copyright; Avail: CASI; A03, Hardcopy

Malignant transformation and progression of human cancer is frequently associated with overabundance of proteins that

are involved in normal cellular processes, such as proliferation, differentiation, migration or apoptosis. Examples of such proteins include members of human epidermal growth factor receptor (hEGFR) and cellular Src (c-Src) tyrosine kinase families, which are frequently cooverexpressed in human neoplasms and especially in breast cancer. Results from recent studies using cultured fibroblasts and human breast cancer cell lines have indicated that c-Src and EGFR synergistically interact to promote tumor formation in nude mice xenografts. To check whether this synergism occurs in the more physiological setting of the mammary gland, I am going to test the interaction of these tyrosine kinases in a transgenic mouse model, where MMTV-c-Src and MMTV EGFR transgenic mice will be generated, cross-bred to form bigenic mice, then examinated for tumor formation in mammary gland tissue. If the synergism hypothesis is correct, bigenic mice should develop large tumors more rapidly than single transgenic mice, thus validating the synergism between c-Src and EGFR as a target for future therapies.
DTIC
Breast; Cancer; Mammary Glands; Tyrosine

20050080287 Nebraska Univ., Omaha, NE USA
Characterization of Genetic Modifiers of Estrogen-Induced Mammary Cancer
Schaffer, Beverly S.; Jul. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0477
Report No.(s): AD-A428943; No Copyright; Avail: CASI; A02, Hardcopy

Prolonged exposure to estrogens is considered a major risk factor for development of breast cancer; When treated with estrogen for 28 weeks, ACI rats develop mammary cancers in over 90% of the population at risk. Genetic crosses between the susceptible ACI rat and resistant Copenhagen (COP) or Brown Norway (BN) rats identified a region on chromosome 5 (Emcal) t!%at modified the development of estrogen-induced mammary cancer. To define the role of Emcal in the development of estrogen-induced mammary cancer, a congenic line has been developed (ACI.BN-Emcal) in which the resistant BN allele of Emcal has been introgressed onto an ACI background. Female ACI.BN-Emcal rats treated with estrogen for 28 weeks exhibit a significant decrease in the incidence of mammary cancer in the population at risk, a significant delay in the latency to the development of mammary cancer, and a significant decrease in the number of tumors per rat compared to ACI rats. These data suggest that Emcal is a strong modifier of estrogen-induced mammary cancer. Additional congenic lines, in which the Emcal locus has been divided into smaller regions, have been generated and will be used to further define the region(s) on chromosome 5 and to identify more precisely the gene(s) that modify estrogen-induced mammary cancer.
DTIC
Breast; Cancer; Estrogens; Genetics; Mammary Glands

20050080289 Georgetown Univ. Hospital, Washington, DC USA
Gene Environment Interactions in Women with Breast Cancer and Secondary Lung Cancer
Tennis, Meredith A.; Shields, Peter G.; Jul. 2004; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0300
Report No.(s): AD-A428946; No Copyright; Avail: CASI; A03, Hardcopy

Radiotherapy has become a standard treatment for breast cancer, however, few studies examined individual susceptibilities to risks from radiation exposure. Lung cancer following breast cancer has been associated with radiation exposure and this increased lung cancer risk has been shown to be even higher with tobacco exposure. We are identifying p53 mutations in breast and lung tumors using the Affymetrix GeneChip system and examining the methylation status of five genes important in the progression of breast or lung cancer. We are also describing ER alpha and ER beta expression using immunohistochemistry. We have received 245 of the expected 300 tumors from cases and controls and all samples have been processed and DNA extracted. 160 samples have been analyzed for p53 mutations, 230 samples have been bisulfite modified for methylation assays, 200 methylation assays have been completed, and 145 breast tumors have been stained for ER alpha. This project may have significant clinical impact by providing additional information on risk levels to women choosing a breast cancer therapy. Additionally, this research may provide new data on the susceptibilities of women with multiple primary cancers and on hormone related gender differences in cancer risk.
DTIC
Breast; Cancer; Clinical Medicine; Females; Lungs; Mammary Glands; Radiation Therapy

20050080291 Manitoba Univ., Winnipeg, Manitoba Canada

Perception of Risk and Surveillance Practices for Women with a Family History of Breast Cancer

Martin, Wanda; Sep. 2004; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0388

Report No.(s): AD-A428950; No Copyright; Avail: CASI; A03, Hardcopy

in this study, a retrospective, descriptive design was employed to examine the relationship between perception of risk and surveillance activities (mammography and clinical breast examination) of women with a family history of breast cancer. The Revised Susceptibility, Benefits, and Barriers Scale for Mammography Screening,the CES-D, and a demographic form were administered to a convenience sample of 56 women. There were no significant findings between perceived risk and screening, nor between age or depressive symptoms with perceived risk or screening behaviors. Women with post-secondary qualifications were found to be more likely to obtain regular mammograms (X2 =7.423, df= 1, p =0.006). The level of depressive symptomology was high with 34.5% of participants scoring\g 16 on the CES-D. A substantial portion of participants reported depressive symptoms at a level associated with clinically significant levels of depression. Women over age 50 reported significantly more depressive symptoms (t =2.279, p .027). Overall perceived risk was not found to have an association with screening, however depression should be considered more closely when dealing with women with higher-than-average risk of breast cancer.

DTIC

Breast; Cancer; Females; Mammary Glands; Procedures; Risk; Surveillance

20050080292 Oklahoma Univ. Health Sciences Center, Oklahoma City, OK USA

Caspase Deficiency: Involvement in Breast Carcinogenesis and Resistance

Yang, XiaoHe; Jul. 2004; 24 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9180

Report No.(s): AD-A428952; No Copyright; Avail: CASI; A03, Hardcopy

This project was proposed to study the correlation between caspase deficiency and breast cancer carcinogenesis and therapeutic resistance. In the last year of this grant, we examined the mRNA levels of 8 caspases in 20 breast cancer cell lines and the expression of caspases-3 in 102 cases of breast cancer tissues. We also studied the role of caspase-3 in genistein induced apoptosis. In summary of the whole project, we have examined the expression profiles of the majority members of the caspase family in 20 breast cancer cell lines and performed functional screening of these cell lines treated with different apoptotic stimuli. Our results indicated that caspase deficiency/down-regulation was frequently detected in breast cancer and suggested a correlation between caspase deficiency and breast carcinogenesis and therapeutic resistance. Using a caspase-3 specific model, we demonstrated that caspase-3 plays a critical role in the apoptosis of breast cancer cells. Deficiency of caspase-3 significantly impaired cellular response to various apoptotic stimuli, which contributed to therapeutic resistance. Sensitization of caspase-3 deficient cells by transfection of the caspase-3 gene suggests that caspase-3 gene therapy could be used to enhance therapeutic responses of refractory breast cancers.

DTIC

Breast; Cancer; Carcinogens; Enzymes; Gene Therapy; Mammary Glands; Tumors

20050080296 Illinois Univ., Chicago, IL USA

Biochemical Characterization of Native Schwannomin/Merlin

Chishti, Athar; Sep. 2004; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0647

Report No.(s): AD-A428957; No Copyright; Avail: CASI; A02, Hardcopy

The NF2 tumor suppressor protein, termed Merlin/Schwannomin, is a member of the protein 4.1 superfamily that functions as a linker of the plasma membrane to the cytoskeleton. A major limitation in understanding the biochemical function of NF2 protein is the unavailability of purified native protein from human tissues. Our discovery of the presence of NF2 protein in human erythrocytes allowed us to develop a purification procedure that affords homogeneous NF2 protein in its native state. Selective extraction of ghosts in the low ionic strength buffer indicated that the bulk of NF2 protein remains associated with spectrin-actin depleted inside-out-vesicles. Quantitative removal of NF2 protein by potassium iodide shows that it is tightly associated with the membrane. Interestingly, the NF2 protein was completely solubilized in 0.5% Triton X-100 at high but not at low ionic strength. These results suggest a novel mode of NF2 protein association with the membrane that is distinct from protein 4.1. We devised a purification strategy to isolate NF2 protein from human erythrocytes. Identification of NF2 protein as a constituent of erythrocyte membrane provides a unique opportunity to study the biochemical properties

of native protein, and identify proteins that interact with NF2 protein in the mammalian plasma membrane.
DTIC
Biochemistry; Erythrocytes; Proteins

20050080297 Pennsylvania Univ., Philadelphia, PA USA
Hot Flashes and Quality of Life Among Breast Cancer Patients
Jacobs, Linda A.; Aug. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0264
Report No.(s): AD-A428958; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer (BC) has the greatest one-year incidence of any cancer among women, and women diagnosed with BC constitute the largest group of female survivors of cancer at five years and beyond. Both because of the age of the population and the use of certain therapeutic agents this process often includes menopause. Hot Flashes among BC patients are highly prevalent and qualitatively different from those experienced by healthy menopausal women. Specifically, BC patients report more frequent, longer lasting, and more bothersome hot flashes. Furthermore, compared to BC patients who do not experience hot flashes, those who do report poorer quality of life (QoL) with decreased physical and social functioning, as well as poorer general health, even after controlling for medical, demographic, and treatment variables. However, not all BC patients who experience hot flashes experience decreased QoL. Further, it is unclear whether BC patients rely solely on medical intervention or utilize complementary/ alternative medicines (CAM) to treat hot flashes. This study examines the relationship between hot flashes and QoL in BC patients and develops a taxonomy of medical and CAM interventions used by BC patients. To date 78 patients have been recruited to participate in the parent study to the proposed project.
DTIC
Breast; Cancer; Fever; Mammary Glands; Patients

20050080305 Baylor Coll. of Medicine, Houston, TX USA
Identification of Pathways Required for the Coordination of Late Mitotic Events in Animal Cells
Baumgartner, Bridget L.; Harper, J. W.; Aug. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0596
Report No.(s): AD-A428977; No Copyright; Avail: CASI; A02, Hardcopy

The temporal coordination of anaphase, cytokinesis and mitotic exit is essential for the production of viable daughter cells, and mutations that affect the proper timing of these events result in genomic instability, a hallmark of cancer. In yeast, a signaling pathway has been identified, called the Mitotic Exit Network, which coordinates mitotic exit and cytokinesis with the end of anaphase. Homologues of three of these signaling components have been identified in humans suggesting that human cells regulate mitosis in a similar fashion; however, a clear mitotic exit network has yet to be revealed. The identification and characterization of such a pathway in human cells will further our understanding of how normal cell division is regulated and will highlight possible mechanisms of genomic instability in tumor cells. In order to discover those genes that are involved specifically in animal cell division and are not conserved in yeast, we are taking advantage of the nematode, C. elegans. C. elegans is a multi-cellular complex metazoan whose genes are more homologous to humans than are those of yeast. This system will allow for the rapid functional analysis of large numbers of candidate genes that can then be used to ascertain their human counterparts by sequence comparison. Using the yeast two-hybrid system we have built a protein interaction map for hundreds of candidate C. elegans genes that are potentially involved in mitotic temporal control, based on phenotypic data as well as homology to yeast genes of known function. Once complete, these interaction data in combination with phenotypic data will help to elucidate specific biochemical pathways involved in late mitotic events. By recognizing the components of these putative pathways novel targets for anti-cancer therapies may be discovered. This report summarizes work done over the past twelve months, which culminated in the drawing of a preliminary mitotic protein interaction map for C. elegans.
DTIC
Animals; Cancer; Coordination; Mitosis

20050080306 Garvan Inst. of Medical Research, Darlinghurst, Australia
The Role of the GAB2 Docking Protein in Human Breast Cancer
Brummer, Tilman; Daly, Roger J.; Jul. 2004; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0441
Report No.(s): AD-A428979; No Copyright; Avail: CASI; A03, Hardcopy

Deregulated receptor-tyrosine kinase (RTK) signalling is a hallmark of many breast cancers and therefore RTKs and their

associated signal transducers have emerged as targets for novel therapeutic strategies as well as markers for patient prognosis. Docking proteins of the Gab/Dos family amplify RTK signals and couple these to the Ras/MAPK and Pl-3K pathways, two major signaling pathways with well established roles in tumorigenesis. Expression of the Gab2 isoform is often elevated in primary breast cancer specimens and is positively regulated by estrogen. This suggests that Gab2 plays a role in the crosstalk between steroid hormone and growth factor receptors pathways, which is implicated in the decreased estrogen sensitivity and anti-estrogen resistance of breast cancer cells. We have therefore initiated the present project to analyse the importance of Gab2 over-expression for the development and progression of breast cancer. Within the last year, we have established Gab2 overexpressing HC11 cells, a widely used model system for the analysis of signaling pathways in normal mammary epithelium. We report here the phenotypic analysis of Gab2 overexpressing HC11 cells in terms of growth factor- and serum-induced proliferation. Furthermore, we have established stable Gab2 expressing pools of the estrogen-dependent breast cancer line ZR- 75-1.
DTIC
Breast; Cancer; Estrogens; Hormones; Mammary Glands; Proteins; Spacecraft Docking; Tyrosine

20050080308 Mayo Clinic, Rochester, MN USA
Changes in Ovarian Stromal Function in Premenopausal Women Undergoing Chemotherapy for Breast Cancer
Barton, Debra; Sloan, Jeff; Loprinzi, Charles; Kearns, Ann; Aug. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0593
Report No.(s): AD-A428981; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this clinical research training grant is to gain the expertise to develop a program of research regarding understudied, critical quality of life issues in breast cancer survivors. A pilot research project was developed to look at the effect of chemotherapy on ovarian stromal function in premenopausal women undergoing chemotherapy for breast cancer. In this pilot study to assess ovarian stromal function, androgen levels will be drawn and evaluated at baseline and over the course of chemotherapy as the ovarian stroma is a significant source of androgens in naturally postmenopausal women. As androgens are linked in the literature to several symptoms that women with breast cancer experience, specifically decreased libido, increased fatigue, negative mood, vasomotor symptoms, and weight gain, it is important to explore the potential role of androgens in the etiologies of these symptoms. Nothing is known about this area currently in breast cancer survivors. Through the process of writing the pilot study and attending educational sessions, this principal investigator has continued to develop expertise in the area of sexuality and endocrine function as they relate to breast cancer survivors. A published review article on libido and a presentation on endocrine changes in breast cancer survivors have resulted.
DTIC
Breast; Cancer; Chemotherapy; Females; Mammary Glands

20050080312 Georgetown Univ., Washington, DC USA
One Carbon Metabolism and Methylation in Breast Tumors
Sumner, Simone B.; Shields, Peter; Jun. 2004; 148 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0344
Report No.(s): AD-A428992; No Copyright; Avail: CASI; A07, Hardcopy

The first aim of this case control study is to examine the risk of breast cancer in relation to germ-line variants found in three key enzymes related to one-carbon metabolism. We also plan to determine the Methylation status of several genes in our cases and to identify any association with polymorphisms found in enzymes related to one-carbon metabolism. Finally we determined the ER status of all cases in an attempt to identify associations with p53 mutations. In the last year I have completed genotyping on all cases and controls for polymorphisms in 4 genes, determined the Methylation status of 4 genes for a fraction of all cases, and completed ER staining and scoring on all cases. MTHFR C677T data has been analyzed and the results indicated an increase breast cancer risk for the TT variant. This increased risk was further influenced by a high alcohol and low folate intake especially in our postmenopausal women. The analysis other SNF data has not been completed.
DTIC
Breast; Cancer; Carbon; Mammary Glands; Metabolism; Methylation; Tumors

20050080316 Pittsburgh Univ., Pittsburgh, PA USA
Functional Estrogen Deprivation by activating the Orphan Nuclear Receptor PXR
Xie, Wen; Aug. 2004; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0539
Report No.(s): AD-A429003; No Copyright; Avail: CASI; A03, Hardcopy

Estrogens are required for mammary epithelial proliferation and are prerequisite for breast cancer formation. Accordingly, strategies to down-regulate estrogen activity have been proven effective to treat and prevent breast cancer. A major pathway to deactivate estrogens is through estrogen sulfation mediated by the phase II sulfotransferases (SULT). SULT is expressed in normal mammary epithelial cells but its expression and activities are significantly lower in many breast cancer cells, suggesting that down-regulation of SULT may led to unchecked estrogen stimulation and cancerous transformation. The expression of sulfotransferase is regulated by orphan nuclear receptor PXR. We hypothesize that the lower SULT activity in breast cancer cells is due to lower expression and activation of the PXR receptor. Activation of PXR by chemical or genetic means will induce the expression of SULT, which in turn facilitates estrogen deactivation and inhibits estrogen-dependent breast cancer cell growth. The traditional antiestrogenic agents such as tamoxifen, though effective, are known to have untoward clinical side effects. It is anticipated that development of PXR activating and ER neutral agents may represent a novel strategy to functionally deprive estrogen activity and to treat and prevent breast cancers.
DTIC
Activation; Breast; Cancer; Deprivation; Epithelium; Estrogens; Mammary Glands

20050080328 Iowa Univ., Iowa City, IA USA
Automatic Exposure Control Device for Digital Mammography
Fajardo, Laurie L.; Aug. 2004; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9429
Report No.(s): AD-A429043; No Copyright; Avail: Defense Technical Information Center (DTIC)
The broad, long-term objective of this IDEA proposal is to achieve optimized image quality for DM within acceptable limits of radiation exposure by developing innovative approaches for controlling DM exposures. These approaches entail using the digital detector and an artificial neural network to control mammographic exposures. This project's specific aims are (1) to use short, low dose pre-exposures of the breast to create 'intelligent' regions of interest that determine the exposure parameters for the fully exposed image; and (2) to use an artificial neural network to select exposure parameters (mAs, kVp, and beam filtration) based on 'intelligent decisions' that optimize signal-to- noise (SNR) as a function of mean glandular dose.
DTIC
Automatic Control; Control Equipment; Digital Systems; Exposure; Radiation Dosage

20050080330 Long Island Jewish Medical Center, Lake Success, NY USA
Neural Protein Synuclein Gamma (ISNCG) in Breast Cancer Progression
Jiang, Yangfu; Jul. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0352
Report No.(s): AD-A429052; No Copyright; Avail: CASI; A03, Hardcopy
Synucleins are involved in the formation of pathologically insoluble deposits characteristic of neurodegenerative diseases. Gamma Synuclein (SNCG), previously identified as a breast cancer specific gene (BCSG1), is also highly associated with breast or ovarian cancer progression. However, the molecular targets of SNCG aberrant expression for breast Cancer have not been identified. Here we report that SNCG is overexpressed in the majority of breast cancer and stimulates ligand-dependent estrogen receptor signaling and mammary tumorigenesis. As an Hsp7O-associated chaperone, SNCG participated in Hsp-ER-alpha complex, enhanced the high affinity ligand-binding capacity of ER and stimulated ligand-dependent activation of ER-alpha. The SNCG-mediated stimulation of ER-alpha transcriptional activity is consistent with its stimulation of mammary tumorigenesis in response to estrogen. SNCG overexpression stimulated the ductal branching of mammary glands in SNCG transgenic mice. These data indicate that SNCG is a new chaperone protein in the Hsp-based multiprotein chaperone complex for stimulation of ligand-dependent ER-alpha signaling and, thus, stimulates hormone responsive mammary tumorigenesis.
DTIC
Breast; Cancer; Mammary Glands; Proteins

20050080335 Mayo Clinic, Rochester, MN USA
Rcl, a Novel Breast Cancer Oncoprotein?
Janknecht, Ralf; Aug. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0538
Report No.(s): AD-A429059; No Copyright; Avail: CASI; A02, Hardcopy
Rcl is an undefined protein whose expression can be induced by the oncoproteins c-Myc and HER2/Neu, both of which

are heavily implicated in breast tumorigenesis. As such, Rcl may be an important downstream effector of c-Myc and HER2/Neu in breast cancer. To prove this hypothesis, we pursued three lines of research (i) We studied the potential co-overexpression of Rcl, c-Myc and HER2/ Neu in human breast tumor specimens and found Rcl to be overexpressed in one-third of all cases, but seemingly independent of HER2/Neu and c- Myc overexpression. This suggests that Rcl is an oncogene contributing to cancer. (ii) We wished to assess the importance of Rcl for the phenotypic changes observable in tumor cells. To this end, we attempted to knock-down Rcl expression by RNA interference and study the resultant phenotypic changes in tumor cells. However, these experiments could not yet be performed due to our inability to generate effective Rcl siRNA. (iii) To unravel Rd's mode of action, potential interaction partners have been identified by a yeast two-hybrid screen and a procedure has been developed to isolate Rcl-containg protein complexes amenable for mass spectrometric identification. Thus, the foundation for the identification of Rcl interaction partners has been established.
DTIC
Breast; Cancer; Mammary Glands; Proteins

20050080340 Princeton Univ., NJ USA
Photosynthetic Complexes: Molecularly Activated Bioswitches and Agents for Light Powered Molecular Circuitry
Forrest, Stephen R.; Baldo, Marc; Sep. 2004; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0559
Report No.(s): AD-A429068; AFRL-SR-AR-TR-04-0583; No Copyright; Avail: Defense Technical Information Center (DTIC)

This program was directed at demonstrating functional optoelectronic devices by contacting individual, highly photoactive molecules of biological origin. This 2 phase program (each phase duration of 1 year), successfully addressed the fundamental engineering issues associated with the application of protein/molecular aggregates to electronic devices: purification of the complexes, and their interconnection to conventional bulk organic circuitry. We have demonstrated a molecular power source using a single antenna complex extracted from a biological photosynthetic unit. To exploit the optimization of photosynthesis, we have demonstrated, for the first time, the solid state integration of photosynthetic complexes in solar cells. The internal quantum efficiency of the first generation of devices is estimated to be 12%.
DTIC
Circuits; Electro-Optics; Molecular Biology; Photosynthesis

20050080346 Hurd (Harry L.) Associates, Inc., Raleigh, NC USA
Effectiveness of Ranked t Scores for Identification of Signaling Genes: A Simulation Study
Hurd, Harry; Aug. 2002; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-C-0045
Report No.(s): AD-A429082; TR02-1; ARO-43812.2-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

Since some of the methods for identifying signaling genes in microarray experiments are hiearchical networks of often simple methods, it seems natural to use simulation to understand how well these methods perform under idealized circumstances. In this study we assume that expression levels for signaling genes are distributed $N(
DTIC
Genes; Simulation

20050080347 Baylor Coll. of Medicine, Houston, TX USA
A Potent Oncolytic Herpes Simplex Virus for the Therapy of Advanced Prostate Cancer
Zhang, Xiaoliu; Jul. 2004; 15 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0437
Report No.(s): AD-A429083; No Copyright; Avail: CASI; A03, Hardcopy

Although conventional radiation therapy and surgery are potentially curative treatments for organ-confined prostate cancer, there are few effective treatments for metastatic disease. We recently created a potent antitumor agent - the fusogenic oncolytic herpes simplex virus (HSV). The first task originally planned for the first year of this project was to demonstrate the potency of the fusogenic oncolytic HSV against advanced prostate cancer. The subtasks include: a) Production of high grade viral stocks; b) Establishment of metastatic prostate cancer in the animal model; c) Therapeutic administration of the virus, and evaluation of the results. We have now successfully finished these tasks. We used a mouse model of primary and metastatic human prostate cancer established from PC-3M-Pro4 cells to evaluate three different types of oncolytic HSVs:

non-fusogenic Baco-1, singly fusogenic Synco-2 and doubly fusogenic Synco-2D. Our results show that the doubly fusogenic Synco-2D has greater oncolytic activity than either Baco-1 or the singly fusogenic Synco-2 virus. Against lung metastases of human prostate cancer xenografts, intravenous administration of Synco-2D had produced a significant reduction of tumor nodules as compared with Synco-2, Baco-1 (p\h0.01) and PBS control. These results demonstrate that the doubly fusogenic Synco-2D indeed is an effective therapeutic agent for human metastatic prostate cancer.
DTIC
Cancer; Prostate Gland; Therapy; Viruses

20050080348 Pennsylvania Univ., Philadelphia, PA USA
X-Ray Polarization Imaging
Maidment, Andrew D.; Jul. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0593
Report No.(s): AD-A429084; No Copyright; Avail: CASI; A03, Hardcopy

Conventional mammography only evaluates the spatial arrangement of tissue in the breast as it depends upon the fact that some materials absorb A-rays more than other materials (the x-ray energy must be deposited in the body to produce an image). We propose: to investigate the potential of x-ray polarization imaging, by building an x-ray polarimeter (a device designed to measure polarization) and determine the factors that affect polarimeter design. Polarization radiography has the potential to supplement mammographic images with information about the function, composition, and metabolism of the breast. We plan to perform fundamental experiments regarding x-ray polarization to determine whether the effect is sufficiently large to allow it to be used to produce images. We also wish to measure the ability of key biological materials, including breast tissue, to alter the polarization of x-rays, and determine the accuracy with which we can measure this effect. This research is quite clearly, speculative, but the program described in the grant would give the experimental data necessary to clearly understand the benefits and limitations of attempting to image tissue using polarized x-rays. This annual report presents our research to date.
DTIC
Breast; Cancer; Mammary Glands; Polarimeters; X Ray Imagery; X Rays

20050080353 Virginia Univ., Charlottesville, VA USA
Dual Modality Imaging System for Breast Cancer Research
Williams, Mark B.; Jul. 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9432
Report No.(s): AD-A429091; No Copyright; Avail: CASI; A03, Hardcopy

In the 25-40% of the general female population with radiodense breast parenchyma, clinically occult lesions may be invisible in the screen-film mammogram. Even if suspicious masses are detected, determination of the benign or malignant nature of a mass is often impossible from the x-ray image. There is thus a need for diagnostic procedures that can noninvasively help characterize suspicious breast lesions. Scintimammography is an imaging technique that shows promise as an adjunct diagnostic tool in problem solving mammography, for monitoring recurrence after surgery, and in the assessment of multidrug-resistance. However, because clinical Anger cameras have only moderate spatial resolution and are difficult to position close to the breast, small lesions are difficult to detect. In addition, no direct means exists of correlating mammographic and scintigraphic information because of the significantly different shape of the breast in mammography (compressed) and scintimammography (prone, pendulant). We are developing an imaging system that overcomes these problems by combining digital x-ray mammography and gamma emission scintigraphy in a single, integrated system. The system is mounted on a standard upright mammography unit, and can easily be placed in a typical mammography room, providing accessibility even for small breast imaging clinics not associated with major medical centers.
DTIC
Breast; Cancer; Imaging Techniques; Mammary Glands; X Rays

20050080356 McGill Univ., Montreal, Quebec Canada
Nuclear Receptor Interactions in Breast Cancer: The Role of Kinase Signaling Pathways
Petterson, Filippa; Jul. 2004; 22 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0472
Report No.(s): AD-A429094; No Copyright; Avail: CASI; A03, Hardcopy

Retinoids are vitamin A derivatives, which cause growth inhibition, differentiation and/or apoptosis in various cell types,

including some breast cancer cells. In general, estrogen receptor (ER)-positive cells are retinoic acid (RA) sensitive, whereas ER-negative cells are resistant. In this report, I show that ER-negative MDA-MB-231 cells are strongly growth inhibited by retinoids in combination with a PKC inhibitor. While neither RA nor GF109203X (GF) has a significant growth inhibitory effect in these cells, RA+GF potently suppress proliferation and induce apoptosis. Moreover, GF was found to enhance RA-induced transcriptional activation of an RARE reporter construct. Expression of phosphorylated as well as total PKC alpha and delta was decreased by GF and this was potentiated by RA. In addition, treatment with GF caused a sustained activation of ERK1/2 and p38-MAPK. Importantly, inhibition of ERK but not p38 or JNK suppressed apoptosis induced by RA+GF, indicating that activation of ERK is specifically required. In support of this novel finding, the ability of other PKC inhibitors to cause apoptosis in combination with RA correlates with ability to cause sustained activation of ERK. Moreover, it appears that inhibition/ downregulation of PKC delta is specifically involved.
DTIC
Breast; Cancer; Enzyme Activity; Mammary Glands; Nuclear Interactions; Proteins

20050080360 Geneva Foundation, Tacoma, WA USA
Call-Center Based Disease Management of Pediatric Asthmatics
Quinn, James M.; Apr. 2004; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0182
Report No.(s): AD-A429099; No Copyright; Avail: CASI; A03, Hardcopy
The purpose of this study is to examine a population-based intervention using preventive measures of a remote call-based asthma disease management program utilizing proactive education and monitoring. This intervention will be compared to a control population of pediatric asthma patients receiving printed education materials and usual care at three DOD military treatment facilities in a similar geographic region.
DTIC
Asthma; Diseases

20050080362 Stanford Univ., Stanford, CA USA
Development of a Novel Test System for Screening Antagonists of ErbB receptors in Breast Cancer
Blau, Helen M.; Jun. 2004; 56 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0442
Report No.(s): AD-A429104; No Copyright; Avail: CASI; A04, Hardcopy
The focus of this project was to design a system for screening chemical compounds that would inhibit the dimerization of the EGFR family members ErbB2 and ErbB3 using beta-galactosidase complementation. We attempted to apply the beta galactosidase complementation system to both ErbB2, 3 homo and heterodimerization, as well as the interaction of these receptors with downstream signaling molecules such as Grb2. The initial attempts to design an assay amenable to high-throughput screening for antagonists of ErbB2 activity failed due to fundamental problems associated with the interaction system employed. In order to circumvent these limitations we rationally redesigned the system to be more stable and tolerate wider ranges of expression levels. The new system based on a 46aa mutated alpha-peptide was able to successfully discern inducible interactions for transmembrane receptors, cytosolic, and nuclear proteins. Further the magnitude of induction is sufficient for high throughput screening for drugs that inhibit this heterodimerization event.
DTIC
Breast; Cancer; Dimerization; Dimers; Estrogens; Mammary Glands

20050080365 Wayne State Univ., Detroit, MI USA
Molecular Effects of 13C/DIM in Prostate Cancer
Sarkar, Fazlul; Apr. 2004; 41 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0042
Report No.(s): AD-A429108; No Copyright; Avail: CASI; A03, Hardcopy
Our previous data have shown that I3C inhibits cell growth and induces apoptosis in cancer cells. We have also observed a reduction in the activated Akt and the activity of NF-xB in prostate cancer cells treated with I3C We hypothesize that I3C/DIM functions as an inhibitor of NF-xB, which may be due to the inactivation of Akt-related signaling molecules, and ultimately leads to the induction-of-apoptotic processes. To test our hypotheses we investigated the effects of I3C/DIM on NF-xB and Akt activities in prostate cancer-cells and non-tumorigenic prostate epithelial cells. We also investigated how the Akt and NF-) cB pathways may cross-talk in prostate cancer cells exposed to I3C/DIM. We have found that 13C/DIM

inhibited NF-xB activity and the inhibition- was partly mediated through the inactivation of Akt. 13C and DIM inactivated NF-KB and Akt, f regulated the expressi9n of genes related to cell growth and apoptosis, and induced Bax trans location and cytochrome c release, resulting in inhibition of cell growth and induction of apoptosis in prostate cancer cells. However, no significant such effects were observed in non-tumorigenic CRt-222l prostate epithelial cells, suggesting that I3C and DIM may be potent agents for the prevention and/or treatment of prostate cancer.
DTIC
Cancer; Prostate Gland

20050080369 California Univ., Los Angeles, CA USA
A PSCA Promoter Based Avian Retroviral Transgene Model of Normal and Malignant Prostate
Reiter, Robert; Apr. 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0163
Report No.(s): AD-A429113; No Copyright; Avail: Defense Technical Information Center (DTIC)

The molecular and cellular origins of prostate cancer are poorly understood. Recent evidence from our laboratory suggests that prostate cancer may arise from a basal/luminal precursor cell marked by cell surface expression of PSCA. The evidence supporting this hypothesis is that (1) PSCA marks an intermediate cell population that co-expresses basal and luminal cell cytokeratins (2) this cell population does not express p63 and is androgen receptor positive, all hallmarks of prostate cancer, and (3) PSCA is highly expressed in HGPIN and prostate cancer and in all animal models of prostate cancer. To test this hypothesis and to develop new models of prostate, we propose to determine whether delivery of oncogenes specifically to the PSCA positive cells of mouse prostate is sufficient to cause cancer. To accomplish this, we will develop a transgenic mouse model in which the retroviral receptor gene TVA is expressed in the prostate under control of the PSCA promoter. Virus containing one or more oncogenes will be delivered to the prostate and the resulting phenotype characterized.
DTIC
Antigens; Birds; Cancer; Carcinogens; Prostate Gland; Stem Cells; Tumors; Viruses

20050080371 Buck Inst. for Age Research, Novato, CA USA
Comprehensive Development Program of Hunter-Killer Peptides for Prostate Cancer
Ellerby, Howard M.; May 2004; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0029
Report No.(s): AD-A429116; No Copyright; Avail: Defense Technical Information Center (DTIC)

Prostate cancer is now the most common cancer among men in the USA. Angiogenesis is required for prostate tumor survival, growth, and metastasis. We proposed to design novel Hunter-Killer Peptides (HKPs) , each representing a chimeric peptide of an angiogenesis-targeting peptide and a mitochondrial membrane-disrupting peptide. While non-toxic in the circulation, the HKPs will be preferentially toxic to mitochondria once internalized into angiogenic cells, via the targeting domain. As we reported in Ellerby et al., Nature Medicine, 5, 1032-1038, 1999, our prototypes contain only 21 and 26 amino acid residues, are selectively toxic to angiogenic endothelial cells and show strong anti-cancer activity in mice (breast carcinoma xenografts) . In the work described here, we evaluated the HKPs for efficacy and toxicity in a xenograft model of human prostate carcinoma, and in the TEAMP (transgenic adenocarcinoma mouse prostate) model for prostate cancer. The central theme of this research is to develop and appraise this new chemotherapy with the goal of producing both a safer, and more effective, treatment of advanced prostate cancer.
DTIC
Cancer; Peptides; Prostate Gland

20050080372 Cold Spring Harbor Lab., New York, NY USA
Genetic Requirements for the Transformation of Human Cells
Seger, Yvette; Jul. 2004; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0210
Report No.(s): AD-A429117; No Copyright; Avail: Defense Technical Information Center (DTIC)

Our knowledge of the transformation process has emerged largely from studies of primary rodent cells and animal models. However, numerous attempts to transform human cells using oncogene combinations that are effective in rodents have proven unsuccessful. These findings strongly argue for the study of homologous experimental systems. Here we report that the combined expression of adenovirus E1A, Ha-RasV12, and MDM2 is sufficient to convert a normal human cell into a cancer cell. Notably, transformation did not require telomerase activation. Therefore, activation of telomere maintenance strategies

is not an obligate characteristic of tumorigenic human cells. Activation of telomerase, and consequently telomere maintenance, is a common characteristic of human tumors. Existing models of human cancer cells, created by the introduction of defined genetic alterations, all include telomerase activation as an obligate component of the transformed phenotype. Here we demonstrate that normal human cells can be converted into cancer cells, capable of forming tumors in immunocompromised mice in the absence of telomerase activation or an alternative telomere maintenance strategy. This suggests that alterations in telomere biology must be viewed similarly to genomic instability as catalysts of transformation rather than as central components of the transformed phenotype.
DTIC
Cancer; Carcinogens; Genetics; Tumors; Viruses

20050080379 Georgetown Univ., Washington, DC USA
Long Term Outcomes of BRCA1/BRCA2 Mutation Testing
Schwartz, Marc D.; Aug. 2004; 44 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0553
Report No.(s): AD-A429130; No Copyright; Avail: CASI; A03, Hardcopy

This project aims to gain a better understanding of the implications of genetic testing for breast-ovarian cancer susceptibility. The primary goal is to evaluate the impact of BRACA1/BRACA2 mutation testing on long term psychosocial (quality of life, distress, social functioning) and prevention/surveillance (mammography, cAl25, transvaginal ultrasound, prophylactic mastectomy, prophylactic oophorectomy and chemoprevention) outcomes. To accomplish this we will measure outcomes within a group of women who received BRCAl/BRACA2 test results at least four years ago. We will divide our sample based upon their personal cancer history evaluating cancer survivors with different measures compared to unaffected individuals. For both survivors and unaffected individuals we will recruit separate comparison samples of women who have never received BRCAl/BRACA2 testing. To date, we have submitted a protocol and received IRB approval from Georgetown University, have submitted a protocol and are awaiting approval from the DOD, have developed our measurement and data management systems and are prepared to begin accrual upon receipt of human subjects approval from the DOD.
DTIC
Breast; Cancer; Evaluation; Genes; Mammary Glands; Mutations; System Effectiveness; Ultrasonics

20050080380 Texas Univ., Houston, TX USA
The Role of MEKK3 Signaling of Pathway in the Resistance of Breast Cancer Cells to TNF-(Alpha)-Mediated Apoptosis
Yu, Ling; May 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0449
Report No.(s): AD-A429131; No Copyright; Avail: CASI; A02, Hardcopy

In the past year, we continued to test the hypothesis that NF-kB activation in breast cancer cells plays a critical role in cancer cells' resistance to anti-cancer drugs and to TNFalpha treatment, and MEKK3 is an essential component of this process. We finished construction of dominant negative forms of MEKK3 expression vectors and tested the vectors in 293T cells and in breast cancer cell line MCF7. We also prepared two lentiviral vectors for MEKK3 siRNA. The second line of this study is to further determine the regulation of NF-kB and AP-1 activation through MEKK3. Because both the NF-kB and AP-1 pathways are crucial in regulating cell apoptosis, the balance of their activation will determine the outcome of cell survival or apoptosis. We found that MEKK3 is crucial for NF-kB, JNK, and p38 but not for ERK MAPK activation. Furthermore we generated and characterized a unique antibody that recognize active MEKK3. This antibody will allow us to measure the effect of inhibitors and/or modulators of MEKK3 activity in breast cancer cells for investigation of the cancer cell sensitive to TNFalpha.
DTIC
Apoptosis; Breast; Cancer; Chemotherapy; Diseases; Drugs; Mammary Glands

20050080381 Georgetown Univ. Hospital, Washington, DC USA
Combined M.D./Ph.D. and Ph.D. Training Program in Breast Cancer Prevention
Dickson, Robert B.; Jul. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9198
Report No.(s): AD-A429133; No Copyright; Avail: CASI; A02, Hardcopy

The goal of this training program is to dramatically extend our existing, highly successful Interdisciplinary Doctoral

Training Program in Tumor Biology with a new track which integrates genetics; molecular epidemiology, and prevention of breast cancer. This new track offers both MD/PhD and PhD training opportunities, and integrates new faculty from the Lombardi Comprehensive Cancer Center Programs in Cancer Prevention and Control, and Cancer Genetics. The program is enriched by new courses, as well as practical research experience. This new programmatic initiative make use of the existing organizational structure of the Interdisciplinary Doctoral training Program in Tumor Biology and incorporates a multi-disciplinary faculty who are devoted to research and education in breast cancer. To date, 10 students were recruited into 5 classes, and 4 new courses were created. Students in this program so far have published 9 papers, and 19 abstracts/ presentations. They were also awarded 4 individual fellowship grants, and one has now been awarded her PhD, with others currently in the program continuing to make good progress toward that goal.
DTIC
Breast; Cancer; Education; Health; Mammary Glands; Medical Science; Prevention

20050080382 Tulane Univ., New Orleans, LA USA
Enhancing the Immune Response to Recombinant Plague Antigens
Clements, John D.; Oct. 2004; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0058
Report No.(s): AD-A429134; No Copyright; Avail: CASI; A03, Hardcopy

The etiologic agent of plague is the Gram negative bacterium Yersinia pestis. Y. pestis is a concern as one of the microorganisms with potential for use against civilian or military populations as a biological warfare/ biological terrorism agent. In that case, the pneumonic form of plague would be the most likely outcome. This form of plague is particularly devastating because of the rapidity of onset, the high mortality, and the rapid spread of the disease. Immunization against aerosolized plague presents a particular challenge for vaccine developers. The studies reported herein explore the ability of a novel adjuvant, designated LT(Rl92G), to promote the rapid development of long-lasting, high titer antibodies against a recombinant plague antigen (Fl-V) and protection in a murine model. Subsequent studies will be performed in non-human primates. Different routes of administration are examined to test the hypothesis that heterologous boosting will be more effective than homologous boosting at increasing the magnitude and/or duration of the antibody response.
DTIC
Antigens; Bacillus; Bacteria; Etiology; Immunity; Microorganisms; Physiological Responses; Terrorism; Vaccines; Warfare

20050080383 Drexel Univ., Philadelphia, PA USA
Immobilization of Enzymes in Nanoporous Host Materials: A nanobiotechnological Approach to Decontamination and Demilitarization of Chemical and Biological Warfare Agents
Wei, Yen; May 2002; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-1-0685
Report No.(s): AD-A429136; No Copyright; Avail: Defense Technical Information Center (DTIC)

As proposed, we have established the concept of a novel nanobiotechnology for decontamination and demilitarization of chemical and biological warfare agents, based on immobilizing decon/demil effective enzymes such as organophosphorus acid anhydrolases (OPAA) in nanoporous host materials such as silica. The immobilization has been achieved by encapsulating the enzymes in nanoporous silicate or organically modified silicate frameworks prepared by the nonsurfactant-templated sol-gel technology recently developed in our laboratory. Such enzyme (guest)-nanoporous silica (host) systems offer many advantages over the use of free enzymes, including: (1) significantly improved thermal stability; (2) retain enzymatic activity in decon/demil media that contain organic solvents; (3) longer shelf life and higher storage stability; and (4) reusability and recyclability of the enzymes. Based on our results using diisopropyl fluorophosphate (DFP) as the simulant for G-type agents, encapsulated OPAA not only retains its enzymatic activity to a significant extent but also exhibits much enhanced stability. Further investigation would lead to practical applications of these novel nanobiomaterials in decontamination creams/lotions and as survivable bio-decontaminants under battlefield conditions.
DTIC
Biological Weapons; Biotechnology; Chemical Warfare; Decontamination; Enzyme Inhibitors; Enzymes; Immobilization; Nanotechnology

20050080389 North Carolina Univ., Chapel Hill, NC USA
Targeting Lysophosphatidic Acid Signaling in Breast Cancer Cells
Thiel, Debra A.; Morris, Andrew J.; Sep. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0643
Report No.(s): AD-A429144; No Copyright; Avail: CASI; A03, Hardcopy

Autotaxin (ATX) is a tumor cell-derived enzyme that regulates cancer cell growth motility and survival. ATX exhibits both phosphodiesterase and lysophospholipase D (lysoPLD) catalytic activities. The lysoPLp activity of ATX has been reported to generate lysophosphatidic (LPA) acid via hydrolysis of lysophosphatylcholine substrate. IJPA exerts its effects on target cells primarily through the actions at G-protein coupled cell surface receptors. Because the actions of ATX on cancer cells are very similar to those elicited by LPA, the biological activity of ATX has been suggested to result from the -production of LPA by the hydrolysis of lysoglycerophospholipid substrates that are produced by cells or present in cell culture systems. The broad purpose of the proposed research is to investigate the effects of IJPA signaling in breast cancer cells. Specifically by targeting an important enzyme involved in the extracellular production of this bioactive lipid mediator. The long-term goal of the particular research presented in this report is to define the regulation, mechanism and biological significance of the lysophopholipase D activity of ATX.
DTIC
Breast; Cancer; Enzyme Activity; Mammary Glands

20050080391 State Univ. of New York at Buffalo, Amherst, NY USA
Phenethyl Isothiocyanate in Breast Cancer Prevention
Morris, Marilyn E.; Aug. 2004; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0527
Report No.(s): AD-A429146; No Copyright; Avail: CASI; A03, Hardcopy

Our hypothesis is that PEITC is an effective preventive agent in breast cancer. Although a number of mechanisms may be involved, one mechanism of PEITC effects that has not been explored is the potential for PEITC to alter the synthesis and elimination of estrogens. Our specific aims are: (1) to evaluate the efficacy of dietary PEITC, at relevant doses, in preventing or delaying the onset of breast cancer in estrogen-dependent breast cancer animal models, (2) to evaluate the effects of PEITC on 1 Theta-estradiol (E2) and metabolite (E2 sulfate, E2 glucuronide, estrone, 2-hydroxyE2, 4-hydroxyE2, 2- methoxyE2, and 4-methoxyE2) concentrations in plasma and tumor samples, and (3) to determine changes in enzyme activity and/or mRNA/protein expression in tumor and liver samples, for metabolic pathways which may be altered based on the E2 and E2 metabolite profiles. Our studies to date have characterized the pharmacokinetics of PEITC in rats (our animal model) and demonstrated in preliminary studies that PEITC can alter estrogen metabolism in the liver. Additionally, we found that low concentrations of PEITC can alter the expression of some genes important in breast cancer. These studies will provide new findings regarding the chemopreventive effects of the dietary compound PEITC in estrogen-dependent breast cancer.
DTIC
Breast; Cancer; Estrogens; Health; Mammary Glands; Prevention

20050080392 Colorado Univ., Aurora, CO USA
The Role of Claudin-7 in Mouse Mammary Gland and Tumorigenesis
Neville, Margaret C.; Jul. 2004; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0211
Report No.(s): AD-A429147; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have fully characterized the expression and localization of claudin 7 in the mammary epithelium, finding that it is not associated with tight junctions but is constitutively present in punctate structures, presumably vesicles, at the basal and lateral borders of cells. The same is true of bronchiole and certain elements of the renal epithelium while claudin 7 is found associated with tight junctions of the epididymus and mouse mammary cell lines. Four types of murine mammary tumors were examined. In all claudin 7 showed a distinct cytosolic and basolateral distribution. We find claudins 1, 3, 4, 5, 7 and 8 to be present in at least one of our mouse mammary cell lines, where they are localized to the tight junction. Only claudin 1 has been found to be consistently present in mammary epithelial tight junctions. Claudin 3 is localized to the basal and lateral borders of the cells in the virgin and pregnant animals, but not observed in lactation. Claudin 8 is prominent at the tight junctions in the mammary epithelium from the lactating animal. One paper has been submitted detailing these findings and a second is in the final stages of preparation.
DTIC
Breast; Cancer; Mammary Glands; Mice

20050080394 Pennsylvania State Univ., University Park, PA USA
Unique Proteins Expressed by Blood Vessels in Skeletal Sites Colonized by Breast Cancer Cells
Gay, Carol V.; Aug. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0583
Report No.(s): AD-A429149; No Copyright; Avail: CASI; A02, Hardcopy

We are comparing vascular endothelial cells isolated from 1) the ends of bone where metastasized breast cancer cells frequently lodge and proliferate (cells called BVECs) and from 2) the nearby central marrow cavity (cells called MVECs). Project-1: to acquire a broader view of differences between BVECs and MVECs, one goal is to compare messenger RNA using micro array analysis. We have purified the cell populations by flow cytometry; this resulted in impaired RNA quality. We have set up a magnetic bead method to more gently isolate and purify the cells using an antibody to PECAM, a protein specifically on vascular endothelial cells. Project-2: we have found differences in expression and display of surface adhesion molecules. Using immunodetection, BVECs express more total p-selectin, e-selectin, ICAM- 1, and VCAM- 1 than MVECs; only a few (5-15%) of both cell types display these adhesion molecules externally. BVECs display more surface e-selectin when exposed to conditioned medium from MDA-MB-435 breast cancer cells. BVECs are fully stimulated by osteoblast conditioned medium, but MVECs respond by displaying substantially more p-/e-selectins. The data, while preliminary, suggest that BVECs in the ends of long bones possess adhesion properties that favor the entrapment of breast cancer cells.
DTIC
Blood Vessels; Breast; Cancer; Mammary Glands; Musculoskeletal System; Proteins

20050080395 Wisconsin Univ., Madison, WI USA
The Role of Amplified Wild-Type Neu in the Etiology of Breast Cancer
Gould, Michael N.; Jul. 2004; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0459
Report No.(s): AD-A429151; No Copyright; Avail: Defense Technical Information Center (DTIC)
Many human breast cancers have amplified wild-type Neu (Her2) protooncogenes. It is still not known from either human or rodent models if amplified wild-type Neu is involved in the etiology of breast cancer, We have begun to develop rat transgenic models. Under the first aim we will construct additional Neu transgenic rat lines. Aim 2 will endocrinologically manipulate female Neu-transgenic rats in a way that models high androgen postmenopausal women. Aim 3 will explore alternative reasons of why these female transgenics do not develop breast cancer. The role of genetic background as it relates to female breast cancer development in this model will be explored. We have produced two independent strains of Neu-transgenic rats that spontaneously develop mammary carcinomas in males. Females supplemented with androgens develop mammary carcinomas. These carcinomas activated Neu by amplification and not by mutagenesis. We have thus developed a useful model of Neu associated mammary carcinogenesis. This answers a key question of whether the amplification of wild-type Neu is only associated with tumor progression or is it also possibly involved in breast cancer etiology. These data presented is the first model to clearly demonstrate that the amplification of wild type Neu can induce mammary cancer. In addition we also show that the genetic penetrance of neu can be altered by different modifier genes on varying genetic backgrounds. This suggests that these modifiers may be good biomarker or drug targets for neu associated breast cancer.
DTIC
Breast; Cancer; Etiology; Mammary Glands

20050080396 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA
Overcoming Bone Marrow Stroma-Mediated Chemoresistance in Metastatic Breast Cancer Cells
Wieder, Robert; Aug. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0524
Report No.(s): AD-A429152; No Copyright; Avail: CASI; A03, Hardcopy
Breast cancer cells that metastasize to the bone marrow early in the course of the disease can become dormant and are resistant to the chemotherapy given to eliminate them. We developed a model of dormancy in vitro where well-differentiated breast cancer cells incubated with basic fibroblast growth factor (FGF-2) are growth-inhibited and upregulate integrins through which they receive survival signaling. Interaction between integrin alpha 5 beta 1 and fibronectin provides a survival advantage to dormant clones. Dormant cells have activated Akt and are resistant to docetaxel. Blocking Akt and P13 kinase, its upstream activator, using specific inhibitors reverses the survival advantage conferred by fibronectin but does not abrogate dormant clones completely. Blocking P13 kinase has the additional effect of disrupting the morphologic characteristics of dormant cells, suggesting a role for additional pathways besides Akt downstream of P13 kinase in dormant cell survival. A transcription inhibitor, flavopiridol, was very effective in diminishing survival of dormant clones. While it inhibited Akt phosphorylation, virally transduced replacement of Akt function did not reverse the inhibitory effects of flavopiridol. Flavopiridol reversed the upregulation of integrins and diminished adherence, particularly to fibronectin, supporting a role for this mechanism for its effects on dormant cells.
DTIC
Bone Marrow; Breast; Cancer; Mammary Glands; Metastasis; Phosphorylation

20050080402 Texas Univ., Houston, TX USA

The Role of c-Src Activation in Prostate Tumor Progression

Gallick, Gary; Jul. 2004; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0484

Report No.(s): AD-A429162; No Copyright; Avail: Defense Technical Information Center (DTIC)

DOD Award number DAMDl7-03-l-0484, 'The Role of c-Src Activation in Prostate Tumor Progression', has as its goal an understanding of the mechanisms of how activation of the protein tyrosine kinase, Src, contributes to prostate tumor progression and how Src regulation in host osteoclasts regulates metastatic growth of prostate tumor cells in the bone. In the first year of work, we have successfully developed cell lines from PC3 human prostate tumor cells that are constitutively increased in Src expression, or in which Src expression is induced by doxycyclin. Using these cells, we have demonstrated that increased Src activity leads to increased expression of vascular endothelial growth factor (VEGF); a novel finding implicating Src in promotion of angiogenesis by prostate tumor cells. We have further demonstrated that increased Src expression leads to increased tumorigenic growth in nude mice. Thus, we have provided new evidence that Src activation is important to prostate tumor progression. To examine the role of Src in growth of prostate tumor cells in the bone, we have begun to develop a Src-/- nu/nu strain of mice. Breeding of these mice is underway and two generations of mice have been obtained. Continued studies should provide new insights into role of Src in both the tumor and host environment in promoting prostate tumor cell metastasis.

DTIC

Cancer; Prostate Gland; Tumors

20050080403 Pittsburgh Univ., Pittsburgh, PA USA

Automated Analysis and Display of Temporal Sequences of Mammograms

Good, Walter F.; Jul. 2004; 40 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0549

Report No.(s): AD-A429163; No Copyright; Avail: CASI; A03, Hardcopy

Although screening for breast cancer has been effective in detecting cancers, it is not clear that the diagnostic information present in the sequences of screening exams is currently being utilized. In an attempt to unprove diagnostic accuracy, this project is adapting and integrating several novel technologies, under development in our laboratory, into a system for providing mammographers with information about changing tissue patterns, and the corresponding likelihood of malignancy, derived from temporal sequences of images. Our hypotheses are: 1) Sequences of screening mammograms contain information about tissue changes that is not otherwise being exploited in the diagnosis of breast cancer; and, 2) Changing tissue patterns can automatically be identified, and correlated with diagnostic questions. The main objectives of the project are to provide a system, which can be employed at the discretion of mammographers, to: 1) Normalize images to facilitate comparisons; 2) Apply multi-image CAD methods to identify corresponding features between images; 3) Detect and classify trends in temporal sequences; 4) Calculate and present various kinds of parameter images; and, 5) Develop a display system for efficiently presenting sequences of exams. Our expectation is that this display will improve diagnostic performance of mammographers for these cases.

DTIC

Breast; Cancer; Mammary Glands; Sequencing

20050080406 Texas Univ., Dallas, TX USA

Targeting Osteoblastic Bone Metastasis with a Novel Site Restricted Gene Therapy

Koeneman, Kenneth S.; Jun. 2004; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0107

Report No.(s): AD-A429175; No Copyright; Avail: Defense Technical Information Center (DTIC)

Continuing from the previous two years work on this project, encouraging data was also obtained in year 3. Effectiveness of the Ad- BSP-Ela viral contrast was again demonstrated in the intraosseous model of prostate cancer bone metastasis. Further tests were completed and, as such, it appears that low dose systemic taxotere administration in combination with the viral construct Ad-BSP-Ela may have better efficacy and long-term cancer control, based upon serum PSA as a biochemical recurrence marker. This metastasis model in vivo data corresponds nicely to the previously reported in vitro data which was presented in year 2 progress report After much effort, we were able to construct the Ad-HTERT-Ela construct. The cloning data and purification analysis is presented in this report. This construct will be available for future testing and future attempts at funding. The most striking nature of this research is the apparent synergism with the 'chemogene therapy' approach in the in vivo metastasis model. It appears that systemic Ad-BSP-Ela virus along with taxotere has a striking effect on control of the

prostate intraosseous tumors. The likely most efficacious combination in humans afflicted with prostate cancer metastasis is Ad-BSP-Ela virus and low-dose taxotere (with dexamethasone) as evidenced by our data presented herein.
DTIC
Bones; Cancer; Gene Therapy; Metastasis; Prostate Gland; Viruses

20050080407 Loma Linda Veterans Association for Research and Education, Loma Linda, CA USA
Molecular Genetic and Gene Therapy Studies of the Musculoskeletal System
Baylink, David J.; Mohan, Subburaman; Oct. 2004; 256 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-2-0021
Report No.(s): AD-A429176; No Copyright; Avail: Defense Technical Information Center (DTIC)

The primary goal of the proposed work is to apply several state of the art molecular genetic and gene therapy technologies to address fundamental questions in bone biology with a particular emphasis on attempting: l)to clarify gene functions of the those genes that are involved in the musculoskeletal system; and 2)to promote rapid healing and eventually regeneration of soft and hared tissues using appropriate animal models. To discover novel genes and evaluated functional genes relevant to the musculoskeletal system, we are performing a number of molecular genetics studies using appropriate mouse models. To develop therapeutic approaches for treating systemic and local lesions in the skeleton by means of gene therapy, we are developing technologies 0 target one or more growth factor genes to bone using experimental animal model systems. During the last funding period, we have successfully accomplished all of the specific objectives. Our work during this period has resulted in 2 manuscripts and 3 abstracts. We believe that successful accomplishment of the proposed studies will provide a better understanding of the molecular mechanics involved in soft and hard tissue regeneration and will provide a frame work for future development of therapies for soft and hard tissue injuries.
DTIC
Gene Therapy; Genetics; Musculoskeletal System

20050080438 Georgetown Univ. Hospital, Washington, DC USA
Georgetown Institute for Cognitive and Computational Sciences
Faden, Alan I.; Apr. 2004; 513 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-2-9007
Report No.(s): AD-A429304; No Copyright; Avail: Defense Technical Information Center (DTIC)

Understanding and modifying plasticity/recovery within the central nervous system (CNS) represents the over-arching theme of this multidisciplinary research program. Participating investigators have used tools from cellular and molecular neurobiology, as well as systems neuroscience, to study mechanisms of neuronal cell death, as well as plasticity, after acute or chronic CNS injury. This included development/evaluation of pharmacological strategies to limit tissue damage and enhance recovery after acute or chronic neurodegeneration. Magnetic resonance imaging and spectroscopy were utilized as tools to evaluate changes in response to injury and/or treatment. Computational modeling was also used to predict both plasticity and for drug discovery. Together, these complementary research efforts were intended to elucidate mechanisms/processes relating to CNS injury and plasticity, with particular reference to language disorders, traumatic brain injury, spinal cord injury, and Alzheimer's disease.
DTIC
Apoptosis; Cells (Biology); Central Nervous System; Nervous System; Neurology; Plastic Properties

20050080741 Prins Maurits Lab. TNO, Rijswijk, Netherlands
SIBCRA Round Robin Exercise 2002: Identification with Conventional and Realtime PCR
Broekhuijsen, M. P.; Visser, A. I.; vanderLaaken, A. I.; September 2004; 34 pp.; In English
Contract(s)/Grant(s): B01D411; TNO Proj. 014.12827
Report No.(s): TD2004-0038; TNO-PML-2004-A38; Copyright; Avail: Other Sources

TNO PML participated in the fourth round robin exercise organized by SIBCRA in 2002. This report describes the use of conventional and real-time Polymerase Chain Reaction (PCR) for identification of the samples. Within two days, all six samples were identified correctly, using real-time PCR. The identified species were Bacillus anthracis, Brucella melitensis, Yersinia pestis, Francisella tularensis, and Vibrio cholerae. During the next days, confirmatory and additional experiments were performed, which were completely consistent with the results of the first two days. The supposedly blanc sample was

shown to contain a bacterium of the genus Bacillus, which was later revealed to be Bacillus thuringiensis.
Author
Life Detectors; Bacteria; Polymerase Chain Reaction; Real Time Operation

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*.

20050080630 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Improvement and Implementation of the Physical Activity Part of Weightco@ch KL
Stafleu, A.; vandenBosch, L. M. C.; November 2004; 39 pp.; In Dutch
Contract(s)/Grant(s): A03/KL/138; Proj. 010.22093.010.22056
Report No.(s): TD2004-0356; TNO-Voeding-V6055; Copyright; Avail: Other Sources

In 2002 the intranetsite Weightco@ch KL was developed. Weightco@ch KL is a computer tailored program focused on weight reduction or weight maintenance to a healthy level, taking account of actual nutrition behavior and level of physical activity. In 2004 the physical activity part of Weightco@ch KL is extended. This report describes the new parts of Weightco@ch KL. New elements are physical activity training programs, extra outcomes of the physical activity questionnaire, new information pages about physical activity and a new questionnaire to assess motivation. In addition some other improvements have been made.
Author
Computer Programs; Educational Resources; Computer Networks; Weight Reduction; Physical Exercise; Physical Fitness

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*.

20050061199 NASA Langley Research Center, Hampton, VA, USA
Shuttle Spacesuit: Fabric/LCVG Model Validation
Wilson, J. W.; Tweed, J.; Zeitflin, C.; Kim, M.-H.; Anderson, B. M.; Cucinotta, F. A.; Ware, J.; Persans, A. E.; [2001]; In English
Contract(s)/Grant(s): NCC1-396
Report No.(s): ICES-2001-01-2372; Copyright; Avail: Other Sources

A detailed spacesuit computational model is being developed at the Langley Research Center for radiation exposure evaluation studies. The details of the construction of the spacesuit are critical to estimation of exposures and assessing the risk to the astronaut on EVA. Past evaluations of spacesuit shielding properties assumed the basic fabric lay-up (Thermal Micrometeroid Garment, fabric restraints, and pressure envelope) and Liquid Cooling and Ventilation Garment (LCVG) could be homogenized as a single layer overestimating the protective properties over 60 percent of the fabric area. The present spacesuit model represents the inhomogeneous distributions of LCVG materials (mainly the water filled cooling tubes). An experimental test is performed using a 34-MeV proton beam and high- resolution detectors to compare with model-predicted transmission factors. Some suggestions are made on possible improved construction methods to improve the spacesuit's protection properties.
Author
Astronauts; Extravehicular Activity; Space Suits; Radiation Dosage

20050061205 NASA Langley Research Center, Hampton, VA, USA
Design and Testing of Improved Spacesuit Shielding Components
Ware, J.; Ferl, J.; Wilson, J. W.; Clowdsley, M. S.; deAngelis, G.; Tweed, J.; Zeitlin, C. J.; [2002]; In English
Contract(s)/Grant(s): NCC1-396
Report No.(s): SAE-2002-01-220; Copyright; Avail: Other Sources

In prior studies of the current Shuttle Spacesuit (SSA), where basic fabric lay-ups were tested for shielding capabilities, it was found that the fabric portions of the suit give far less protection than previously estimated due to porosity and non-uniformity of fabric and LCVG components. In addition, overall material transmission properties were less than optimum. A number of alternate approaches are being tested to provide more uniform coverage and to use more efficient materials. We will discuss in this paper, recent testing of new material layups/configurations for possible use in future spacesuit designs. Author

Space Suits; Radiation Shielding; Fabrics

20050061222 NASA Ames Research Center, Moffett Field, CA, USA

Expert Water Quality Panel Review of Responses to the NASA Request for Information for the International Space Station On-Board Environmental Monitoring System

Fishman, Julianna L.; Mudgett, Paul D.; Packham, Nigel J.; Schultz, John R.; Straub, John E., II; February 2005; 60 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TM-2004-213156; No Copyright; Avail: CASI; A04, Hardcopy

On August 9, 2003, NASA, with the cooperative support of the Vehicle Office of the International Space Station Program, the Advanced Human Support Technology Program, and the Johnson Space Center Habitability and Environmental Factors Office released a Request for Information, or RFI, to identify next-generation environmental monitoring systems that have demonstrated ability or the potential to meet defined requirements for monitoring air and water quality onboard the International Space Station. This report summarizes the review and analysis of the proposed solutions submitted to meet the water quality monitoring requirements. Proposals were to improve upon the functionality of the existing Space Station Total Organic Carbon Analyzer (TOCA) and monitor additional contaminants in water samples. The TOCA is responsible for in-flight measurement of total organic carbon, total inorganic carbon, total carbon, pH, and conductivity in the Space Station potable water supplies. The current TOCA requires hazardous reagents to accomplish the carbon analyses. NASA is using the request for information process to investigate new technologies that may improve upon existing capabilities, as well as reduce or eliminate the need for hazardous reagents. Ideally, a replacement for the TOCA would be deployed in conjunction with the delivery of the Node 3 water recovery system currently scheduled for November 2007.
Author

International Space Station; Potable Water; Consumables (Spacecrew Supplies); Monitors; Water Quality

20050061254 National Defence Research Establishment, Umea, Sweden

Gravitational Effects on Lung Function

Groenkvist, M.; Feb. 2004; 18 pp.; In Swedish

Report No.(s): PB2005-100731; FOI-R-1172-SE; No Copyright; Avail: CASI; A03, Hardcopy

The aim of the project was to investigate how respiratory function is affected by increased gravity (G) and the use of G-protection equipment (anti-G suit (AGS), counter-pressure jerkin (CPJ), positive pressure-breathing). Studies in normogravity were conducted at FOI's respiration laboratory. Linkoping and in hyper gravity in the human centrifuge at Karolinska Institut, Stockholm, Development of equipment and software has been performed to allow measurement and analysis of different physiological variables. The two main issues were: (A) Effects on lung function of gravitational forces and pressurization of an AGS; (B) Function of CPJ during positive pressure breathing at high G-loads (PBG). Our studies showed that a change in body posture from standing to supine deteriorates ventilation distribution between large lung regions (interregional). Increased G-load (3G) involved significant effects on lung volumes and increased ventilation in homogeneity, both interregional and in the lung periphery where gas exchange takes place (intraregional). Pressurization of the AGS at 3 G improved interregional but impaired intraregional ventilation distribution. Furthermore, the amount of trapped gas increased significantly.
NTIS

Gravitational Effects; Lungs

20050061288 Naval Undersea Warfare Center, Newport, RI, USA

Uncertainty and Automation

Kirschenbaum, Susan S.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 19-1 - 19-8; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are many issues associated with the role of humans in automated systems. Among those that have received the least

attention are the questions associated with uncertainty. Uncertainty is inherent in military operations, yet it is often ignored. By making assumptions, explicitly or implicitly, about the environment in which it works, automation can modify evidence of uncertainty, conceal the sources of variability, or even induce uncertainty in the user by neglecting environmental variability. This paper will explore the range of issues and suggest some ways to mitigate the effects of uncertainty associated with automation.
Author
Automatic Control; Man Machine Systems

20050061289 Morozov (Victor), Minsk, Belarus
Instrumental Efficient Assessment of Mental Condition of Computer-Aided Control Systems Operator
Morozov, Victor; Kremen, Marks; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 27-1 - 27-9; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This material contains the description of instrumental technique of operative assessment of the mental condition of computer-aided control systems operator. The assessment is based on the study of processes of formation and functioning of mental dynamic images when an operator becomes involved in an activity on the basis of observation by perception. The data concerning the structure and dynamics of formation and functioning of mental dynamic images helps to determine in numbers the following components of mental condition: abilities for adaptation, self-organization of behavior, mental tension, operative dynamic memory etc. This method is realized as a program product working under Windows 95/98/ME operating system.
Author
Mental Performance; Computer Techniques; Human-Computer Interface

20050061290 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Uninhabited Military Vehicles: What Is the Role of the Operators?
Reising, John M.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. KN1-1 - KN1-10; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The role the operator in future uninhabited military vehicles (UMVs) will be quite different from that of the operators of current vehicles such as the Predator. Future UMVs will contain associate systems that will incorporate varying levels of autonomy and dynamic function allocation as basic operating principles. These principles will enable the UMV operator and the associate to form a team consisting of two crewmembers - one human and one electronic (although teams of multiple humans and multiple electronic crewmembers are certainly possible). U
Author
Command and Control; Autonomy; Military Vehicles

20050061291 Defence Research and Development Canada, Valcartier, Quebec, Canada
The Cognitive Costs and Benefits of Automation
Breton, Richard; Bosse, Eloi; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 1-1 - 1-11; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In complex environments like Command and Control (C2) where human errors may have tragic consequences, intelligent automated systems are essential to execute complex tasks such as situation assessment and decision-making. However, because C2 environments are also dynamic, it can be difficult for the machine to adapt to the changing and unstable conditions of the environments. Human capacity of adaptation is then required. Because the human cannot be completely replaced or removed from the execution of these tasks, the interaction and coordination between the human and the automated systems become crucial. This paper discusses the cognitive costs and benefits related to the automation within the execution of all processes that lead to the course of action selection. Among the benefits identified, the human workload and the demand of attentional resources can be significantly reduced. A major cognitive cost of automation can be attributed to the shifting role of the human in the execution of a task. With automated systems, the role of human is to supervise their functioning. The more passive role for the human may prevent him to build an appropriate mental model of the situation that is essential for the recovery of system failures.
Author
System Failures; Human Tolerances; Errors; Automatic Control; Command and Control

20050061296 Defence Science Technology Lab., Farnborough, UK

Capability, Cognition and Autonomy

Taylor, Robert M.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. KN3-1 - KN3-26; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The aim is to consider the role of humans in intelligent and automated systems, with enhanced capability from ubiquitous information, computer and communication technologies. The key human factors (HF) issues are generally believed to be what are appropriate levels of automation for military decision functions, and how to mitigate the associated risks for human understanding, prediction and control of system functioning. The aim of this paper is to attempt to synthesize these issues into a view of human roles through frameworks of military capability, cognition and autonomy.

Author

Cognition; Human Factors Engineering; Prediction Analysis Techniques; Automatic Control; Autonomy

20050061299 National Center of Hygiene, Medical Ecology and Nutrition, Sofia, Bulgaria

Functional Determination of the Operator State in the Interaction of Humans with Automated Systems

Nikolova, Rouja; Radev, Valentin; Vukov, Mircho; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 26-1 - 26-12; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To predict future problems and prevent difficulties with human-automation interaction and coordination, we need to evaluate dynamically the three components of the complex human-socio-technical system: human operators, social characteristics, and automation/technology. The goal of our study is to determine the effect of workload and work stress components on operator functional state as a function of an automated system, and to examine functional relationship between both factors. The results of our study indicate that contrary to mean values of actual and intrinsic heart rate, the Heart Rate Variability (HRV) spectral components: P(sub T), P(sub THM), P(sub RSA) are significant indicators for the assessment of operator state. Human-automated system interaction exerted greater strain in telecommunication operators, ATC, and computer operators as revealed by the P(sub T), P(sub THM), P(sub RSA) and mean R-R interval changes. Both sympathetic and parasympathetic activity modulating frequency-domain HRV measures decreased as a function of mental workload. An attempt was made to define a model discriminating human-system/human-computer interaction. Controllability of work situation, quantitative workload, variance in workload, and work satisfaction discriminate human-system- from human-computer interaction. In our study we observed a functional relationship between cognitive workload, assessed by HRV and HR, and work stress measured by work-related psychosocial factors. Functional dependence of cognitive demands and work satisfaction on vagal activity assessed by P(sub RSA) could promote future research on the association between cognitive workload, work stress, and performance in considering the role of P(sub RSA) as an indirect measure of performance and as a direct indicator of the cardiovascular protective function. The results of our field studies clearly indicate that operators are exposed to the effects of cognitive load and work stress factors which are function of their interaction with an automated system.

Author (revised)

Man Machine Systems; Automatic Control; Psychomotor Performance; Operator Performance

20050061302 Air Force Research Lab., Wright-Patterson AFB, OH, USA

Adaptive Aiding Implemented by Psychophysiologically Determined Operator Functional State

Wilson, Glenn F.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 18-1 - 18-8; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Psychophysiological monitoring of operator state has been developed over the past decades as measures of mental workload, fatigue, and inattention. This paper provides examples of the application of these measures to classify operator functional state (OFS) and further to implement adaptive aiding. Examples using several levels of mental workload are presented to show that combinatorial classifiers can utilize the information from several psychophysiological measures to provide highly accurate correct classification of OFS. An example of adaptive aiding, using on-line assessment of OFS, demonstrated that highly accurate classification could be achieved and that using this information to control adaptive aiding enhanced performance of a complex task. A model of how psychophysiological and performance data could be used to provided continuous OFS monitoring and adaptive aiding is presented.

Author

Workloads (Psychophysiology); Adaptive Control; Artificial Intelligence

20050061303 Universitaet der Bundeswehr Muenchen, Neubiberg, Germany

Cognitive Cooperation for the Sake of the Human-Machine Team Effectiveness

Onken, R.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. KN5-1 - KN5-18; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This keynote presents a framework for incorporating cognitive automation into a work system, not only as part of the operation-assisting means but also in terms of cognitive cooperation of a human-machine team operating the work system and thereby taking the high-end decisions of the work process. This framework is based on the experience with successful prototype development of cognitive assistant systems in the flight systems and road vehicle domain. A theoretical framework as shown is important in order to be able to assess work system designs with regard to productivity, i.e. effectiveness and safety.

Author

Man Machine Systems; Productivity

20050080385 Defence Science and Technology Organisation, Salisbury, Australia

Overview of Biotechnology Futures: Possible Applications to Land Force Development

Egudo, Margaret; Nov. 2004; 35 pp.; In English

Report No.(s): AD-A429139; DSTO-GD-0419; DODA-AR-013254; No Copyright; Avail: CASI; A03, Hardcopy

This review of selected scientific and technological advances occurring in the field of biotechnology discusses their possible impact for Land Force capability development in the next decade or two. Some studies suggest that the socio-technical impact of biotechnology may surpass that of the Information Revolution, and it could become a major force in the 21st Century. Its synergy with nanotechnology, materials and information technology has led to the development of new and revolutionary applications that are likely to be adopted in agriculture, health, environmental applications, manufacturing industries, and by the military. The implication of this technological impact has raised complex social, political and legal issues all of which will impact to some degree on the future Land Forces and their operational environment. This report discusses these issues both in relation to how they may affect society and hence future contexts, and their pertinence to the future military in terms of direct application of these technologies.

DTIC

Biotechnology; Forecasting; Military Technology

20050080442 Defence Science and Technology Organisation, Victoria, Australia

A Dexterity and Tactility Evaluation of the Australian Nuclear Biological Chemical (NBC) Glove

Scanlan, S.; Roberts, W.; McCallum, R.; Robinson, D.; Aug. 2004; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429344; DSTO-TN-0576; DODA-AR-013-168; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report details the tactility and dexterity of four different glove types, including the Australian in-service NBC butyl rubber glove and Nomex flying glove for standardized (Purdue pegboard) and operational (weapon assembly/disassembly) tasks. The Nomex flying glove was included for comparative purposes despite offering no NBC protection . Two commercially available chemically protective gloves (the Canadian NBC butyl rubber glove, Ansell TNT nitrile glove) were also assessed. Twenty-four healthy male subjects participated in the study. Subjects completed two questionnaires, one on the priority of glove functions and the second on glove specific fit and functionality. Subjects completed either the weapon assembly/ disassembly task or the Purdue pegboard task. The results from both these tasks were consistent for all gloves and in agreement with the responses recorded on the questionnaires. The Ansell TNT glove tended to provide the best dexterity scores followed by the Nomex flying, Canadian butyl and Australian butyl gloves. The Ansell TNT glove tended to be the most tactile glove followed by the Canadian Butyl, Nomex flying and Australian butyl. Subjects felt their performance in the Australian Butyl rubber glove could be enhanced through training and by adopting seamless liners similar to those used in the Canadian system. Overall subjects preferred single layered, seamless gloves that had a low impact on task-depend ant dexterity and tactility. Typically subjects felt that if the Nomex flying glove offered NBC protection and had the seam removed on the index finger it would make an ideal NBC glove. The outcomes of this study provide a scientific basis from which a requirements document for a new NBC glove could be generated. It is intended that the most favorable features of a glove identified during this study will be used in future ADF NBC glove designs.

DTIC

Australia; Gloves; Protection; Protective Clothing

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20050070891 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Bio-Limited Forming Technology Based On Microorganism And Its Application
Cai, Jun; Li, Ya-Qin; Li, Xiang-Feng; Chen, Bo; Zhang, De-Yuan; Progress of Machining Technology; December 2004, pp. 281-285; In English; See also 20050070885
Contract(s)/Grant(s): NHTP-2001AA421120; NNSF-59975007; Copyright; Avail: Other Sources

Microorganisms have great potential in manufacturing complex microstructures because of their various regular shapes. Templating techniques that transform microorganisms into rugged and stable microstructures are described, which is named bio-limited forming technology. By using microorganisms as templates, the path followed from research to emerging technological applications is detailed. This process includes culture of microorganisms, modification of the microorganism, the use of these microorganisms as templates for metallization, and the characterization and assessment of these soft-core metal microstructures for several potential applications.
Author
Microorganisms; Templates; Microstructure; Electroless Deposition; Metallizing

20050070914 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Research On Bio-Machining Based On Lipid
Chen, Bo; Cai, Jun; Zhang, Bo; Yue, Jia-Chang; Zhang, De-Yuan; Progress of Machining Technology; December 2004, pp. 286-291; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-50275007; Copyright; Avail: Other Sources

There has been an increasing concern about lipid. Lipid is amphipathic and can form various nano- and microstructures by self-assembling. Lipid can be connected with some substrates' surface, such as metal surfaces, and as one of the main components of biomembrane, it is biocompatible. So it plays an important role in the bio-manufacturing field. In this paper, the researches on bio-machining technology based on lipid are summarized, which include metallization of lipid microtubule, ceramics of liposome, micro-patterning of bilayer lipid membrane and micro-arraying of liposome. Key words lipid, self-assembling, Bio-manufacturing, Bio-machining, molecule device, Biochip
Author
Lipids; Manufacturing; Metallizing; Microstructure; Membranes

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*.

20050061207 MJW Corp., Inc., Williamsville, NY, USA
Environmental Remediation Data Management Tools
Wierowski, J. V.; Henry, L. G.; Dooley, D. A.; 2002; 20 pp.; In English
Report No.(s): DE2004-828643; No Copyright; Avail: Department of Energy Information Bridge

Computer software tools for data management can improve site characterization, planning and execution of remediation projects. This paper discusses the use of two such products that have primarily been used within the nuclear power industry to enhance the capabilities of radiation protection department operations. Advances in digital imaging, web application development and programming technologies have made development of these tools possible. The Interactive Visual Tour System (IVTS) allows the user to easily create and maintain a comprehensive catalog containing digital pictures of the remediation site. Pictures can be cataloged in groups (termed 'tours') that can be organized either chronologically or spatially. Spatial organization enables the user to 'walk around' the site and view desired areas or components instantly. Each photo is linked to a map (floor plan, topographical map, elevation drawing, etc.) with graphics displaying the location on the map and any available tour/component links. Chronological organization enables the user to view the physical results of the remediation efforts over time. Local and remote management teams can view these pictures at any time and from any location. The Visual

Survey Data System (VSDS) allows users to record survey and sample data directly on photos and/or maps of areas and/or components. As survey information is collected for each area, survey data trends can be reviewed for any repetitively measured location or component. All data is stored in a Quality Assurance (Q/A) records database with reference to its physical sampling point on the site as well as other information to support the final closeout report for the site. The ease of use of these web-based products has allowed nuclear power plant clients to plan outage work from their desktop and realize significant savings with respect to dose and cost. These same tools are invaluable for remediation and decommissioning planning of any scale and for recording of survey data related to building or site decontamination, waste shipments and eventual unrestricted release of entire facilities. This presentation will show the utility of these products in a variety of decontamination, decommissioning and environmental remediation settings including a university research reactor decommissioning project.

NTIS

Data Management; Computer Programs; Computer Systems Programs

20050061208 Kansas Univ., Lawrence, KS, USA

Seismic-Reflection and Ground Penetrating Radar for Environmental Site Characterization

Steeples, D. W.; 2004; 12 pp.; In English

Report No.(s): DE2004-828637; No Copyright; Avail: Department of Energy Information Bridge

The goals of the project are: 1. To examine the complementary site-characterization capabilities of modern, threecomponent shallow seismic reflection (SSR) techniques and ground-penetrating radar (GPR) methods at depths ranging from 2 to 8 m at an existing test site; 2. To demonstrate the usefulness of the two methods when used in concert to characterize, in three dimensions, the cone of depression of a pumping well that will serve as a proxy site for fluid-flow at an actual, polluted site; 3. To use the site as an outdoor mesoscale laboratory to validate existing threedimensional ground-penetrating radar and seismic-reflection computer models developed at the University of Kansas. To do this, seismic and GPR data are being collected along the same line(s) and within the same depth range. The principal investigators selected a site in central Kansas as a primary location, and although the site itself is not environmentally sensitive, the area offers attributes that are particularly useful for this research and allow the site to serve as a proxy for areas that are contaminated. As part of an effort to evaluate the strengths of each method, the seismic and GPR surveys are repeated on a seasonal basis to establish how the complementary information obtained varies over time. Because the water table fluctuates seasonally at this site, variations in the two types of data over time also can be observed. Such noninvasive, in-situ methods of identifying and characterizing the hydrologic flow regimes at contaminated sites support the prospect of developing effective, costconscious cleanup strategies in the near future.

NTIS

Ground Penetrating Radar; Seismology; Computerized Simulation

20050061214 Nevada Univ., Reno, NV, USA

Evaluation of Lithophysal Conductivity, Diffusivity, and Porosity Measurements using the Reka Method

Danko, G.; Shah, N.; Bahrami, D.; 2004; In English

Report No.(s): DE2004-828425; No Copyright; Avail: National Technical Information Service (NTIS)

A method is presented, based on the NUFT and REKA V1.1 software packages combination, to study the nature of non-steady-state heat flow during a single-borehole REKA thermal probe thermophysical measurement in solid as well as lithophysal rock formation. The results prove the principle of the REKA method application in lithophysal formation. The numerical evaluation results, based on the use of two qualified software packages, show that the presented REKA probe arrangement is correctly modeled and that the effective heat conductivity and the lithophysal porosity can be evaluated correctly using the REKA probe method.

NTIS

Applications Programs (Computers); Porosity; Diffusivity; Thermal Conductivity

20050061250 Swedish Defence Research Establishment, Linkoeping

Mixed Reality for Technical Support

Gustafsson, T.; Carleberg, P.; Nilsson, S.; Svensson, P.; Sivertun, A.; Mar. 2004; In Swedish

Report No.(s): PB2005-101245; FOI-R-1198-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this project has been to build up knowledge about how future Mixed-Reality (MR) systems should be designed concerning technical solutions, aspects of Human-Machine-Interaction (HMI) and logistics. Two MR-systems have

been developed, one binocular and one gaze-controlled monocular. The MR-systems consist principally of a head-mounted micro-display-system, an integrated image sensor for indirect vision, an integrated gaze-tracker, a computer and software for MR and a tool for flexible composition of application examples. For real-world positioning the MR-system uses marker detection. Each marker is linked to some form of virtual image information which is mixed into the image from the image sensor. To illustrate which HMI aspects that are related to the use of an MR-system for technical support, a comprehensive literature search and survey of knowledge have been carried out. This work has resulted into a theoretical frame work that is described in the report. To further illustrate HMI aspects a number of practical tests with prototypical equipment have been made. A relevant application example, dismounting of a machine gun mounting, has been performed and evaluated. The goal concerning the application example was to demonstrate how an MR system could work as a help for assistance during technical support.
NTIS
Computer Programs; Display Devices

20050061253 Atomic Energy Establishment, Winfrith, UK
Decommissioning Cost Estimating the PRICE Approach
Manning, R.; Gilmour, J.; 2002; In English
Report No.(s): DE2004-828660; No Copyright; Avail: National Technical Information Service (NTIS)

Over the past 9 years UKAEA has developed a formalised approach to decommissioning cost estimating. The estimating methodology and computer-based application are known collectively as the PRICE system. At the heart of the system is a database (the knowledge base) which holds resource demand data on a comprehensive range of decommissioning activities. This data is used in conjunction with project specific information (the quantities of specific components) to produce decommissioning cost estimates. PRICE is a dynamic cost-estimating tool, which can satisfy both strategic planning and project management needs. With a relatively limited analysis a basic PRICE estimate can be produced and used for the purposes of strategic planning. This same estimate can be enhanced and improved, primarily by the improvement of detail, to support sanction expenditure proposals, and also as a tender assessment and project management tool. The paper will: describe the principles of the PRICE estimating system; report on the experiences of applying the system to a wide range of projects from contaminated car parks to nuclear reactors; provide information on the performance of the system in relation to historic estimates, tender bids, and outturn costs.
NTIS
Decommissioning; Methodology; Knowledge Based Systems; Cost Estimates

20050061256 Fluor Daniel Hanford, Inc., Richland, WA, USA
Validation of the Consolidated Model of Fire Growth and Smoke Transport (CFAST) Software for the Hanford Site
Ailes, S. B.; Jun. 2004; 26 pp.; In English
Report No.(s): DE2004-825365; HNF-21413-REV-0; No Copyright; Avail: Department of Energy Information Bridge

On April 7, 2004 Hanford's Waste Management organization initiated a draft site report (Occurrence Report RL-PHMC-General-2004-0001) that a Potential Inadequacy in the Safety Analysis (PISA) had been determined to exist due to issues involving the validation and/or verification of CFAST software used to develop documents supporting the safety basis. In response to the PISA, each Hanford Project Organization instituted a USQ review and performed a safety review. This report documents the results of an analysis performed to determine if sufficient verification and validation test data exist to support the use of the CFAST code for Safety Analysis at the Hanford Site. The analysis also identifies critical features, capabilities and interfaces to be validated for Hanford Site applications. The report is prepared in response to the Fluor Hanford Evaluation of the PISA (FH-0401 116).
NTIS
Program Verification (Computers); Safety; Applications Programs (Computers)

20050061257 Jupiter Corp., Wheaton, MD, USA
Systematic Approach for Decommissioning Planning and Estimating
Dam, A. S.; 2002; In English
Report No.(s): DE2004-828663; No Copyright; Avail: National Technical Information Service (NTIS)

Nuclear facility decommissioning, satisfactorily completed at the lowest cost, relies on a systematic approach to the planning, estimating, and documenting the work. High quality information is needed to properly perform the planning and estimating. A systematic approach to collecting and maintaining the needed information is recommended using a

knowledgebase system for information management. A systematic approach is also recommended to develop the decommissioning plan, cost estimate and schedule. A probabilistic project cost and schedule risk analysis is included as part of the planning process. The entire effort is performed by a experienced team of decommissioning planners, cost estimators, schedulers, and facility/knowledgeable owner representatives. The plant data, work plans, cost and schedule are entered into a knowledgebase. This systematic approach has been used successfully for decommissioning planning and cost estimating for a commercial nuclear power plant. Elements of this approach have been used for numerous cost estimates and estimate reviews. The plan and estimate in the knowledgebase should be a living document, updated periodically, to support decommissioning fund provisioning, with the plan ready for use when the need arises.
NTIS
Decommissioning; Planning; Estimating

20050061275 National Renewable Energy Lab., Golden, CO
Lessons Learned from Field Evaluation of Six High-Performance Buildings
Torcellini, P. A.; Deru, M.; Griffith, B.; Long, N.; Pless, S.; 2004; In English
Report No.(s): DE2004-15008804; No Copyright; Avail: National Technical Information Service (NTIS)

The energy performance of six high-performance buildings around the USA was monitored in detail. The six buildings include the Visitor Center at Zion National Park; the National Renewable Energy Laboratory's Thermal Test Facility, the Chesapeake Bay Foundation's Merrill Center, the BigHorn Home Improvement Center; the Cambria DEP Office Building; and the Oberlin College Lewis Center. Evaluations began with extensive one-year minimum monitoring and were used to calibrate energy simulation models. This paper will discuss differences between the design energy targets and actual performance, common mistakes in implementing 'state-of-the shelf' building technologies, commissioning experiences, policy implications, and lessons learned for future buildings. Overall, energy performance of the buildings will be compared to each other and to code compliant, base-case buildings. The owners and design teams for each building had aggressive energy saving goals ranging from 40% to a net-zero energy performance. Some of the design teams also had ambitious goals regarding other dimensions of sustainability such as water management, building materials selection, or obtaining a high LEED score. The focus of this paper is on energy performance. Computer simulations were used for each building during the design process. All buildings used daylighting and good thermal envelopes as part of their high-performance features. Other high-performance features include mechanical and passive evaporative cooling, radiant heating, natural ventilation, mixed-mode ventilation, ground source heat pumps, photovoltaic, and passive solar strategies. A set of performance metrics are presented and discussed. All of the buildings used much less energy on an annualized basis than comparable code compliant buildings.
NTIS
Buildings; Management Systems; Renewable Energy

20050061280 Lawrence Livermore National Lab., Livermore, CA
Simulating Fertilization of the Ocean as a Carbon Sequestration Strategy: Effectiveness and Unintended Consequences
Caldeira, K.; Mar. 20, 2002; 28 pp.; In English
Report No.(s): DE2004-15003243; UCRL-ID-147662; No Copyright; Avail: Department of Energy Information Bridge

The primary objectives of this project are to assess, and improve our understanding of (1) The effectiveness of various strategies to intentionally store carbon in the ocean through fertilization of the surface ocean with iron and/or macronutrients; (2) Unanticipated environmental consequences of these ocean fertilization strategies. We propose to use what may be the best global ocean biogeochemical model in the world (PISCES) and apply it to perform the most realistic global-scale simulations of various iron fertilization scenarios. Versions of PISCES are currently used by MPI in Germany and IPSL in France. The model represents diatoms, coccolithophorids, and two classes of zooplankton. This model considers Fey N, P, 0, Si, alkalinity, and carbon; for some of these it considers dissolved inorganic and organic, as well as particulate, forms. We would install the PISCES model with a minimum of modification into the LLNL ocean model, and perform an initial suite of simulations of both iron fertilization experiments (e g , SOFeX) and proposed iron fertilization strategies. Based on the simulated experiments, we will analyze model deficiencies with respect to the observations and use this analysis to improve future versions of the model. The source code for and results from this set of models will be freely distributed, and thus should help groups performing related work elsewhere. This project the most-realistic ocean fertilization simulations yet performed in a global model, with an assessment of and improvement in the reliability of those predictions using results from iron fertilization experiments such as SOFeX. These results will help provide context and guidance for biological observations within the ocean carbon sequestration research program.
NTIS
Carbon; Computerized Simulation; Oceans; Biogeochemistry

20050061329 Transtek, Inc., Pittsburgh, PA, USA
Wireless Mine-Wide Telecommunications Technology
Meiksin, Z. H.; Mar. 2004; 38 pp.; In English
Report No.(s): DE2004-828656; No Copyright; Avail: Department of Energy Information Bridge

A comprehensive mine-wide, two-way wireless voice and data communication system for the underground mining industry was developed. The system achieves energy savings through increased productivity and greater energy efficiency in meeting safety requirements within mines. The mine-wide system is comprised of two interfaced subsystems: a through-the-earth communications system and an in-mine communications system. The mine-wide system permits two-way communication among underground personnel and between underground and surface personnel. The system was designed, built, and commercialized. Several systems are in operation in underground mines in the USA. The use of these systems has proven they result in considerable energy savings. A system for tracking the location of vehicles and people within the mine was also developed, built and tested successfully. Transtek's systems are being used by the National Institute of Occupational Safety and Health (NIOSH) in their underground mine rescue team training program. This project also resulted in a spin-off rescue team lifeline and communications system. Furthermore, the project points the way to further developments that can lead to a GPS-like system for underground mines allowing the use of autonomous machines in underground mining operations, greatly reducing the amount of energy used in these operations. Some products developed under this program are transferable to applications in fields other than mining. The rescue team system is applicable to use by first responders to natural, accidental, or terrorist-caused building collapses. The in-mine communications system can be installed in high-rise buildings providing in-building communications to security and maintenance personnel as well as to first responders.
NTIS
Safety; Mining; Global Positioning System; Telecommunication

20050071562 National Science Foundation, Arlington, VA
Revolutionizing Science and Engineering Through Cyberinfrastructure: Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure
Atkins, D. E.; Droegemeier, K. K.; Feldman, S. I.; Garcia-Molina, H.; Klein, M. L.; Jan. 2003; 88 pp.; In English
Report No.(s): PB2005-102583; No Copyright; Avail: CASI; A05, Hardcopy

Scientific and engineering research has been crucial in both the creation and the advanced application of the amazing products of the digital revolution begun some sixty years ago--a revolution that increasingly undergirds our modern world. Advances in computational technology continue to transform scientific and engineering research, practice, and allied education. Recently, multiple accelerating trends are converging and crossing thresholds in ways that show extraordinary promise for an even more profound and rapid transformation--indeed a further revolution--in how we create, disseminate, and preserve scientific and engineering knowledge. We now have the opportunity and responsibility to integrate and extend the products of the digital revolution to serve the next generation of science and engineering research and education. Digital computation, data, information, and networks are now being used to replace and extend traditional efforts in science and engineering research, indeed to create new disciplines.
NTIS
Computer Systems Programs; Research Management

20050071564 Applied Pavement Technology, Inc., Urbana, IL, USA
Incremental Costs and Performance Benefits of Various Features of Concrete Pavements
Hoerner, T. E.; Smith, K. D.; Bruinsma, J. E.; Apr. 2004; 220 pp.; In English
Report No.(s): PB2005-102690; No Copyright; Avail: CASI; A10, Hardcopy

Various design features (such as dowel bars, tied shoulders, or drainable bases) may be added to a PCC pavement design to improve its overall performance by maintaining a higher level of serviceability or by extending its service life. However, the addition of these features also increases the initial cost of the pavement design, in some cases quite significantly. This then raises the question as to whether the improved performance benefits gained by adding the design features are worth the increase in cost. Furthermore, the effects of adding more and more design features to a PCC pavement design may produce smaller and smaller performance gains, while significantly increasing the overall costs of the pavement structure. Unfortunately, current design practices do not always consider this trade-off between performance benefits and costs when design features are added to a PCC pavement design. This report presents a methodology for quickly assessing the relative costs and benefits of incorporating various design features in PCC pavements. That methodology has been incorporated into an analytical software tool that can be used by pavement design engineers who are interested in investigating the cost versus performance trade-offs associated with the selection of different design features during the PCC pavement design process. The

tool is not intended to provide absolute answers on the effect of different design features, but rather to provide insight into general performance and cost trends associated with the use of those design features.
NTIS
Concretes; Costs; Pavements

20050071572 Minnesota Univ., Minneapolis, MN, USA
Improving the Estimation of Travel Demand for Traffic Simulation, Part 2
Wu, Y.; Davis, G.; Levinson, D.; Dec. 2004; In English
Report No.(s): PB2005-102695; CTS 04-11-Pt-2; No Copyright; Avail: National Technical Information Service (NTIS)
This report examined several methods for estimating Origin-Destination (OD) matrices for freeways using loop detector data. Least squares based methods were compared in terms of both off-line and on-line estimation. Simulated data and observed data were used for evaluating the static and recursive estimators. For off-line estimation, four fully constrained least squares methods were compared. The results showed that the variations of a constrained least squares approach produced more efficient estimates. For on-line estimation, two recursive least squares algorithms were examined. The first method extends Kalman Filtering to satisfy the natural constraints of the OD split parameters. The second was developed from sequential quadratic programming. These algorithms showed different capabilities to capture an abrupt change in the split parameters. Practical recommendations of the choice of different algorithms are given.
NTIS
Computerized Simulation; Air Traffic; Air Transportation; Demand (Economics)

20050071583 Lawrence Livermore National Lab., Livermore, CA
Discrete Differential Forms: A Novel Methodology for Robust Computational Electromagnetics
Castillo, P.; Koning, J.; Rieben, R.; Stowell, M.; White, D.; Jan. 17, 2003; In English
Report No.(s): DE2004-15003246; UCRL-ID-151522; No Copyright; Avail: National Technical Information Service (NTIS)
This is the final report for the LLNL LDRD 01-LW-068. The Principle Investigator was Daniel White of the Center for Applied Scientific Computing (CASC). Collaborators included Paul Castillo and Mark Stowell of CASC, and Ph.D students Joe Koning and Rob Rieben of UC Davis. Some of the simulation results in this report were partially funded by a Defense Advanced Research Projects Agency research grant, and the two Ph.D. students were supported by the LLNL Student-Employee Graduate Research Fellow program. We begin with a short Administrative Overview which describes the motivation, scope, and deliverables of this research effort. Then follows the Technical section, which introduces the theory behind our Discrete Differential Forms approach, provides an overview of our FEMSTER C++ class library, and concludes with example simulations.
NTIS
Computerized Simulation; Computational Electromagnetics

20050071589 Lawrence Livermore National Lab., Livermore, CA
Massively-Parallel Dislocation Dynamics Simulations
Cai, W.; Bulatov, V. V.; Pierce, T. G.; Hiratani, M.; Rhee, M.; Jun. 18, 2003; 18 pp.; In English
Report No.(s): DE2004-15007878; UCRL/JC-153525; No Copyright; Avail: Department of Energy Information Bridge
Prediction of the plastic strength of single crystals based on the collective dynamics of dislocations has been a challenge for computational materials science for a number of years. The difficulty lies in the inability of the existing dislocation dynamics (DD) codes to handle a sufficiently large number of dislocation lines, in order to be statistically representative and to reproduce experimentally observed microstructures. A new massively-parallel DD code is developed that is capable of modeling million-dislocation systems by employing thousands of processors. We discuss the general aspects of this code that make such large scale simulations possible, as well as a few initial simulation results.
NTIS
Massively Parallel Processors; Parallel Processing (Computers); Dislocations (Materials)

20050071607 American Museum of Natural History, New York, NY, USA
Tree of Life Workshop I: Assembling the Tree of Life: Research Needs in Phylogenetics and Phyloinformatics
Jul. 2000; 28 pp.; In English; See also PB2005-102653 and PB2005-102654. Workshop held at Yale University, July 28-29, 2000
Report No.(s): PB2005-102655; No Copyright; Avail: CASI; A03, Hardcopy

Science and society would benefit enormously from detailed and well-supported knowledge of the Tree of Life (TOL). At present, however, we know relatively little about the phylogenetic relationships of most of the species on Earth, or even among many of the major branches of the Tree. Fortunately, we have reached a turning point. Owing to fundamental theoretical advances, to the development of powerful analytical tools, and to the availability of major new sources of data, we now have the power to assemble the entire TOL. Much of this task can be accomplished within the next two decades, given sufficient vision, resources, and coordination.
NTIS
Assembling; Coordination

20050071620 American Museum of Natural History, New York, NY, USA
Tree of Life Workshop II: Research Needs in Phyloinformatics
Oct. 2000; 18 pp.; In English; See also PB2005-102653 and PB2005-102655. Workshop held at the University of California, Davis, October 20-21, 2000
Report No.(s): PB2005-102654; No Copyright; Avail: CASI; A03, Hardcopy

Phylogenetic trees provide a rigorous framework for all aspects of basic and applied comparative biology. They are also having a dramatic impact on biomedical research and other problems of direct relevance to human health and well-being, such as managing threats from invasive species. Recognition of the important scientific and societal benefits arising from phylogenetic knowledge is generating interest in reconstructing a comprehensive phylogenetic Tree of Life (TOL), a structure that might well include a million species or more. The unprecedented scope of such an enterprise prompted us to organize a workshop to address the informatics needs of such an effort. A group of 26 phylogenetic biologists and computer scientists met at UC Davis on October 20-21, 2000 to make specific recommendations about how to proceed. Discussion led to broad agreement on the mission and goals of phyloinformatics, the elements needed in a Phyloinformatics Infrastructure (PII), and recommendations about implementation strategies.
NTIS
Health; Biomedical Data

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COMPUTER OPERATIONS AND HARDWARE

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

20050070943 Zhejiang Univ. of Sciences, Hangzhou, China
An Internet-based System for Mass Customization Product Development
Shan, Meihua; Li, Renwang; Progress of Machining Technology; December 2004, pp. 851-856; In English; See also 20050070885
Contract(s)/Grant(s): MOS-2002AA414510; NNSF-70272056; NNSF-50005009; Copyright; Avail: Other Sources

Now more and more enterprises have known the importance of the Mass Customization. In order to realize the Mass Customization easily, the author realized an internet-based system for Mass Customization product development. In the text, the author introduced the course of quick design faced on Mass Customization, and gave out the framework and forming of the system. The key techniques of the system were also illustrated.
Author
Internets; Product Development

20050080322 WorldScape Defense Co., Marlton, NJ USA
An Ultra-High Performance Architecture for Embedded Defense Signal and Image Processing Applications
Reddaway, Stewart; Rogina, Pete; Cameron, Ken; McIntosh-Smith, Simon; Stuttard, David; Sep. 2003; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429025; No Copyright; Avail: Defense Technical Information Center (DTIC)

This briefing describes the development of a novel, ultra-high performance next-generation Single-Instruction/Multiple-Data (SIMD) processing architecture originally designed to realize immersive, photo-realistic 3-D simulations. This low-power, Multi-Threaded Array Processor (MTAP) architecture provides for hundreds and ultimately thousands of processing elements, each with optional floating point hardware, to perform data parallel processing on image and signal processing applications as well as for compression, encryption, search, and general sensor processing applications. The

technology is supported by a flexible development environment, including assembly language and C-based language support, as well as a cycle accurate simulator, with plans to develop industry standard API Libraries based upon VSIPL and, ultimately, HPEC-SI. This new technology, being developed by WorldScape and ClearSpeed, has been shown to provide ten to one hundred times the overall performance of PowerPC or Pentium-based architectures, especially when performing image and signal processing functions, such as FFTs or filters. In general, the architecture has been shown to provide significant throughput, size, and power advantages for embedded processing applications.
DTIC
Embedding; Image Processing; Signal Processing

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COMPUTER PROGRAMMING AND SOFTWARE

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

20050070883 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Hierarchical Data Format for EOS (HDF-EOS)
Ullman, Richard; [2005]; 15 pp.; In English; 19th Asia Pacific Advanced Networking (APAN) 19th Meeting, 24-28 Jan. 2005, Bangkok, Thailand; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

HDF is a file format and a software library for data storage, management, exchange, and archiving. It is written and maintained by the National Center for Supercomputing Applications (NCSA). HDF5 has a very simple but versatile data model which is compatible with most competing formats. Through its grouping and linking mechanisms, the HDF5 data model enables complex data relationships and dependencies. HDF5 accommodates the inclusion of many common types of metadata and arbitrary types and quantities of user-defined metadata.
Derived from text
Format; Computer Programs; Data Storage; Data Transmission

20050070901 Beijing Inst. of Tech., China
Research On Product Life Cycle-Oriented Virtual Assembly Technology
Liu, Jianhua; Xu, Hongshan; Ning, Ruxin; Yao, Jun; Progress of Machining Technology; December 2004, pp. 839-844; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-41318.1.1; Copyright; Avail: Other Sources

In this paper, the connotations of Virtual Assembly (VA) are introduced. A Product Lifecycle-Oriented V'mual Assembly Technology Architecture (PLO-VATA) is proposed, and characteristics of this architecture such as concurrence, integration and collaboration are analyzed. The key techniques of VA including virtual assembly model, virtual assembly analysis and evaluation, virtual assembly process planning are discussed. At last, a product lifecycle-oriented virtual assembly environment is built to illustrate the feasibility of the proposed method.
Author
Virtual Properties; Assembly; Architecture (Computers); Life Cycle Costs

20050070902 Beijing Inst. of Tech., China
An Algorithm Study For Job Shop Scheduling With Alternative Operation Routes
Yuan, Xin; Yang, Zhi-Bing; Ci, Jian-Ping; Progress of Machining Technology; December 2004, pp. 885-890; In English; See also 20050070885; Copyright; Avail: Other Sources

A model for production planning and job scheduling is presented in the paper considering the actual production situation with alternative operation routes. A new scheduling algorithm is developed to solve the multi-resources scheduling problem with alternative operation routes, which integrates heuristic rules into adaptive genetic algorithm. The validity and feasibility of the algorithm is studied by simulations. The analysis shows that the proposed algorithm is effective on gaining optimal scheduling results.
Author
Genetic Algorithms; Heuristic Methods; Mathematical Models; Scheduling; Optimization; Operations Research

20050070944 North China Univ. of Science and Technology, Taiyuan, China

Research On E-Manufacturing In Virtual Environment

Shen, Xingquan; Progress of Machining Technology; December 2004, pp. 857-860; In English; See also 20050070885; Copyright; Avail: Other Sources

E-manufacturing as a new generation of product development solution allows manufacturers all over the world to speed up everything from design to manufacturing. It has been employed in a wide range of manufacturing activities. After exploring the architecture and features of Net-VEs, a cost-effective approach to create an E-manufacturing system in Net-VEs is proposed in this paper. The Web-based E-manufacturing system allows users to access integrated manufacturing environments. The VRML (virtual reality modeling language) can be used to control and monitor manufacturing systems by visual means. The WWW (World Wide Web) as the delivery mechanism has made such system widely available and affordable. And an E-manufacturing system in net virtual environment is also evaluated by comparison with a traditional product development approach.

Author

Manufacturing; Virtual Reality; World Wide Web; Research and Development

20050070948 Jiangsu Univ., Zhenjiang, China

Surface Reconstruction Based On Planar Curvature To Extract Feature Line From Scattered Data Points

Liu, Huixia; Wang, Xiao; Liang, Jiahong; Fu, Yonghong; Yuan, Run; Cai, Lan; Progress of Machining Technology; December 2004, pp. 914-919; In English; See also 20050070885; Copyright; Avail: Other Sources

A method based on planar curvature to extract characteristic lines from discrete data is presented. It includes three main steps: First, planar clouds is created from discrete data with planes parallel to a specified direction, then characteristic points are extracted in curvature way. Then characteristic lines are created into NURBS with the extracted characteristic points as node, then the NURBS is faired with energy method. At last, the discrete data is segmented into single characteristic patches according to the characteristic lines and surface models are reconstructed for every region. This method simplifies the extraction of product characteristic lines from complex 3-dimension measuring data. This method is also effective to the data measured by CMM.

Author

Curvature; Extraction; Planar Structures; Topology; Data Processing; Pattern Recognition; Reverse Engineering

20050070949 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Stitching Models For Multiple Trimmed Surface Using Dynamic Tolerance

Zhang, Su; Shi, Fazhong; Progress of Machining Technology; December 2004, pp. 954-959; In English; See also 20050070885; Copyright; Avail: Other Sources

CAD repair is a bridge from initial CAD model to mesh model. This paper presents a CAD repair algorithm which can be used in two aspects: to stitch match surface boundaries and to overcome initial CAD detects such as gap, overlap as well as poor parameter curves. In terms of the tolerance defining difficulty during the stitching, this paper presents a dynamic tolerance method. Both of the precision and integrity can be taken into account of. It is especially suited for the repairing of complex model made up of many trimmed surfaces with a great disparity in size.

Author

Computer Aided Design; Mathematical Models; Algorithms; Surface Geometry; Dynamic Control

20050071023 Manitoba Univ., Winnipeg, Manitoba, Canada

3D Digitization Technology And Its Applications In Reversing Engineering

Peng, Qing-Jin; Progress of Machining Technology; December 2004, pp. 926-931; In English; See also 20050070885; Copyright; Avail: Other Sources

Reverse engineering develops a new product based on the improvement of existing products. Shape recovery of three-dimensional objects is the basis of reverse engineering. 3D digitization technology is an important tool for the shape recovery. Different techniques for 3D data acquisition are discussed in this paper. Hardware and software of 3D data scanning are described. 3D laser scanner and its applications are emphasized.

Author

Reverse Engineering; Three Dimensional Models; Technology Utilization; Digital Techniques; Optical Scanners

20050071025 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Reseach On A Reverse Engineering Method For 3d Surface Using Single Image

Wu, Fenghe; Shi, Fazhong; Progress of Machining Technology; December 2004, pp. 949-953; In English; See also 20050070885; Copyright; Avail: Other Sources

In order to overcome the limitation of object based reverse engineering, a reverse engineering method for 3D surface using single image is proposed. Unlike the typical reverse engineering, the input information of the new method is a single image instead of an object. It is an integration technology of computer vision, image processing and numerical control processing. In this paper, the principles and key technologies of this new reverse engineering method, such as image processing, Shape from Shading, model reconstructing and Adaptive Including Box method, are studied and analyzed. The application example included in this paper shows that the reverse engineering method for 3D surface using single image is robust, and it will be helpful for the further research on image based design and manufacture.

Author

Reverse Engineering; Three Dimensional Models; Image Processing; Surface Geometry

20050071026 Taiyuan Heavy Machinery Inst., Shanxi, China

A Genetic Optimal Algorithm For Plane Line Profile Evaluation Based On Auto-Spotting

Wang, Boping; Jing, Daying; Progress of Machining Technology; December 2004, pp. 938-942; In English; See also 20050070885; Copyright; Avail: Other Sources

For solving the problem why position error between measured profile and its measurement reference influences evaluation precision in measuring the plane line profile error, a new method for calculating the plane line profile error based on genetic algorithm and auto-spotting has been proposed. It used spline function to simulate ideal profile and used genetic optimum algorithm to obtain the best optimum solution in overall situation. Its distinguishing characteristic is that the position of measured profile can be adjusted automatically to adapt an ideal profile during the process of calculation. As a result, the position error between the measured profile and its measurement reference is separated and eliminated from the profile error. Example counting verified this result. This method is simple and clear, it has features of high precision and fast convergent speed and popularizing application easily and so on.

Author

Genetic Algorithms; Metrology; Optimal Control; Curvature; Position Errors

20050071027 Okayama Univ. of Science, Japan

Reconstruction of 3D Models From Simplified and Hierarchical 2D Drawings of Products

Masaji, Tanaka; Toshiakl, Kanceda; Junji, Hirooka; Sigeyuki, Okabe; Progress of Machining Technology; December 2004, pp. 920-925; In English; See also 20050070885; Copyright; Avail: Other Sources

Recently solid modelers have become popular CAD systems. However, there are many 2D drawings and 2D CAD users. In recent solid modelers, the conversion of 2D drawings to solid models is operated manually although the operation becomes difficult and time consuming as the 2D drawings become complex. Many methods have been proposed for the automatic conversion but their targets are always one object and they almost ignore simplified and/or hierarchical expressions in 2D drawings because they are only interested in geometric conversions. As a result, those methods have not been practical. In this paper, an original method is proposed that can automatically convert 2D assembly drawings including simplified and hierarchical expressions to 3D assembly models. This method utilizes dimensions and parts lists in 2D drawings. Simplified conversion can be realized by using the information and almost a single solution can be output regardless of the complexity in 2D drawings.

Author

Computer Aided Design; Three Dimensional Models; Two Dimensional Models; Architecture (Computers)

20050071051 Dalian Jiaotong Univ., Dalian, China

A New Modeling Methods for Turning Simulation

Sha, Zhihua; Zhao, Liang; Zhang, Shengfang; Ge, Yanjun; Progress of Machining Technology; December 2004, pp. 775-779; In English; See also 20050070885

Contract(s)/Grant(s): NNSF-50075014; Copyright; Avail: Other Sources

Machining simulation is one of the important applications of computer simulation in modem mechanical manufacturing industry. Modeling is the key aspect to realize machining simulation, and it is also one of the vital criterions to the simulation system evaluating. Three types of simulation models have been used to study and predict machining: analytical, finite element

and atomistic. All of these models are useful for understanding specific aspects of machining and have a certain applications in practice. But due to their limitations, they cannot be applied widely. In reference to the existed models, an 'Imitated-solid' modeling method for machining simulation is presented in this paper. The basic principle and working flow of turning simulation in terms of Imitated-solid modeling method is brought forward. Based on the material characteristics of the workpiece in the real machining, the model of Imitated-solid is built. The example of turning simulation using Imitated-solid modeling method is realized finally.
Author
Computerized Simulation; Machining

20050071055 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
A Study On Interference Detection Simulation Of Tube Bending Machine Based On UG
Wang, Chunjie; Zhao, Xiang; Ma, Liangwen; Zong, Xiao; Progress of Machining Technology; December 2004, pp. 798-802; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper discusses an Interference Detection Simulation System of Tube Bending Machine based on UG technology. The author developed the simulation program using UG/OPEN API development technology and the C++ programming language. This method described here can help the manufacturers improve the quality of their tube structure saving money and time. It is also a good example of UG API development solving practical engineering problem. Key words interference detection, simulation, tube bending machine, process control
Author
Detection; C++ (Programming Language); Simulation

20050071063 Zhejiang Univ. of Sciences, Hangzhou, China
Research On Design And Realization Of Mass Customization-Oriented Product Data Aided Management System
Li, Ren-Wang; Zou, Ting-Ting; Zhang, Sirong; Liu, Lei; Progress of Machining Technology; December 2004, pp. 834-838; In English; See also 20050070885
Contract(s)/Grant(s): NSFC-70272056; NHTPC-2002AA414510; Copyright; Avail: Other Sources

Mass customization (MC) is an important production mode for manufacturing enterprise in 21st century, whose core technology is to improve product commonality as much as possible. MC-oriented product aided design system (MCOPADS) aims to deal with, draw lessons from, make use of all product data record, and roundly improve commonality of all kinds of components and parts (CAP), finally help enterprise reduce cost, shorten product delivery time, improve customer satisfaction and what not. Moreover, applications of MCOPADS are illustrated through taking Hangzhou Turbine Ltd. (HTL) as practical engineering background.
Author
Data Management; Management Systems; Cost Reduction

20050071064 Worcester Polytechnic Inst., MA, USA
Computer-Aided Manufacturing Planning For Mass Customization
Rong, Yi-Ming; Yao, Su-Qin; Han, Xiang-Li; Progress of Machining Technology; December 2004, pp. 845-850; In English; See also 20050070885; Copyright; Avail: Other Sources

This paper introduces a comprehensive system for the production planning of mass customization of non-rotational parts. Combined features are defined based on the concept of part families. The process parameters are associated with the feature parameters so that rapid production planning can be achieved for product design changes. Setup planning is carried out based on both the best practice knowledge in industry and the algorithmic generation of setups. Manufacturing resource, fixture design, and tolerance issues are considered in the production planning. The system also estimates cycle times and generates standard documentation.
Author
Computer Aided Design; Computer Aided Manufacturing; Production Planning; Estimates

20050080358 Technische Univ., Munich, Germany
Service-Based Development of Embedded Systems
Kof, Leonid; Schaetz, Bernhard; Thaler, Ingomar; Wisspeintner, Alexander; Nov. 2004; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0197
Report No.(s): AD-A429097; ARO-43722.3-CI; No Copyright; Avail: Defense Technical Information Center (DTIC)

Services as a basic notion are helpful in two respects: (1) services are used to structure the specification of a system, easing understand and reasoning about the system; and (2) services also can be used as the design principle of the implementation architecture. This paper presents an approach for developing software systems using services as the central development concept. A concrete case study, namely the development of a control unit for an automotive seat adjustment system, clarifies the proposed service-based development process. Components and services differ essentially concerning the construction of complex systems: component-based architectures only support concurrent composition to form hierarchic structures; service-based architectures support a more flexible form of reusing behavior by offering composition with concurrent and alternative configurations. As a result, service-based architecture does the following: (1) supports a description of the functional structure of the system using explicit description of modes of operation in the form of configurations of active services; (2) avoids design-oriented description of the system enforced by component-based architectures; and (3) supports efficient implementations by explicitly describing active and inactive functionality. Since service-based architectures target the functional structure of a system, an important aspect of the development process is the systematic detection of conflicts and under specifications during service composition as well as the transition from service-based to component-based architectures. Current investigations include tool-based refactoring steps supporting conflict elimination and transition from service- to component-based architectures. Also, suitable variants for the constructive design of embedded software are investigated focusing on issues like explicit description of timing constraints and efficient deployment to hardware. (8 figures, 12 refs.)
DTIC
Automobiles; Computer Programming; Design Analysis; Embedding; Human-Computer Interface; Object-Oriented Programming; Software Engineering

20050080368 Defence Science and Technology Organisation, Salisbury, Australia
Lessons for the Construction of Military Simulators: A Comparison of Artificial Intelligence With Human-Controlled Actors
Sandercock, Jennifer; Sep. 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429112; DSTO-TR-1614; DODA-AR-013-185; No Copyright; Avail: Defense Technical Information Center (DTIC)

Computer Generated Forces (CGF) are a significant component of military modelling and simulation. The creation of artificial agents with human-like decision-making is difficult. By using a Turing Test in a virtual environment that relates to military scenarios, areas in which CGF need to improve in order to help direct future studies are probed. The main areas determined for improvement are: environment awareness, human variance, persistence, vengeance anticipation, learning and teaming. The CGF show consistent weakness in these areas across all virtual environments and should be considered in future studies. They present a technical challenge in adoption of CGF as surrogate players in computer supported simulation activity for training mission rehersal, operations research and military experimentation.
DTIC
Artificial Intelligence; Construction; Man Machine Systems; Virtual Reality

20050080642 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Evaluation of the Intranetprogram Weightco@ch KL
Stafleu, A.; opdeWeegh, M. J..; vandenBosch, L. M. C.; October 2004; 104 pp.; In Dutch
Contract(s)/Grant(s): A02/KL/130; TNO Proj. 010.22056
Report No.(s): TD-2004-0401; TNO-Voeding-V6083; Copyright; Avail: Other Sources

Weightco@ch KL is an interactive computer program aimed at weight management. The program is developed for the Dutch Military. Since June 2002, Weightco@ch is available on the intranetsite of the Military. In 2003 an evaluation study took place to get insight into the use of the program by the target group and the effect of the program on change in attitudes, behavior and stages of change. Subjects filled out a pretest (n=147) and posttest (n=98) questionnaire. Differences in social psychological determinants, weight and middle circumference between pretest and posttest were in the desired direction. Subjects evaluated Weightco@ch as a useful program. In addition the evaluation study delivered concrete indications for improvements of Weightco @ch.
Author
Computer Programs; Computer Networks; Body Weight

20050080704 NASA Glenn Research Center, Cleveland, OH, USA

Exploring Diverse Data Sets and Developing New Theories and Ideas With Project Integration Architecture

Benyo, Theresa L.; Jones, William H.; January 2005; 22 pp.; In English; AIAA First Intelligent Systems Technical Conference, 20-22 Sep. 2004, Chicago, IL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS-22-617-912-40

Report No.(s): NASA/TM-2005-213415; AIAA Paper 2004-6360; E-14935; No Copyright; Avail: CASI; A03, Hardcopy

The development of new ideas is the essence of scientific research. This is frequently done by developing models of physical processes and comparing model predictions with results from experiments. With models becoming ever more complex and data acquisition systems becoming more powerful, the researcher is burdened with wading through data ranging in volume up to a level of many terabytes and beyond. These data often come from multiple, heterogeneous sources and usually the methods for searching through it are at or near the manual level. In addition, current documentation methods are generally limited to researchers pen-and-paper style notebooks. Researchers may want to form constraint-based queries on a body of existing knowledge that is, itself, distributed over many different machines and environments and from the results of such queries then spawn additional queries, simulations, and data analyses in order to discover new insights into the problem being investigated. Currently, researchers are restricted to working within the boundaries of tools that are inefficient at probing current and legacy data to extend the knowledge of the problem at hand and reveal innovative and efficient solutions. A framework called the Project Integration Architecture is discussed that can address these desired functionalities.

Author

Systems Integration; Expert Systems; Decision Support Systems; Management Information Systems; Data Processing; Project Management; Architecture (Computers)

62
COMPUTER SYSTEMS

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

20050061284 Defence Research and Development Canada, Dartmouth, Nova Scotia, Canada

The Roles of Human Operator and Machine in Decision Aid Strategies for Target Detection

Allen, Nancy J. M.; Kessel, Ronald T.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 3-1 - 3-13; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Automated detection systems are more often disappointing than they are genuinely useful. The automated detection algorithms have borne too much of the blame thus far. Success and failure are re-examined here, at a system level, in light of a simple principle of balance: the responsibilities of each detector, human and machine alike, must be matched to its abilities. Giving the automation too much or too little responsibility makes it ineffective, either jeopardizing the mission on the one hand, or robbing it of purpose and making it an annoyance on the other hand. This notion of balance is substantiated using elementary detection theory. It is used then to diagnose what we call conventional detection aids within a larger framework of human-machine decision support. Three strategies for the development of detection systems are proposed, all based on the principle of balance, with many realistic examples given for illustration. The strategies are not new, but their derivation, now from a single principle, builds a coherent framework for purposeful improvement and design. This work should be of particular use to system developers, operators, and tactical planners.

Author

Decision Support Systems; Man Machine Systems; Target Acquisition; Algorithms

20050061286 Defence Research and Development Canada, Val-Belair, Quebec, Canada

A Pragmatic Cognitive System Engineering Approach to Model Dynamic Human Decision-Making Activities in Intelligent and Automated Systems

Paradis, Stephane; Breton, Richard; Bosse, Eloi; Elm, William C.; Potter, Scott S.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 13-1 - 13-12; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Defence R&D Canada - Valcartier has undertaken R&D work to provide Canadian warships with a revolutionary decision support capability explicitly designed to make the automation transparent and provide warfighters with effective and trusted decision support. This effort uses cognitive system engineering (CSE) as the essential design framework. CSE

approaches are well suited to deal with decision support issues but are in practice very expensive to conduct, time consuming and more important, generally inefficient from a design process perspective. With the latter limitations in mind, a pragmatic CSE approach, known as the Applied Cognitive Work Analysis (ACWA), was developed to bridge, in a structure, efficient and converging way, the gap between cognitive analysis and design. As a result, the cost to conduct CSE analyses using the ACWA approach is reduced and the analysis-design efficiency is significantly improved, therefore making easier the identification of decision-aiding concepts suited to provide effective decision support. This paper presents a brief overview of CSE analyses methods and their benefits. The paper will describe in more detail the actual CSE approach, known as the Applied Cognitive Work Analysis (ACWA)1, used in decision support R&D investigations. Finally, the paper presents some lessons learned when using ACWA for a specific project.
Author
Decision Making; Support Systems; Systems Engineering; Automatic Control; Cognition

20050061297 Warsaw Univ. of Technology, Warsaw, Poland
Simulator Technology in Optimising the Human-Automated System Interface
Szczepanski, Cezary; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 23-1 - 23-10; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Increasing complexity of human-operator environment required from him higher and higher abilities in input data analysis, decision making and controlling of the object (system). Time deficit combined with above requirement caused introducing the automatic systems supporting the human-operator in his tasks performance. Effective support of the human-operator activity was also possible thanks to the technology achievements, i.e. more efficient and cheaper computer systems. Complex, hierarchical control systems took a part of work typically done by the human-operator. After initial 'computer euphoria' some problems appeared; smooth co-operation between human-operator and automatic or automated system sometimes became not very effective or even problematic. That situation had usually appeared during untypical, dangerous situation, when standard decision should have been modified and new action was required. Some mishaps or even fatalities showed that the problem existed and should be worked out. In such very complicated situation researchers and designers needed a tool for replicating the environment of human-operator, with all factors and stimuli acting on the human in the real situation. It was required for the proper designing and optimising automated systems, which had had to co-operate with the human-operator. Possibility of that replication created the research simulators and simulator technology. On the example of research works, done with help of the flight simulators during the optimising of the new aircraft cockpit and designing the new aircraft, with all its on-board automatic and control systems, the simulator technology, will be presented. In the author opinion that technology is one of the best if not the best, allowing for real checking and optimising the human-operator - automated system interface in the modern, complicated dynamic systems.
Author
Human-Computer Interface; Operator Performance; Flight Simulators; Automatic Control; Cockpits; Activity (Biology); Human Performance

20050070932 South China Univ. of Technology, Guangzhou, China
Open And Reconfigurable Characteristics On ONC Unit Of Digitized Manufacturing
Li, Weiguang; Zhou, Jianhui; Zhao, Bo; Zhu, Jinhua; Progress of Machining Technology; December 2004, pp. 582-586; In English; See also 20050070885
Contract(s)/Grant(s): NNSF-2003C102017; NNSF-020917; Copyright; Avail: Other Sources

This paper introduced the trend of networked digitized manufacturing technology and its newest application to the base unit-Open Numerical Control (ONC) system that is compatible with the standard of GB/T18759.1-2002. The reconfigurable and opening characteristics of the ONC system are discussed and its reconfigurable architecture has been built in this paper. In its hardware structure, the ONC system adopts the widely used pattern - PC&NC pattern and works with the universal field-bus. While in its software hierarchical model described with the Unified Modeling Language (UML), four layers are set up and illustrated respectively. At last, two important modules, the intelligent NC module and opening Human Machine Interface (HMI) are expatiated individually.
Author
Manufacturing; Numerical Control; Control Systems Design; Pulse Communication; Computer Networks; Reconfigurable Hardware

20050070942 Beijing Inst. of Tech., China

An Integrated Management System Of Production-Preparation Information

Ci, Jianping; Sun, Houfang; Lei, Hegong; Progress of Machining Technology; December 2004, pp. 829-833; In English; See also 20050070885; Copyright; Avail: Other Sources

Production-preparation is a key link in the production chain, including production planning, process planning, tooling design, equipments arrangement, and so on. According to the digitalization manufacturing mode, the production-preparation system should be integrated with CAD/CAM system to share resource information among production links. An integrated management system based on feature and agent technology is developed and described in this paper. K
Author

Production Planning; Computer Aided Design; Computer Aided Manufacturing; Management Systems; Systems Integration

20050071033 Xiamen Univ., China

Study On An Intellectualization CNC System With Open Architecture

Zou, Qin; Guo, Yin-Biao; Progress of Machining Technology; December 2004, pp. 676-681; In English; See also 20050070885

Contract(s)/Grant(s): NSFC-8638042416; Copyright; Avail: Other Sources

An intelligent CNC system with open architecture is introduced to ameliorate the existing open-architecture numerical control system, which has some objection in velocity and intelligence. The system works on a double CPU structure, in which upper machine is industrial PC and lower machine is DSP based multi-axes motion controller. It provides an interface to Master CAM software, supports the DNC machining and HTTP, SMTP net protocol. It has the characteristics of high speed, high precision, high reliability and high aptitude, has the function of automatic receive and deal with electronic mail. This system can be applied to all kinds of control system such as numerical control carving machine and laser punching machine. Author

Numerical Control; Computer Systems Programs; Protocol (Computers); Trajectories; Intelligence

20050071606 Swedish Defence Research Establishment, Linkoeping

Review of Free-Space Quantum Key Distribution

Jonsson, P.; Jan. 2004; 24 pp.; In English

Report No.(s): PB2005-101930; FOI-R-1165-SE; No Copyright; Avail: CASI; A03, Hardcopy

Quantum key distribution is a method of distributing cryptographic key securely over a distance. No other method of key distribution has been proven secure. Today trusted couriers are used to distribute keys for cryptography with the highest security level. However, the use of couriers for key distribution is impractical in many cases. Therefore, quantum key distribution may be of interest for many civilian and military cryptographic applications. This report presents the concept of quantum key distribution in general and free-space applications in specific. The presentation includes a background and the principle of the general method. Furthermore, the last year's experimental realizations of free-space quantum key distribution systems are reviewed and some military applications are presented. Finally, some recommendation of further work is suggested.
NTIS

Computer Information Security; Quantum Cryptography; Data Transmission

20050080334 Silicon Graphics Computer Systems, Rockville, MD USA

Application of General Purpose HPC Systems in HPEC

Alexander, David; Aug. 2004; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A429058; No Copyright; Avail: Defense Technical Information Center (DTIC)

High performance embedded computing (HPEC) has traditionally been performed by systems designed specifically for the task. Recent years have seen the increasing application of general-purpose high performance computing (HPC) systems in embedded applications. General purpose HPC systems typically have a large user base which results in broad application SW and device driver availability, robust development and debugging tools, and revenue streams which support significant R&D funding of technologies to enhance HPC system performance and reliability. Various factors have prevented wider adoption of general purpose HPC systems in the embedded space...factors such as lack of dense, ruggedized packaging suitable for embedded applications, lack of real-time capabilities in general purpose operating systems 1, and performance/watt and performance/unit volume advantages that specialized systems have traditionally had over general purpose HPC systems. This presentation details plans for addressing these shortcomings through the deployment of a heterogeneous

computing architecture which incorporates FPGA-based reconfigurable computing and I/O elements, system interconnect advancements leveraged from HPC system development, microprocessor and system advancements developed under DARPA's HPCS program, and the mapping of the system into packaging suitable for HPEC applications.
DTIC
Architecture (Computers)

20050080433 Army Engineer Research and Development Center, Vicksburg, MS USA
Setup and Operation of the Third-Generation TeleEngineering Communications Equipment - Deployable (TCE-D) System, Version II
Williamson, Jeffrey L.; Lynch, Larry N.; Powell, Jeff; Register, Bryan; Oct. 2004; 62 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429284; ERDC-SR-04-4; No Copyright; Avail: Defense Technical Information Center (DTIC)

In FY97, the U.S. Army Engineer Research and Development Center (ERDC) initiated a technology demonstration program to determine the feasibility of providing deployed troops with direct access to subject matter experts (SMEs). Direct access to SMEs allows responses to engineering challenges beyond the in-theater capability to respond, and allows them to be provided without the time delays and costs associated with deploying the SME to the theater. Shortly after being established, the TeleEngineering Operations Center (TEOC) initiated an effort to develop a secure, deployable communications package capable of video teleconferencing and data transfer. This report describes the components of the third generation of this package and the steps necessary to set up and operate the system. (63 figures)
DTIC
Communication Equipment; Data Transmission; Interprocessor Communication; Satellite Communication

20050080434 Army Construction Engineering Research Lab., Champaign, IL USA
Installation of a Wastewater SCADA Monitoring System at Fort Bragg, NC
Mullaney, Joe; McClafferty, Kim; Gerdes, Gary L.; Hanson, Michelle J.; Jun. 2004; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429285; ERDC/CERL-TR-04-8; No Copyright; Avail: Defense Technical Information Center (DTIC)

Fort Bragg has had several Notices of Violations (NOVs) because of collection system failures, primarily lift station overflows. A current shortage of personnel to operate and maintain the Fort Bragg Wastewater Treatment Plant (WWTP) and the collection system has prompted the decision to install a state-of-the-art Supervisory Control and Data Acquisition (SCADA) system. This report describes the system that was installed at Fort Bragg, the selection of the hardware and software components needed for the system, and its successful startup. The Wastewater SCADA Monitoring System was installed to monitor 26 remote sites. A detailed radio study of the area verified the feasibility of using radio equipment to transfer data from these sites to a computer at the WWTP. Of these 26 sites, 9 had existing radio equipment that was upgraded. A master repeater for polling was set up at Corps Support Command using the existing sites with upgraded equipment. The existing frequency was used for the new SCADA system. The central host would reside at the WWTP. Lookout software was chosen for the human-machine interface at this site and another was set up at the Environmental Sustainment Division and resides on the Fort Bragg server with client software allowing two people viewing access at a time. Entirely new remote terminal unit panels were installed at the remaining 17 sites and these sites were integrated into the system. The new SCADA system now allows an operator to monitor and control lift stations at all remote sites on Fort Bragg. Because of its remote-sensing capability, the SCADA system eliminates the need for a full-time person to visually inspect each site. It is estimated that labor needed to monitor the wastewater collection system will be reduced by 60 percent. Considering only the savings in labor, the return on investment for the installation of this system is 6.6 years. There is also a cost avoidance by eliminating NOVs due to pump station failures. (40 figures)7
DTIC
Data Acquisition; Detection; Installing; Remote Sensing; Waste Water

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*.

20050061122 Institute for Human and Machine Cognition, Pensacola, FL, USA
Multi-Agent Software Design and Engineering for Human Centered Collaborative Autonomous Space Systems: NASA Intelligent Systems
Bradshaw, Jeffrey M.; [2005]; 10 pp.; In English
Contract(s)/Grant(s): NCC2-1283; No Copyright; Avail: CASI; A02, Hardcopy

Detailed results of this three-year project are available in 37 publications, including 7 book chapters, 3 journal articles, and 27 refereed conference proceedings. In addition, various aspects of the project were the subject of 31 invited presentations and 6 tutorials at international conferences and workshops. Good descriptions of prior and ongoing work on foundational technologies in Brahms, KAoS, NOMADS, and the PSA project can be found in numerous publications not listed here.
Derived from text
Bibliographies; Software Engineering; Teams; Man Machine Systems; Aerospace Systems

20050061283 Research and Technology Organization, Neuilly-sur-Seine, France
The Role of Humans in Intelligent and Automated Systems
October 2003; In English; In French; The Role of Humans in Intelligent and Automated Systems, 7-9 Oct. 2002, Warsaw, Poland; See also 20050061284 - 20050061306; Original contains color and black and white illustrations
Report No.(s): RTO-MP-088; Copyright; Avail: CASI; C01, CD-ROM

On 7-9 October 2002, more than 100 NATO, Partnership for Peace, and Non-NATO nationals from 22 countries met in Warsaw, Poland to discuss the role of humans in intelligent and automated systems. Sponsored by the Human Factors and Medicine Panel of the North Atlantic Treaty Organization's Research and Technology Organization, the symposium participants discussed the problem, research approaches and techniques for how automation technology can take advantage of human strengths and compensate for human disadvantages. The Symposium consisted of an Opening Session, three sessions on design philosophy, two sessions and a roundtable discussion on design methodology, two sessions on design evaluation, and a Capstone Panel with open discussion. Six Keynote Addresses were interspersed throughout the program. All told, 18 papers were presented, and 5 poster-boards were available for review.
Author
Conferences; Man Machine Systems; Automatic Control; Artificial Intelligence; North Atlantic Treaty Organization (NATO); Human Factors Engineering

20050061285 Akademiya Nauk BSSR, Minsk, Belarus
Two-Level Behavior Control of Virtual Humans
Tom, Igor E.; Navasiolava, Natallia A.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 25-1 - 25-9; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The digital human modeling is considered in terms of intelligence agents with regard to human behavior in virtual environment. The human modeling systems are classified. The problems of high-level control of virtual human's behavior and methods of low-level positioning control are shortly described.
Author
Artificial Intelligence; Human Behavior; Virtual Reality; Human Body

20050061293 Defence Research and Development Suffield, Medicine Hat, Alberta, Canada
Humans Teaching Learning Machines: Apprentice Systems and Shared Control of Military Vehicles
Digney, Bruce L.; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 4-1 - 4-30; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many military applications will benefit from the use of unmanned vehicles. However communication realities have limited the effectiveness of the current direct teloperated vehicles. One solution is to increase the on-board autonomy of the vehicle. While this does reduce the communication requirements, the level of machine intelligence is not sufficient to insure

operation in extreme situations. Proposed is a shared control solutions that is a synergestic partnership of on-board autonomy and the superior cognitive capabilities of the remote human operator. This paper describes work at the Defence Research and Development Canada-Suffield (DRDC-Suffield) in teleoperated vehicles, autonomous control systems and discusses the issues and benefits of shared control of military vehicles.
Derived from text
Teleoperators; Artificial Intelligence; Automatic Control; Man Machine Systems

20050061294 Office of the Secretary of Defense, Washington, DC, USA
Computer-Based Aids for Learning, Job Performance, and Decision Making in Military Applications: Emergent Technology and Challenges
Foster, Robert E.; Fletcher, J. Dexter; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 6-1 - 6-24; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Technology-based systems for education, training, and performance aiding (including decision aiding) may pose the ultimate test for validating approaches to integrate humans with automated systems. These systems need to model students and users. The models they generate, as well as the interactions based on them, must adapt to the evolving knowledge and skills of individual students and users. Evaluation findings suggest that such adaptations are feasible, worthwhile, and cost-effective. Data drawn from many evaluations of technology-based education and training indicate overall that these systems can reduce costs by one-third and that they can additionally either reduce the time to achieve instructional objectives by one-third or increase achievement (holding time constant) by one-third. The likely impact on military readiness and effectiveness suggested by these findings is significant. Similar results indicating increased personnel effectiveness and cost-savings have been found in evaluations of technology-based performance aiding systems. They suggest a need to determine and re-adjust the balance between resources allocated to training and resources allocated to performance aiding systems. Development of sharable, reusable objects and capabilities for assembling these objects on demand and in real time will substantially increase accessibility and reduce costs of education, training, and performance aiding while making them asynchronously and continuously available - regardless of distance and time. Specifications and capabilities for such objects are the goals of much research and development. Some of these goals are discussed under the systems engineering categories of analysis, design and development, delivery and management, and evaluation. This research agenda would be substantially enhanced by NATO/PfP participation, which might include development of a NATO/PfP directory of data-bases permitting wide dissemination and sharing of techniques and findings and the development of NATO/PfP common practices for the development of sharable objects and guidelines for their use.
Author
Computer Techniques; Decision Making; Military Technology; Human Performance

20050061300 Air Force Research Lab., Wright-Patterson AFB, OH, USA
The Application of a Qualitative Model of Human-Interaction with Automation: Effects of Unreliable Automation on Performance
Galster, Scott M.; Bolia, Robert S.; Parasuraman, Raja; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 15-1 - 15-10; In English; See also 20050061283; Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A visual search paradigm was used to examine the effects of information automation and decision-aiding automation in a target detection and processing task. Manual, information automation, and decision-aiding automation conditions were manipulated with the size of the distractor set. Participants were required to respond to the presence or absence of a target in a time-limited trial. Reliability level (90%, 70%, 50%) of the automation was manipulated as a between subjects variable. Each reliability level group was comprised of eight volunteers for a total of 24 participants. Results indicated that the information automation cue condition engendered an increase in correct responses and a reduction in search times, regardless of set size or automation reliability. On the other hand, the presence of a decision-aiding cue differentially affected performance on all dependent measures as a function of both set size and automation reliability, alone or in concert with an information automation cue.
Author
Automatic Control; Mathematical Models; Human-Computer Interface; Artificial Intelligence

20050061305 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany
Design and Evaluation of a Multi-Robot Control Interface

The Role of Humans in Intelligent and Automated Systems; October 2003, pp. 22-1 - 22-12; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Designing a human-machine interface for a semi-autonomous mobile multi-robot system is a challenging task. The requirements range from operating in a real time environment, facilitating asynchronous command execution to supporting the operator in dividing his monitoring and control resources among multiple robots. This paper presents the results of two simulations based multi-robot experiments being conducted to guide and support the development of our multi-robot control interface. Robot autonomy represents a requirement for a multi-robot system managed by a single operator. Understanding the impact of varying levels of robot autonomy on operator performance is important for the interface design process. In separate trials operators had to manage 2, 4 and 8 robots in two different environments. The two experiments featured different levels of robot autonomy.

Author

Robot Control; Operator Performance; Man Machine Systems; Design Analysis; Evaluation

20050061306 NASA Ames Research Center, Moffett Field, CA, USA

Adjustable Autonomy and Human-Agent Teamwork in Practice: An Interim Report on Space Applications

Bradshaw, Jeffrey M.; Feltovich, Paul; Hoffman, Robert; Jeffers, Renia; Suri, Niranhan; Uszok, Andrzej; VanHoof, Ron; Acquisti, Alessandro; Prescott, Debbie; The Role of Humans in Intelligent and Automated Systems; October 2003, pp. KN6-1 - KN6-30; In English; See also 20050061283; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We give a preliminary perspective on the basic principles and pitfalls of adjustable autonomy and human-centered teamwork. We then summarize the interim results of our study on the problem of work practice modeling and human-agent collaboration in space applications, the development of a broad model of human-agent teamwork grounded in practice, and the integration of the Brahms, KAoS, and NOMADS agent frameworks. We hope our work will benefit those who plan and participate in work activities in a wide variety of space applications, as well as those who are interested in design and execution tools for teams of robots that can function as effective assistants to humans.

Author

Autonomy; Technology Utilization; Human-Computer Interface; Robotics

20050071040 South Bank Univ., London, UK

Application Of Artificial Neural Networks For Tool Condition Monitoring When Turning Ti-6al-4v Alloy With High Pressure Coolant Supply

Ezugwu, E. O.; Fadare, D. A.; DaSilva, R. B.; Bonney, J.; Progress of Machining Technology; December 2004, pp. 13-20; In English; See also 20050070885; Copyright; Avail: Other Sources

Titanium alloy (Ti-6A1-4V) can be economically machined with high-pressure coolant (HPC) supply. In this study, a tool condition monitoring (TCM) model is developed with artificial neural networks (ANNs) for on-line monitoring of tool life and wear rate when machining Ti-6AI-4V alloy with conventional flow and high-pressure coolant flow, up to 20.3 MPa. Machining trials were conducted at different cutting conditions for both rough and finish turning operations with uncoated carbide (K10 grade) and double (TiAIN/TiN) PVD coated carbide (K10 substrate) inserts. The cutting parameters, (cutting speed, feed rate, depth of cut, coolant pressure and tool type) and the process parameters (cutting forces, machined surface roughness and circularity) were used as input data set to train the three-layered feed-forward, back-propagation artificial neural networks. The results show that the correlation coefficients between the neural network predictions and experimental values of tool life and wear rate were 0.996 and 0.999 respectively, suggesting the reliability of the network as a tool condition monitoring model in the manufacturing industry.

Author

Neural Nets; Titanium Alloys; Carbides; Cutters; Machining; Aluminum Alloys

20050071617 Clemson Univ., SC, National Science Foundation, Arlington, VA, Department of Energy, Washington, DC

Joint DOE/NSF Report of the Workshop on: Biological Information Processing Systems. Executive Summary

Hickman, J. J.; Dooley, L.; Jan. 2002; In English

Report No.(s): PB2005-102595; No Copyright; Avail: National Technical Information Service (NTIS)

The second level of abstraction in biological information technology and the enabling tools for building artificial neuronal systems were two of the major highlights from the joint DOE and NSF workshop on Biological Information Processing and

Systems. The workshop brought together the leading researchers and funding managers in the emerging field of biological computation. This workshop highlighted current cutting-edge basic and applied research going on in this area. A central goal of biological computation research is to understand how biological systems compute: what tasks are being carried out by nervous systems, what are the algorithms with which those tasks are being executed, and what is the functional architecture of the biological systems through which those algorithms are implemented. Although work in this area is of considerable intrinsic interest and importance from the basic research standpoint, the specific focus of this workshop was to consider the application of that knowledge toward the development of enabling tools for building artificial neuronal systems.
NTIS
Biology; Conferences; Biotechnology; Information Systems

20050080405 Texas Univ., Arlington, TX USA
Neural Network Control of DoD and Industrial Motion Systems
Lewis, Frank L.; Mar. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-1-0137
Report No.(s): AD-A429174; 26-0401-05; ARO-P-39657-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

Actuator dead zones, backlash, and saturation impose severe performance limitations in industrial and DoD systems. Modern Battle Information Systems need improved dynamic decision-making control systems to avoid NP-complexity problems and properly assign resources. The goals of this grant were to develop neural network (NN) compensators for industrial actuator nonlinearities, to develop high-level NN architectures for control, to implement NN controllers on actual devices, and to design and implement discrete event decision controllers. A family of NN and fuzzy logic (FL) controllers was developed for dead zones and backlash. Rigorous analytical techniques were given for the design of NN controllers for actuator compensation that guarantee stability. High-level NN adaptive critic controllers were designed. Intelligent controllers were implemented on industrial test beds. The authors designed a remote site control system allowing monitoring and control of systems over the internet. A supervisory controller was designed based on matrices that allows for fast changing of goals and priorities. Matching funds have allowed them to work with small companies and transfer the ARO technology to them. Numerous students graduated and received many awards. The report includes a list of 3 books, 3 book chapters, 1 journal, 19 journal articles, 24 conference papers, and 3 patents that were produced as a result of this grant. (10 figures)
DTIC
Actuators; Artificial Intelligence; Manufacturing; Network Control; Neural Nets; Nonlinear Systems

64
NUMERICAL ANALYSIS

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

20050061319 California Inst. of Tech., Pasadena, CA USA
Uncertainty of Stability Variances Based on Finite Differences
Greenhall, C. A.; Riley, W. J.; Sep. 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A427933; No Copyright; Avail: CASI

This work gives an algorithm for computing the degrees of freedom of estimators of Allan and Hadamard variances, including their modified versions. A consistent approach is used throughout.
DTIC
Algorithms; Analysis of Variance; Degrees of Freedom; Finite Difference Theory; Stability

20050070862 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Error and Symmetry Analysis of Misner's Algorithm for Spherical Harmonic Decomposition on a Cubic Grid
Fiske, David R.; [2004]; 7 pp.; In English; 22nd Texas Symposium on Relativistic Astrophysics, 13-17 Dec. 2004, Stanford, CA, USA
Contract(s)/Grant(s): ATP02-0043-0056; No Copyright; Avail: CASI; A02, Hardcopy

In an earlier paper, Misner (2004, Class. Quant. Grav., 21, S243) presented a novel algorithm for computing the spherical harmonic components of data represented on a cubic grid. I extend Misner s original analysis by making detailed error estimates of the numerical errors accrued by the algorithm, by using symmetry arguments to suggest a more efficient

implementation scheme, and by explaining how the algorithm can be applied efficiently on data with explicit reflection symmetries.
Author
Spherical Harmonics; Error Analysis; Mathematical Models; Grid Generation (Mathematics); Algorithms

20050070939 North China Univ. of Science and Technology, Taiyuan, China
The Prediction Of Cutting Parameter Using Grey System Theory
Pang, Xuehui; Wu, Wenge; Chang, Xing; Progress of Machining Technology; December 2004, pp. 759-762; In English; See also 20050070885; Copyright; Avail: Other Sources

A new predictive method is proposed to characterize the phenomena in metal cutting process. This method is based on grey system theory. Its prominent superiority is do not need large quantity of sample, and which must subject to typical distribution. In the proposed method, an accumulated sampling data matrix is established to reduce the effect of the errors in the measurement and in the numerical calculation. Cutting tests were carried out. The results demonstrated the effectiveness and consistency of the proposed method.
Author
Prediction Analysis Techniques; Cutting; Metal Cutting; Systems Analysis

20050071053 Northwestern Polytechnical Univ., Xian, China
Effective Prediction Of Cutting Forces And Static Form Errors In Flexible End Milling
Wan, Min; Zhang, Weihong; Progress of Machining Technology; December 2004, pp. 792-797; In English; See also 20050070885
Contract(s)/Grant(s): CX200411; Copyright; Avail: Other Sources

The main objective of this study is to develop a general approach for calculations of cutting forces and static form errors in flexible end milling. The key techniques used are as follows: the finite element discretization of the cutter/workpiece, calculations of the instantaneous uncut chip thickness, iterative corrections of radial depth of cut as well as the workpiece's rigidity without finite element remeshing. Based on the typical cutting force model, numerical results obtained are compared with existing experimental and simulation results. It is shown that the developed approach has good prediction accuracy.
Author
Milling (Machining); Iteration; Correction; Computational Grids; Errors

20050071059 Jiangsu Univ., Zhenjiang, China
The Formation Mechanism And Physical Simulation Of Chip
Wang, Xiao; Liu, Hui-Xia; Yang, Rundang; Wu, Bo; Cai, Lan; Progress of Machining Technology; December 2004, pp. 814-818; In English; See also 20050070885
Contract(s)/Grant(s): Proj. 02KJD460003; Copyright; Avail: Other Sources

The curling reasons, breaking conditions and generating thickness of chip are discussed, and numerical simulation models are built according to formation mechanism of chip. The 3-D solid models of chip are given according to classification criterion of chip, furthermore, the effect of machining parameters on shape dimension and types of chip are analyzed. On the basis of above researches, the real-time simulation system of chip generating, curling and breaking is developed by integrating curling radius, breaking condition and thickness of chip etc. into simulation models. The system can gain corresponding chip types and dimensions, and real-time simulating chip generating, curling and breaking according to different parameters input.
Author
Computerized Simulation; Chips; Real Time Operation; Metal Cutting; Mathematical Models

20050071116 NASA Langley Research Center, Hampton, VA, USA
Recent Applications of the Volterra Theory to Aeroelastic Phenomena
Silva, Walter A.; Haji, Muhammad R; Prazenica, Richard J.; February 10, 2005; 14 pp.; In English; IMAC XXIII: Conference and Exposition on Structural Dynamics, Jan. 31 - Feb. 2, 2005, Orlando, FL, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-762-45-DA; No Copyright; Avail: CASI; A03, Hardcopy

The identification of nonlinear aeroelastic systems based on the Volterra theory of nonlinear systems is presented. Recent applications of the theory to problems in experimental aeroelasticity are reviewed. These results include the identification of aerodynamic impulse responses, the application of higher-order spectra (HOS) to wind-tunnel flutter data, and the

identification of nonlinear aeroelastic phenomena from flight flutter test data of the Active Aeroelastic Wing (AAW) aircraft. Author
Volterra Equations; Aeroelasticity; Nonlinearity

20050071574 Stanford Linear Accelerator Center, Stanford, CA, USA
Measurements Related to the CKM Angle Beta/Phil1 from BABAR
Verderi, M.; 2004; In English
Report No.(s): DE2004-827314; SLAC-UB-10515; No Copyright; Avail: National Technical Information Service (NTIS)

We present measurements related to the CKM angle (beta) from BABAR based on 82 or (approx)115 fb(sup -1) data samples collected at the PEP-II e(sup +)e(sup -) asymmetric B Factory collider. A new method allowing to measure the sign of cos2(beta) with B(sup 0) (yields) J/(psi) 'K*(sup 0)' events is explained and related results reported. Recent CP measurements in the penguin dominated modes B(sup 0) (yields) (phi)K(sup 0), B(sup 0) (yields) K(sup +) K(sup -) K(sub S)(sup 0), B(sup 0) (yields) (pi)(sup 0) K(sub S)(sup 0) and B(sup 0) (yields) f(sub 0) (980)K(sub S)(sup 0) are presented. NTIS
Asymmetry; Angles (Geometry)

20050080276 Air Force Technical Applications Center, Patrick AFB, FL USA
Theoretical Analysis of Narrow-Band Surface Wave Magnitudes
Russell, David R.; Jun. 2004; 42 pp.; In English
Report No.(s): AD-A428925; AFTAC-TR-04-0004; No Copyright; Avail: CASI; A03, Hardcopy

A major problem with time domain measurements of seismic surface waves is the significant effect of non- dispersed Rayleigh waves (Airy phases) which can occur at both regional and teleseismic distances. This paper derives a time domain method for measuring surface waves with minimum digital processing, using zero-phase Butterworth filters. This method can effectively measure surface wave magnitudes at both regional and teleseismic distances, while ensuring that the magnitudes are unbiased with respect to accepted formulae at reference periods, thus providing historical continuity. For applications over typical continental crust, the proposed magnitude equation is: M(subS(b)=log(measured filtered amplitude)+1/ 2log(sin(delta))+0.0031(20/period)(exp2.3) delta-0.66log (20/ period)-log(Butterworth filter corner frequency)-0.43 where a(sub b)=Measured filtered amplitude, T=period, and f(sub c)=.
DTIC
Magnitude; Narrowband; Rayleigh Waves; Seismic Waves; Surface Waves

20050080295 Georgia Inst. of Tech., Atlanta, GA USA
Geometric PDE's and Invariants for Problems in Visual Control Tracking and Optimization
Tannenbaum, Allen R.; Jan. 2005; 29 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0017
Report No.(s): AD-A428955; AFRL-SR-AR-TR-05-0006; No Copyright; Avail: CASI; A03, Hardcopy

In this proposal, we considered certain invariant flows to treat a number of key issues in controlled active vision, in particular visual tracking. The flows are all derived from some variational principle and so are physically very well justified. In fact, many of the partial differential equations (PDE's) in imaging are based on curvature driven flows from interfacial physics. They have been shown to be useful for a number of applications including crystal growth, flame propagation, and computer vision. We have extensively studied the problems of optimal transport and optical flow for problems in tracking. Optimal transport has appeared in econometrics, fluid dynamics, automatic control, transportation, statistical physics, shape optimization, expert systems, and meteorology. In particular, for the general visual tracking problem in controlled active vision, a robust and reliable object and shape recognition system is of major importance. We have based a new approach to this problem on the theory of optimal mass transport.
DTIC
Invariance; Partial Differential Equations; Visual Control

20050080309 Naval Research Lab., Bay Saint Louis, MS USA
Resolution and Algorithmic Influences on the Baroclinic Pressure Gradient in Finite Element-Based Hydrodynamic Models
Dresback, Kendra M.; Blain, Cheryl A.; Kolar, Randall L.; Jun. 2004; 14 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0651
Report No.(s): AD-A428984; NRL/PP/7320-04-2; No Copyright; Avail: CASI; A03, Hardcopy

In 3D shallow water models, the baroclinic pressure gradient (BPG) can become unstable or physically unrealistic in areas of rapidly changing topography and/or density fields. By using a 2D finite element x-z model, whose formulation uses the generalized wave continuity equation, we assess the impact on accuracy of three methods used to compute the BPG: the sigma coordinate method, the z-coordinate (level coordinate) method and a hybrid method that switches from sigma coordinates to z-coordinates at a prescribed depth. Resolution studies then look at horizontal and vertical resolution independently, and the interplay of the horizontal and vertical resolutions for these three methods of computing the BPG. Numerical experiments are carried out on several domains, from constant to rapidly changing bathymetry, with two different density fields, which vary only in the horizontal or vertical directions. Results thus far indicate that the z-coordinate method provides the least amount of error in the solution.
DTIC
Algorithms; Baroclinity; Finite Element Method; Hydrodynamics; Pressure Gradients

20050080310 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
FASST Vegetation Models
Frankenstein, Susan; Koenig, George; Dec. 2004; 54 pp.; In English; Original contains color illustrations
Report No.(s): AD-A428989; ERDC/CRREL-TR-04-25; No Copyright; Avail: Defense Technical Information Center (DTIC)
The one-dimensional dynamic state of the ground model FASST (Fast All-season Soil Strength) is a state of the ground model developed by Frankenstein and Koenig (2004) as part of the Army's Battlespace Terrain Reasoning and Awareness (BTRA) research program. In its original form, the only effects vegetation had on FASST were to change the surface albedo and emissivity. Recently, a two tier, multilayer vegetation algorithm was added. These can be implemented separately or together. Both alter the soil surface energy and moisture budgets. In this report we will discuss the energy balance equations used to solve for the low vegetation, canopy and ground temperatures. In solving these equations, the effects of precipitation interception and soil moisture modification attributable to root-uptake are incorporated.
DTIC
Algorithms; Soil Mechanics; Soils; Vegetation

20050080344 Army Engineer Research and Development Center, Vicksburg, MS USA
ENPAC 2003: A Tidal Constituent Database for Eastern North Pacific Ocean
Mark, David J.; Spargo, Emily A.; Westerink, Joannes J.; Luettich, Richard A., Jr; Sep. 2004; 191 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429079; ERDC/CHL-TR-04-12; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes the development of the Eastern North Pacific (ENPAC) 2003 tidal database of elevations and velocity components for eight major tidal constituents. This database was developed using the two-dimensional, depth-integrated form of the coastal hydrodynamic model, ADCIRC, which solves the shallow-water equations in the generalized wave continuity equation form. The final ENPAC 2003 incorporates the most accurate bathymetric data available. The resolution of the unstructured finite element mesh was designed to provide a high level of resolution along the continental slope and throughout the coastal waters to resolve the nonlinear hydrodynamics that dominate this area. The domain of this model extends beyond the continental shelf into deep ocean waters, but does not include any amphidromes located in the Pacific Ocean. At the open boundary, the forcing conditions are extracted from global ocean models, in the area where these models are most accurate. The results of the ENPAC 2003 model approach the error levels found in the station data that were used for model validation. (6 tables, 187 figures, 36 refs.)
DTIC
Bathymeters; Coasts; Data Bases; Elevation; Oceans; Pacific Ocean; Tides

20050080349 Rice Univ., Houston, TX USA
Some Topics in Computer Assisted Modeling, Simulation, and Data Analysis
Thompson, James R.; Nov. 2001; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0150
Report No.(s): AD-A429085; ARO-40014.3-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)
The supported graduate student, John Dobelman has begun extensive work on his disseration to find stochastic models to explain the mechanisms whereby electricity prices spike. Three books and six papers were authored or co-authored by Thompson during this grant period. The common thread is the development of models supported by intensive computer simulation to help explain and understand real world processes. Among these investigations are included models for statistical

process control in situations new to SPC. Almost all SPC treatises deal with situations in which the paradigm is of mature usage. Thompson shows how difficult such implementations are to achieve in practice and gives means for jumpstarting SPC in such systems as the International Space Station. The first world AIDS epidemic has received substantial attention by Thompson. Most recently he has given a model based argument that there is no standalone AIDS epidemic in Europe: it only exists by contacts with American infectives. In stochastic process based economic modeling, Thompson and his co-authors have shown how effective simulation models of relative simplicity and parametric parsimony may be achieved by aggregation from the micro to the macro. The simugram is Thompson's discovery that we can forecast the future multivariate stochastic process of even a large portfolio by the use of simulation. The risk neutral formula of Black-Scholes-Merton is shown to be seriously deficient as a practical tool. Similarly, the artificiality of the portfolio paradigm of Markowitz is replaced by other, conceptually simple, but requiring extensive computer simulation, techniques. Work is done which shows how data analysis in high dimensions needs to be carried out with techniques very different from those used in low dimensions.
DTIC
Computerized Simulation; Data Processing; Simulation

20050080367 Hawaii Univ., Honolulu, HI USA
Modeling of Sediment Mechanics for Mine Burial Prediction
Brandes, Horst G.; Riggs, H. R.; Dec. 2004; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-1-0513
Report No.(s): AD-A429111; No Copyright; Avail: Defense Technical Information Center (DTIC)

Numerical model development and testing were carried out for the purpose of assessing the influence of seafloor liquefaction on the burial of mines in shallow water due to cyclic loading by surface water waves. This project was conducted as part of the Office of Naval Research Mine Burial Prediction program (Code 321).
DTIC
Liquefaction; Mathematical Models; Sediments

20050080427 Northwestern Univ., Evanston, IL USA
Adaptive Signal Processing Techniques for Robust, High Capacity Spread-Spectrum Multiple Access
Honig, Michael L.; Sep. 2003; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0288
Report No.(s): AD-A429223; ARO-39184.32-CI; No Copyright; Avail: Defense Technical Information Center (DTIC)

This project is concerned with signal processing and coding techniques that can improve the performance of spread-spectrum, multiple-access systems. Specific topics investigated during the course of this project include the following: (1) reduced-rank interference suppression; (2) combined coding and interference suppression (3) joint transmitter-receiver optimization in the presence of multiple-access interference; and (4) the effect of limited feedback on the performance of joint transmitter-receiver optimization schemes. The theory of large random matrices was used to analyze the performance of both interference suppression and interference avoidance schemes. For example, the authors have used these techniques to analyze the performance of adaptive reduced- and full-rank least squares filtering for interference suppression with limited training. This analysis shows the effects of algorithm parameters, which determine the initialization and data windowing, along with system load and noise level. Other contributions include optimization of the ratio of pilot-to-data power and code rate with adaptive linear interference suppression, and signature optimization for combined interference avoidance and pre-equalization of multi-path. Transmitter optimization with limited feedback also has been considered, and bounds on the achievable performance as a function of feedback bits per dimension have been obtained. This project has resulted in a patent application for an adaptive reduced-rank filter, a paper award (for work on reduced-rank filtering), and numerous journal and conference publications on the preceding topics. A list of 34 journal articles, papers in review, and conference papers is included.
DTIC
Adaptive Filters; Multiple Access; Radio Frequency Interference; Signal Processing; Spread Spectrum Transmission; Wireless Communication

20050080431 North Carolina State Univ., Raleigh, NC USA
Numerical Methods for Granular Flows and Related Problems
Gremaud, Pierre A.; May 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-99-1-0188
Report No.(s): AD-A429267; ARO-39855.5-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

This project has led to significant progress on several critical questions related to granular flows. First, a high order code based on Discontinuous Galerkin method has been produced to study granular in axisymmetric hoppers. Before that, only ad hoc discretization methods were used. This led to the discovery of several new phenomena (such as shock formation and propagation). Several weaknesses of established models were also brought to the fore. Second, the effect of the geometry of the hopper on the flow were analyzed. Secondary circulation and resonance phenomena were observed in the models. This too is new. Third, advances were made in the analysis of sound propagation in sand and the importance of wall friction in the process. Fourth, a model of powder consolidation has been proposed, analyzed and discretized, leading to an industrial code. Fifth, a robust method for the volume determination of granular heap in complicated geometries has been proposed and implemented. The project has also yielded results not directly related to granular materials, such progress in long time integration of Discontinuous Galerkin methods and study of Partial Differential Algebraic equations.
DTIC
Galerkin Method; Granular Materials; Hoppers; Mathematical Models; Numerical Analysis; Two Phase Flow

65
STATISTICS AND PROBABILITY

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

20050071630 Oregon Dept. of Transportation, Salem, OR, USA
Development and Application of a Statistical Quality Assessment Method for Dense-Graded Mixes
Lundy, J. R.; Wurl, R. C.; Remily, M. D.; Aug. 2004; 102 pp.; In English
Report No.(s): PB2005-102515; No Copyright; Avail: CASI; A06, Hardcopy

This report describes the development of the statistical quality assessment method and the procedure for mapping the measures obtained from the quality assessment method to a composite pay factor. The application to dense-graded mixes is demonstrated with an example. This report also describes the development of a smoothness specification based on the IRI. A draft smoothness specification is also included in the appendices. The research team developed a methodology to measure the quality of dense-graded asphalt mixes based on a statistical function called a loss function. Various formulations of the loss function are routinely used in manufacturing to provide quality control/quality assurance measures. The methodology developed for this project provides a pay incentive to contractors that exceed quality expectations, and a penalty to those who fall short of quality expectations. The methodology encourages contractors to produce asphalt mixes that are consistent with specifications with minimum variability. Two principal specification-related products were produced. The first product allows ODOT to statistically judge the HMA quality using the loss function. Second, data analyses showed that project smoothness, as measured by IRI, could be incorporated into an ODOT specification, but only in the form of percent improvement in ride over the existing roadway.
NTIS
Methodology; Q Factors

20050080275 Drexel Univ., Philadelphia, PA USA
Interior-Point Algorithms, Penalty Methods and Equilibrium Problems
Benson, Hande Y.; Sen, Arun; Shanno, David F.; Vanderbei, Robert J.; Aug. 2004; 39 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0145
Report No.(s): AD-A428922; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we consider the question of solving equilibrium problems formulated as complementarity problems and more generally, mathematical programs with equilibrium constraints (MPECs) as nonlinear programs, using an interior-point approach. These problems pose theoretical difficulties for nonlinear solvers, including interior-point methods. We examine the use of penalty methods to get around these difficulties, present an example from game theory where this makes a difference in practice, and provide substantial numerical results. We go on to show that penalty methods can resolve some problems that interior-point algorithms encounter in general.
DTIC
Algorithms; Nonlinear Programming

20050080285 California Univ., Santa Cruz, CA USA
Array Processing for Discrete and Distributed Sources
Friedlander, Benjamin; Dec. 2004; 21 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0075
Report No.(s): AD-A428940; No Copyright; Avail: CASI; A03, Hardcopy

Array processing techniques are primarily designed for point sources, i.e. spatially discrete sources of acoustic or electromagnetic energy. However, in many cases the transmitter is better modeled as a distributed, rather than a discrete source. The principal mechanism for making the source appear to be distributed in space is diffuse and specular multipath caused by scattering of the propagating waves. Another is transmitter motion. The goal of this project was to develop array processing techniques for distributed sources. The vector of the signals received by an array from a distributed source resides in a Grassmanian manifold. This is the natural extension of the array manifold used in the case of point sources, which can be considered to be a special (rank one) case of a subspace manifold. In other words, whereas the response of an array to discrete sources is characterized by what is commonly called the array manifold, its response to a distributed source is characterized by a subspace manifold.
DTIC
Spatial Distribution

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20050070861 Virginia Univ., VA, USA
Solution Concepts for Distributed Decision-Making without Coordination
Beling, Peter A.; Patek, Stephen D.; [2005]; 14 pp.; In English
Contract(s)/Grant(s): NAG1-03059; No Copyright; Avail: CASI; A03, Hardcopy

Consider a single-stage problem in which we have a group N agents who are attempting to minimize the expected cost of their joint actions, without the benefit of communication or a pre-established protocol but with complete knowledge of the expected cost of any joint set of actions for the group. We call this situation a static coordination problem. The central issue in defining an appropriate solution concept for static coordination problems is considering how to deal with the fact that if the agents axe faced with a set of multiple (mixed) strategies that are equally attractive in terms of cost, a failure of coordination may lead to an expected cost value that is worse than that of any of the strategies in the set. In this proposal, we describe the notion of a general coordination problem, describe initial efforts at developing a solution concept for static coordination problems, and then outline a research agenda that centers on activities that will be basis for obtaining a complete understanding of solutions to static coordination problems.
Author
Coordination; Decision Making; Protocol (Computers)

20050071066 Tsinghua Univ., Bejing, China
A New Approach To Supplier Evaluation
Sun, Guozi; Yu, Dingwen; Wu, Zhijun; Liu, Jia; Progress of Machining Technology; December 2004, pp. 861-866; In English; See also 20050070885; Copyright; Avail: Other Sources

As the continual development strategy and environment protection consciousness embedded into the human's heart, manufacturing enterprises are faced with new requirements in their supplier evaluation systems. A newer and more comprehensive evaluation approach, supplier green evaluation system, is given in this paper. The method fulfills the green evaluation to the supplier. To study the science relationship of the green supply chain in the manufacturing enterprise, this paper applies the rough set (RS) theory into the supplier green evaluation system, with which the technical target of the whole process in supplier evaluation and selection could be reasonable. By this evaluation method, it can make scientific evaluation for supplier selection. At last, the application reference model of the decision-making support system (DSS) for supplier evaluation and selection is established, with which the strategic alliance could get a basis for decision-making.
Author
Support Systems; Decision Making; Environment Protection; Manufacturing; Systems Analysis

20050071068 Shenzhen Univ., Shenzhen, China

Study On A Multi-Reasoning Press Process Decision System Based On The Dispersed Knowledge Bases

Wang, Xiankun; Wu, Shaonian; Progress of Machining Technology; December 2004, pp. 867-872; In English; See also 20050070885

Contract(s)/Grant(s): NNFS-2000Z061; Copyright; Avail: Other Sources

Based on the Internet technology and artificial intelligence (AI) technology, this paper presents a dispersed press process knowledge bases based multi-reasoning press process decision system (DKB-MRPPD). The dispersed press process knowledge bases have been organized into case bases and rule bases, which may be located at different enterprises, and employed to plan press process by a multi-reasoning engine made up of the ART1, case reasoning and rule-based reasoning net. The architecture model of DKB-MRPPD has been put forward. The idea and some key technical tools for implementing the system have been also discussed in this paper. For easily access the distributed knowledge bases, a federated knowledge bases System (FKBS) implemented by means of JDBC and CORBA is presented.

Author

Artificial Intelligence; Internets; Knowledge Based Systems; Presses

67
THEORETICAL MATHEMATICS

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

20050061316 NASA Johnson Space Center, Houston, TX, USA

Deformation and Flexibility Equations for ARIS Umbilicals Idealized as Planar Elastica

Hampton, R. David; Leamy, Michael J.; Bryant, Paul J.; Quraishi, Naveed; January 2005; 32 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2004-213155; S-948; No Copyright; Avail: CASI; A03, Hardcopy

The International Space Station relies on the active rack isolation system (ARIS) as the central component of an integrated, stationwide strategy to isolate microgravity space-science experiments. ARIS uses electromechanical actuators to isolate an international standard payload rack from disturbances due to the motion of the Space Station. Disturbances to microgravity experiments on ARIS isolated racks are transmitted primarily via the ARIS power and vacuum umbilicals. Experimental tests indicate that these umbilicals resonate at frequencies outside the ARIS controller s bandwidth at levels of potential concern for certain microgravity experiments. Reduction in the umbilical resonant frequencies could help to address this issue. This work documents the development and verification of equations for the in-plane deflections and flexibilities of an idealized umbilical (thin, flexible, inextensible, cantilever beam) under end-point, in-plane loading (inclined-force and moment). The effect of gravity is neglected due to the on-orbit application. The analysis assumes an initially curved (not necessarily circular), cantilevered umbilical with uniform cross-section, which undergoes large deflections with no plastic deformation, such that the umbilical slope changes monotonically. The treatment is applicable to the ARIS power and vacuum umbilicals under the indicated assumptions.

Author

Flexibility; International Space Station; Microgravity; Umbilical Connectors; Elastic Deformation; Planar Structures

20050080429 San Diego Supercomputer Center, San Diego, CA USA

Atomic Spectral Methods for Molecular Electronic Structure Calculations

Langhoff, P. W.; Boatz, J. A.; Hinde, R. J.; Sheehy, J. A.; Jun. 2004; 45 pp.; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A429238; No Copyright; Avail: Defense Technical Information Center (DTIC)

New theoretical methods are reported for ab initio calculations of the adiabatic (Born-Oppenheimer) electronic wave functions and potential energy surfaces of molecules and other atomic aggregates. An outer product of complete seets of atomic eigenstates familiar from perturbation-theoiretical treatments of long-range interactions is employed as a representational basis without prior enforcement of aggregate wave fnction antisymmetry. The nature and attributes of this atomic spectral-product basis are indicated, completeness proofs for representation of antisymmetric stated provided, convergence of Schrodinger eigenstates in the basis established, and strategies for computational implementation o the theory described.

DTIC

Atoms; Eigenvectors; Electronic Structure; Molecular Structure; Schroedinger Equation; Spectral Methods

20050080595 Defence Research and Development Canada, Dartmouth, Nova Scotia Canada
Appendage and Viscous Forces for Ship Motions in Waves
McTaggart, Kevin A.; Sep. 2004; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429080; DRDC-ATLANTIC-TM-2004-227; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes the prediction of appendage and viscous forces in Defence Research and Development Canada (DRDC) Atlantic's ShipMo3D library for ship motions in waves. Previously, the ShipMo3D library considered only hull forces due to potential flow. Inclusion of appendage and viscous forces is essential for accurate prediction of ship sway, roll, and yaw motions. Appendage forces are caused by added mass, lift, and viscous effects. Hull viscous forces are also important and are included in the present treatment. This report introduces a method for including appendages in hull radiation and diffraction computations by representing appendages using dipole panels. Computations for a naval destroyer have indicated that inclusion of appendages in hull radiation and diffraction computations has a negligible effect on predicted motions; thus, hull and appendage forces can be evaluated separately without affecting accuracy of motion predictions. Comparisons of predictions with experiments for a steered warship model in regular waves show good agreement. Future work will incorporate hull lift forces in ship motion predictions. (7 tables, 43 figures, 29 refs.)
DTIC
Appendages; Ocean Surface; Prediction Analysis Techniques; Ships; Viscosity; Water Waves

70
PHYSICS (GENERAL)

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

20050061123 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Frame Transformation Methods for Open-Shell Systems: Photoabsorption of Ni14+
Felfli, Z.; Gorczyca, T. W.; Deb, N. C.; Msezane, A. Z.; Physics Review A; 2002; Volume 66; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-042716; Copyright; Avail: Other Sources

No abstract available
Photoabsorption; Nickel

20050061239 Fermi National Accelerator Lab., Batavia, IL, USA
Difference Between BPM Reading One Bunch and the Average of Multi-Bunches in Booster
Yang, X.; 2004; In English
Report No.(s): DE2004-828200; FERMILAB-TM-2264-AD; No Copyright; Avail: National Technical Information Service (NTIS)

Differences caused by BPM reading one bunch and multi-bunch average need to be well understood before the beam parameters, such as the synchrotron tune, betatron tune, and chromaticity, are extracted from those BPM data. It is easy to perform such a study using numerical simulation other than modifying the BPM electronics.
NTIS
Betatrons; Color

20050061240 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Effect of Wiggler Insertions on the Single-Particle Dynamics of the NLC Main Damping Rings
Venturini, M.; 2004; In English
Report No.(s): DE2004-827950; LBNL-56264; No Copyright; Avail: National Technical Information Service (NTIS)

As they are expected to occupy a large portion of the lattice, wiggler insertions will introduce signficant linear and nonlinear perturbations to the single-particle dynamics in the NLC Main Damping Rings (MDR). The nonlinearities are of particular concern as a sufficiently large Dynamic Aperture (DA) is required for high injection efficiency. The main content of this report is a study of the wigglers impact on the DA of the NLC-MDR latest lattice design. The particle dynamics is modelled by transfer maps calculated by integration through the wiggler fields. For field representation we employed a 3D

multipole expansion derived from the field data that were obtained with the aid of a magnet design code.
NTIS
Wiggler Magnets; Perturbation; Damping

20050061260 Fermi National Accelerator Lab., Batavia, IL, USA
Possible Ion Trapping in Recycler Ring
Ng, K. Y.; 2004; In English
Report No.(s): DE2004-825349; No Copyright; Avail: National Technical Information Service (NTIS)

Transverse instabilities have been observed in the antiproton beam stored in the Fermilab Recycler Ring, resulting in a sudden increase in the transverse emittances and a small beam loss. The instabilities appear to occur a few hours after a change in the ramping pattern of the Main Injector which shares the same tunnel. The phenomena have been studied by inducing similar instabilities. However, the mechanism is still unknown. A possible explanation is that the ions trapped in the beam reach such an intensity that collective coupled transverse oscillation occurs. However, there is no direct evidence of the trapped ions at this moment.
NTIS
Ions; Antiprotons; Emittance

20050061266 Cornell Univ., Ithaca, NY, USA
Microwave and Accelerator Research
Nation, J. A.; Sep. 2002; 72 pp.; In English
Report No.(s): DE2004-809153; DOE/ER/4073-1; No Copyright; Avail: Department of Energy Information Bridge

This report summarizes the main technical objectives and accomplishments during the life of the grant, and concludes with data on publications describing the research. The main activity was the development of very high power microwave sources, initially in X-band, and recent initial work on a Ka band TWT amplifier. There was additional activity on ferroelectric emitters. Highlights include the following: (1) The development of a relatively broad band microwave source yielding approx. 75 MW power at a power efficiency of 54% and an energy conversion efficiency of 43%. (2) The development of a ferroelectric cathode electron gun which yielded a beam current of up to 350 A at 500 kV. The device was shown to operate satisfactorily at a low repetition rate, limited by the available power supplies. The final beam power obtained exceeds that achieved elsewhere by several orders of magnitude. The gun development achieved was shown to give an electron beam suitable for high power X-band microwave sources with the demonstration of a 5-MW tunable X-band TWT single-stage amplifier. (3) Work was initiated on a Ka-Band TWT amplifier. Gains of over 30 dB were achieved at peak output powers of about 4 MW. Appendices include two submitted papers: Symmetric and asymmetric mode interaction in high-power traveling wave amplifiers: experiments and theory and High power microwave generation using a ferroelectric cathode electron gun.
NTIS
Microwave Amplifiers; Beam Currents; Electron Beams

20050061279 Harvard Univ., Cambridge, MA, USA
Growth and Characterization of GaN As(P) for High Efficiency Solar Cells. Final Subcontract Report, 29 Jul 1999-28 September 2003
Narayanamurti, V.; 2002; 16 pp.; In English
Report No.(s): DE2004-15007877; No Copyright; Avail: Department of Energy Information Bridge

This report describes the characterization of GaAs1-xNx and GaP1-xNx alloys using scanning tunneling microscopy (STM) and ballistic electron emission microscopy (BEEM). One objective was to understand the origins of the giant bandgap bowing of these compound semiconductor alloys as a function of nitrogen concentration. The STM and BEEM have been used to characterize GaNxAs1-x and GaNxP1-x as a function of composition. The reduction in bandgap has been measured. Detailed studies of the band structure as a function of N composition has led to a basic understanding of the materials system. The major results of this work include: (1) determination of relative contributions of the G- and L-like bands of GaNxAs1-x to the BEEM spectra; (2) determination of the composition dependence of the Au/ G- and L-like bands of GaNxAs1-x Schottky barrier height; (3) development of a model to describe the BEEM results at nonepitaxial metal/semiconductor interfaces; and (4) ballistic electron emission spectroscopy studies of GaNxP1-x samples that demonstrated possible splitting in the degeneracy of the X valley due to the nitrogen. The data were qualitatively described by the recent perturbed host states model of Kent and Zunger.
NTIS
Electron Microscopy; Semiconductors (Materials); Electron Emission

20050061309 Princeton Univ., NJ

Ponderomotive Barrier as a Maxwell Demon

Dodin, I. Y.; Fisch, N. J.; Rax, J. M.; May 2004; 62 pp.; In English

Report No.(s): DE2004-827931; PPPL-3949REV; No Copyright; Avail: Department of Energy Information Bridge

The possibility of efficient ponderomotive current drive in a magnetized plasma was reported recently in (Phys. Rev. Lett. 91, 205004 (2003)). Precise limitations on the efficiency are now given through a comprehensive analytical and numerical study of single-particle dynamics under the action of a cyclotron-resonant rf drive in various field configurations. Expressions for the particle energy gain and acceleration along the dc magnetic field are obtained. The fundamental correlation between the two effects is described. A second fundamental quantity, namely, the ratio of the potential barrier to the energy gain, can be changed by altering the field configuration. The asymmetric ponderomotive current drive effect can be optimized by minimizing the transverse heating.

NTIS

Plasmas (Physics); Potential Energy; Particle Energy

20050061317 Princeton Univ., NJ

Design and Construction of a Fast Ion Loss Faraday Cup Array

Draaow, D. S.; Baeumel, S.; Cecil, F. E.; Kiptily, V.; Apr. 2004; In English

Report No.(s): DE2004-827927; PPPL-3947; No Copyright; Avail: National Technical Information Service (NTIS)

A thin foil Faraday cup array is being built to measure the loss of 3.5 MeV alpha particles and MeV ion cyclotron heating (ICH) tail ions on JET. It will consist of nine detectors spread over five different poloidal locations and three radial positions. They will measure the poloidal distribution and radial scrape off of the losses. The detectors will be comprised of four layers of thin (2.5 micron) Ni foil, giving some resolution of the lost particle energy distribution as different ranges of energies will stop in different layers of the detector. One detector will utilize eight thinner (1.0 micron) foils to obtain a better resolved energy distribution. These detectors will accept particles incident up to 45(sup o) from the normal to the foils.

NTIS

Foils (Materials); Alpha Particles; Losses

20050061323 Fermi National Accelerator Lab., Batavia, IL, USA

Chromaticity Measurement Via the Fourier Spectrum of Transverse Oscillations

Yang, X.; 2004; In English

Report No.(s): DE2004-827924; FERMILAB-TM-2262-AD; No Copyright; Avail: National Technical Information Service (NTIS)

Turn-by-turn data from a single BPM includes information on the chromaticity in sidebands displaced above and below the betatron frequency by an amount of the synchrotron frequency. It may be necessary to induce small amplitude synchrotron oscillation by giving the beam a small kick. Power spectrum of the BPM data gives clear chromatic sidebands, and they can be applied to the chromaticity measurement in the Fermilab Booster.

NTIS

Transverse Oscillation; Betatrons

20050061324 Princeton Univ., NJ

Variational Formulation of the Gardner's Restacking Algorithm

Dodin, I. Y.; Fisch, N. J.; Apr. 2004; 16 pp.; In English

Report No.(s): DE2004-827920; PPPL-3946; No Copyright; Avail: Department of Energy Information Bridge

The incompressibility of the phase flow of Hamiltonian wave-plasma interactions restrains the class of realizable wave-driven transformations of the particle distribution. After the interaction, the distribution remains composed of the original phase-space elements, or local densities, which are only rearranged (restacked) by the wave. A variational formalism is developed to study the corresponding limitations on the energy and momentum transfer. A case of particular interest is a toroidal plasma immersed in a dc magnetic field. The restacking algorithm by Gardner is formulated precisely. The minimum energy state for a plasma with a given current is determined.

NTIS

Particle Density (Concentration); Electric Fields; Energy Transfer; Wave Interaction

20050061336 Princeton Univ., NJ

Compact Probe for Power Detection from the Narrow Side of the Waveguide

Kung, C. C.; Bernabi, S.; Gumbas, J.; Greenough, N.; FRedd, E.; May 2004; 30 pp.; In English

Report No.(s): DE2004-827934; PPPL-3950; No Copyright; Avail: Department of Energy Information Bridge

Phased array antennas with high directivity have a variety of applications. One of their applications is in RF heating for magnetically confined plasma fusion research. Among these RF heating schemes, waveguide arrays with careful phase control on each waveguide can act as a phased array antenna to deliver megawatts of power for heating fusion plasmas in the lower-hybrid range of frequencies (1 GHz-10 GHz). In order to achieve compactness, it is common to stack reduced height waveguide together to form the waveguide array. As long as the delivered power does not cause arcing in the waveguide, the waveguide height can be quite smal1. Due to this confined space in a stack of reduced height waveguides, power detection of the incident and reflected wave in the reduced height waveguide is extremely difficult. A new compact probe, which employs current loops, to monitor the incident and reflected wave from the narrow side of the reduced height waveguide has been developed.

NTIS

Waveguides; Probes; Power Supplies

20050070555 Stanford Linear Accelerator Center, Stanford, CA, USA

Varying alpha/lambda in NLC Structures BNS Damping and Emittance Growth

Stupakov, G.; Li, Z.; 2004; In English

Report No.(s): DE2004-827071; SLAC-TN-03-062; No Copyright; Avail: National Technical Information Service (NTIS)

In this note we consider the effect of the varying the iris opening (alpha) in the NLC structures on the beam dynamics and the RF efficiency in the linac. The most important consequence of the variation of the iris openings is the change of the longitudinal and transverse wakefields. Wake as a function of parameter (alpha) for the NLC structures has been previously calculated by K. Bane. Here we will use his result for the scalings of the longitudinal wake w(sub l) and transverse wake w(sub t) with the geometrical dimensions of the structure: w(sub l)(s) = Z(sub 0)c/(pi)(alpha)(sup 2) e(radical)(s/s(sub 0)), dw(sub t)(s)/ds = 2Z(sub 0)c/(pi)(alpha)(sup 4) e(sup -) (radical)(s/s(sub 1)) where for the scaling parameters s(sub 0) and s(sub 1) we have s(sub 0) = 0.41 a(sup 1. 8)g(sup 1.6)/L(sup 2.4), s(sub 1) = ((alpha)(m))(sup 1. 96), with g being the distance between the irises (gap) and L - the cell period (equal to the gap plus the iris thickness).

NTIS

Linear Accelerators; Emittance; Radio Frequencies

20050071539 Stanford Linear Accelerator Center, Stanford, CA, USA

Measurement of the Branching Fraction for B(sup+) Yields K(sup*0)pi(sup+): The BaBAR Collaboration

Sep. 2001; In English

Report No.(s): DE2004-826709; SLAC-PUB-8981; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available

Mesons; Branching (Mathematics)

20050071540 Stanford Linear Accelerator Center, Stanford, CA, USA

Study of B Yields D(*)overbar D(*) decays with the BaBAR Detector

Sep. 2001; In English

Report No.(s): DE2004-826710; SLAC-PUB-8982; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available

Mesons; Branching (Mathematics); Particle Decay

20050071541 Wisconsin Univ., Madison, WI, USA, Stanford Linear Accelerator Center, Stanford, CA, USA

Experimental Status of b Yields s(d)gamma Decays

Di Lodovico, F.; Aug. 2003; In English

Report No.(s): DE2004-826735; SLAC-PUB-10127; No Copyright; Avail: National Technical Information Service (NTIS)

Radiative penguin decays provide an indirect probe for physics beyond the Standard Model and contribute to the determination of the CKM matrix elements. Copious quantities of B mesons produced at the B-Factories permit precision

measurements of radiative penguin decays. We review the experimental status of the radiative penguin processes b (yields) s(d)(gamma).
NTIS
Mesons; Particle Decay

20050071542 Stanford Linear Accelerator Center, Stanford, CA, USA, Colorado State Univ., Fort Collins, CO, USA
Using Untagged B(sup 0) Yields DK(subS) to Determine gamma
Gronau, M.; Grossman, Y.; Shuhmaher, N.; Soffer, A.; Zupan, J.; Feb. 2004; 22 pp.; In English
Report No.(s): DE2004-826741; SLAC-PUB-10323; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Mesons; Particle Decay

20050071543 Stanford Linear Accelerator Center, Stanford, CA, USA, Heidelberg Univ., Heidelberg, Germany
Semileptionic Beta Decays at BABAR
Langeneger, U.; Feb. 2004; In English
Report No.(s): DE2004-826753; SLAC-PUB-10348; No Copyright; Avail: National Technical Information Service (NTIS)
We present results on semileptonic B decays obtained with the BABAR detector. The large data set accumulated at the PEP-II asymmetric-energy B-Factory allows a new measurement technique, where the hadronic decay of one B meson is fully reconstructed and the semileptonic decay of the recoiling B meson is studied. Traditional analysis techniques of inclusive and exclusive B decays complement this approach with very high statistics data samples. These measurements play an important role in the tests of the description of CP violation in the Standard Model.
NTIS
Mesons; Particle Decay

20050071544 Stanford Linear Accelerator Center, Stanford, CA, USA
Studying b Yields S gamma at BaBar Using a Fully Inclusive Method
Schmitz, R. E.; 2004; In English
Report No.(s): DE2004-826757; SLAC-R-706; No Copyright; Avail: National Technical Information Service (NTIS)
The b (yields) s(gamma) decay represents a possible electromagnetic ''loop'' penguin decay of the B meson. This FCNC process is of high theoretical interest because various scenarios of new physics are expected to have contributions at the same (one loop) level as the Standard Model. The large sample of B(bar B) meson decays collected by the BaBar experiment makes a precision measurement of this rare decay possible. In conjunction with Standard Model predictions at the 10% level, it brings new physics effects into the realm of detection--or seriously constrains models that could predict them. A fully inclusive technique is presented to study the b (yields) s(gamma) transition as a function of photon energy, using 88.5 (+-) 1.0 x 10(sup 6) B(bar B) meson decays collected by the BaBar experiment in the years 2000 to 2002. The expected statistical and systematic uncertainties have been fully determined which enables first comparisons with theoretical predictions and other experimental results. It also lays the basis for the determination of the inclusive branching fraction (Beta)(B (yields) X(sub s)(gamma)) and the measurement of the photon energy spectrum.
NTIS
Mesons; Energy Spectra

20050071545 Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Santa Cruz, CA, USA
Luminosity, Energy and Polarization Studies for the Linear Collider: Comparing e(sup+)e(sup-) and e(sup-)e(sup-) for NLC and TESLA
Woods, M.; Moffeit, K. C.; Raubenheimer, T. O.; Seryi, A.; Sramek, C.; Feb. 2004; In English
Report No.(s): DE2004-826781; SLAC-PUB-10353; No Copyright; Avail: National Technical Information Service (NTIS)
We present results from luminosity, energy and polarization studies at a future Linear Collider. We compare e(sup +)e(sup -) and e(sup -)e(sup -) modes of operation and consider both NLC and TESLA beam parameter specifications at a center-of-mass energy of 500 GeV. Realistic colliding beam distributions are used, which include dynamic effects of the beam transport from the Damping Rings to the Interaction Point. Beam-beam deflections scans and their impact for beam-based feedbacks are considered. A transverse kink instability is studied, including its impact on determining the luminosity-weighted

center-of-mass energy. Polarimetry in the extraction line from the IP is presented, including results on beam distributions at the Compton IP and at the Compton detector.
NTIS
Luminosity; Polarimetry; Center of Mass

20050071546 Stanford Linear Accelerator Center, Stanford, CA, USA
Limits on the Decay-Rate Difference of Neutral-B Mesons and on CP, T, and CPT Violation in B0-B0bar Oscillations: The Babar Collaboration
Aubert, B.; Barate, R.; Palano, A.; Chen, J. C.; Eigen, G.; Aug. 2004; In English
Report No.(s): DE2004-826792; SLAC-PUB-10364; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
CP Violation; Mesons

20050071547 Stanford Linear Accelerator Center, Stanford, CA, USA
Study of the Absolute Branching Fraction of Upsilon (4S)Yields anti B(sup0)B(sup0) with Partial Reconstruction of anti-B(sup0)Yields D*(sup+) Lepton(sup-) anti-Ni(sub lepton) at BABAR
Godang, R.; Summers, D.; Apr. 2004; In English
Report No.(s): DE2004-826880; SLAC-PUB-10433; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Polarization; Particle Decay; Branching (Mathematics)

20050071548 Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Los Angeles, CA, USA, Commissariat a l'Energie Atomique, Gif-sur-Yvette, France
Two-loop gluon to gluon gluon Splitting Amplitudes in QCD
Bern, Z.; Dixon, L. J.; Kosower, D. A.; Apr. 2004; 104 pp.; In English
Report No.(s): DE2004-826914; SLAC-PUB-10414; No Copyright; Avail: Department of Energy Information Bridge
Splitting amplitudes are universal functions governing the collinear behavior of scattering amplitudes for massless particles. We compute the two-loop g (yields) gg splitting amplitudes in QCD, N = 1, and N = 4 super-Yang-Mills theories, which describe the limits of two-loop n-point amplitudes where two gluon momenta become parallel. They also represent an ingredient in a direct x-space computation of DGLAP evolution kernels at next-to-next-to-leading order. To obtain the splitting amplitudes, we use the unitarity sewing method. In contrast to the usual light-cone gauge treatment, our calculation does not rely on the principal-value or Mandelstam-Leibbrandt prescriptions, even though the loop integrals contain some of the denominators typically encountered in light-cone gauge. We reduce the integrals to a set of 13 master integrals using integration-by-parts and Lorentz invariance identities. The master integrals are computed with the aid of differential equations in the splitting momentum fraction z. The (epsilon)-poles of the splitting amplitudes are consistent with a formula due to Catani for the infrared singularities of two-loop scattering amplitudes. This consistency essentially provides an inductive proof of Catani's formula, as well as an ansatz for previously-unknown 1/(epsilon) pole terms having non-trivial color structure. Finite terms in the splitting amplitudes determine the collinear behavior of finite remainders in this formula.
NTIS
Quantum Chromodynamics; Amplitudes

20050071565 Technion - Israel Inst. of Tech., Haifa, Israel, Stanford Linear Accelerator Center, Stanford, CA, USA, California Univ., Santa Cruz, CA, USA
Twisted Split Fermions
Gorssman, Y.; Harnik, R.; Perez, G.; Schwartz, M. D.; Surujon, Z.; Jul. 2004; In English
Report No.(s): DE2004-827303; SLAC-PUB-10552; LBNL-55326; No Copyright; Avail: National Technical Information Service (NTIS)
The observed flavor structure of the standard model arises naturally in 'split fermion' models which localize fermions at different places in an extra dimension. It has, until now, been assumed that the bulk masses for such fermions can be chosen to be flavor diagonal simultaneously at every point in the extra dimension, with all the flavor violation coming from the Yukawa couplings to the Higgs. We consider the more natural possibility in which the bulk masses cannot be simultaneously diagonalized, that is, that they are twisted in flavor space. We show that, in general, this does not disturb the natural generation of hierarchies in the flavor parameters. Moreover, it is conceivable that all the flavor mixing and CP-violation in the standard

model may come only from twisting, with the five-dimensional Yukawa couplings taken to be universal.
NTIS
Fermions; Standard Model (Particle Physics)

20050071566 Stanford Linear Accelerator Center, CA, USA, Stockholm Univ., Sweden, Utah Univ., Salt Lake City, UT, USA
DarkSUSY: Computing Supersymmetric Dark Matter Properties Numerically
Gondolo, P.; Edsjo, J.; Ullio, P.; Jul. 2004; 40 pp.; In English
Report No.(s): DE2004-827305; SLAC-PUB-10562; No Copyright; Avail: Department of Energy Information Bridge
The question of the nature of the dark matter in the Universe remains one of the most outstanding unsolved problems in basic science. One of the best motivated particle physics candidates is the lightest supersymmetric particle, assumed to be the lightest neutralino - a linear combination of the supersymmetric partners of the photon, the Z boson and neutral scalar Higgs particles. Here we describe DarkSUSY, a publicly-available advanced numerical package for neutralino dark matter calculations. In DarkSUSY one can compute the neutralino density in the Universe today using precision methods which include resonances, pair production thresholds and coannihilations. Masses and mixings of supersymmetric particles can be computed within DarkSUSY or with the help of external programs such as FeynHiggs, ISASUGRA and SUSPECT. Accelerator bounds can be checked to identify viable dark matter candidates. DarkSUSY also computes a large variety of astrophysical signals from neutralino dark matter, such as direct detection in low-background counting experiments and indirect detection through antiprotons, antideuterons, gamma-rays and positrons from the Galactic halo or high-energy neutrinos from the center of the Earth or of the Sun. Here we describe the physics behind the package. A detailed manual will be provided with the computer package.
NTIS
Dark Matter; Pair Production; Astrophysics

20050071568 Stanford Linear Accelerator Center, Stanford, CA, USA, Stanford Univ., Stanford, CA, USA
Counter-Intuition and Scalar Masses
Silverstein, E.; Jul. 2004; 16 pp.; In English
Report No.(s): DE2004-827307; SLAC-PUB-10569; No Copyright; Avail: Department of Energy Information Bridge
The Bousso-Polchinski mechanism for discretely fine-tuning the cosmological constant favors a large bare negative cosmological constant. I argue (using generalizations of results of Klebanov and Tseytlin) that a similar mechanism for fine-tuning the scalar masses to small values favors a large bare negative (i. e. tachyonic) scalar mass. I comment briefly on the related issue of the role of low energy supersymmetry in string theory.
NTIS
Cosmology; Scalars

20050071570 Stanford Linear Accelerator Center, Stanford, CA, USA, Japan Atomic Energy Research Inst., Hyogo, Japan
Comparison of Synchrotron Radiation Calculations Between Analytic Codes (Stac8, Photon) and Monte Carlo Codes (Fluka, EGS4)
Liu, J. C.; Fasso, A.; Prinz, A.; Rokni, S.; Asano, Y.; 2004; In English
Report No.(s): DE2004-827308; SLAC-PUB-10427; No Copyright; Avail: National Technical Information Service (NTIS)
Significantly improved upon its predecessor PHOTON, STAC8 is a valuable analytic code for quick and conservative beamline shielding designs for synchrotron radiation (SR) facilities. To check the applicability, accuracy, and limitations of STAC8, studies were conducted to compare STAC8 and PHOTON results with calculations using the FLUKA and EGS4 Monte Carlo codes. Doses and spectra for scattered SR in a few beam-target-shield geometries were calculated, with and without photon linear polarization effects. Areas for expanding the STAC8 capabilities, e.g., features of the mirror-reflected lights and double-Compton light calculations, and use of monochromatic light, etc., have been identified. Some of these features have been implemented and benchmarked against Monte Carlo calculations. Reasonable agreements were found between the STAC8 and Monte Carlo calculations.
NTIS
Synchrotron Radiation; Monte Carlo Method; Computation

20050071577 Stanford Linear Accelerator Center, CA, USA
Monte Carlo Exploration of Warped Higgsless Models
Hewett, J. L.; Lillie, B.; Rizzo, T. G.; Jul. 2004; In English
Report No.(s): DE2004-827313; SLAC-PUB-10510; No Copyright; Avail: National Technical Information Service (NTIS)

We have performed a detailed Monte Carlo exploration of the parameter space for a warped Higgsless model of electroweak symmetry breaking in 5 dimensions. This model is based on the SU(2)L x SU(2)(sub R) x U(1)(sub B-L) gauge group in an AdS(sub 5) bulk with arbitrary gauge kinetic terms on both the Planck and TeV branes. Constraints arising from precision electroweak measurements and collider data are found to be relatively easy to satisfy. We show, however, that the additional requirement of perturbative unitarity up to the cut-off, (approx) 10 TeV, in W(sub L)(sup +)W(sub L)(sup -) elastic scattering in the absence of dangerous tachyons eliminates all models. If successful models of this class exist, they must be highly fine-tuned.
NTIS
Tachyons; Elastic Scattering; Monte Carlo Method

20050071578 Stanford Linear Accelerator Center, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, Moscow State Univ., Russia, Ecole Polytechnique, Paris, France
DIRC Particle Indentification System for the BABAR Experiment
Adam, I.; Aleksan, R.; Amerman, L.; Antokhin, E.; Aston, D.; Jun. 2004; 88 pp.; In English
Report No.(s): DE2004-827315; SLAC-PUB-10516; No Copyright; Avail: Department of Energy Information Bridge
A new type of ring-imaging Cherenkov detector is being used for hadronic particle identification in the BABAR experiment at the SLAC B Factory (PEP-II). This detector is called DIRC, an acronym for Detection of Internally Reflected Cherenkov (Light). This paper will discuss the construction, operation and performance of the BABAR DIRC in detail.
NTIS
Imaging Techniques; Hadrons; Radiation Counters

20050071579 Stanford Linear Accelerator Center, CA, USA
Conformal Symmetry as a Template for QCD
Brodsky, S. J.; Jul. 2004; In English
Report No.(s): DE2004-829728; SLAC-PUB-10576; No Copyright; Avail: National Technical Information Service (NTIS)
Conformal symmetry is broken in physical QCD; nevertheless, one can use conformal symmetry as a template, systematically correcting for its nonzero (beta) function as well as higher-twist effects. For example, commensurate scale relations which relate QCD observables to each other, such as the generalized Crewther relation, have no renormalization scale or scheme ambiguity and retain a convergent perturbative structure which reflects the underlying conformal symmetry of the classical theory. The 'conformal correspondence principle' also dictates the form of the expansion basis for hadronic distribution amplitudes. The AdS/CFT correspondence connecting superstring theory to superconformal gauge theory has important implications for hadron phenomenology in the conformal limit, including an all-orders demonstration of counting rules for hard exclusive processes as well as determining essential aspects of hadronic light-front wavefunctions.
NTIS
Quantum Chromodynamics; Symmetry

20050071582 Stanford Linear Accelerator Center, CA, USA
Search for Direct CP Violation in Quasi-Two-Body Charmless B Decays
Sep. 2001; In English
Report No.(s): DE2004-826708; SLAC-PUB-8980; No Copyright; Avail: National Technical Information Service (NTIS)
We have searched for direct CP violation in quasi-two-body charmless B decays observed in a sample of about 45 million B mesons collected with the BABAR detector at the PEP-II collider.
NTIS
CP Violation; Particle Decay

20050071593 Fermi National Accelerator Lab., Batavia, IL, USA
Diffractive Physics Results at CDF
Gallinaro, M.; Dec. 2003; In English
Report No.(s): DE2004-820278; FERMILAB-CONF-03/403-E; No Copyright; Avail: National Technical Information Service (NTIS)
Forward detectors are described together with the first physics results from Run II. Using new data and dedicated

diffractive triggers, a measurement of single diffractive dijet production rate, with particular focus on the diffractive structure function of the antiproton, is discussed.
NTIS
Actuators; Cross Sections; Antiprotons

20050071599 Stanford Linear Accelerator Center, Stanford, CA, USA
Applications of Light-Front QCD
Brodsky, S. J.; Jul. 2004; 18 pp.; In English
Report No.(s): DE2004-829726; SLAC-PUB-10574; No Copyright; Avail: Department of Energy Information Bridge

Light-front Fock state wavefunctions encode the bound state properties of hadrons in terms of their quark and gluon degrees of freedom at the amplitude level. The freedom to choose the light-like quantization four-vector provides an explicitly covariant formulation of light-front quantization and can be used to determine the analytic structure of light-front wave functions. The AdS/CFT correspondence of large N(sub C) supergravity theory in higher-dimensional anti-de Sitter space with supersymmetric QCD in 4-dimensional space-time has interesting implications for hadron phenomenology in the conformal limit, including an all-orders demonstration of counting rules for exclusive processes. String/gauge duality also predicts the QCD power-law behavior of light-front Fock-state hadronic wavefunctions with arbitrary orbital angular momentum at high momentum transfer. The form of these near-conformal wavefunctions can be used as an initial ansatz for a variational treatment of the light-front QCD Hamiltonian.
NTIS
Quantum Chromodynamics; Momentum Transfer

20050071623 California Univ., Berkeley, CA
Toward Femtosecond X-ray Spectroscopy at the Advanced Light Source
Chong, H. H. W.; 2004; In English
Report No.(s): DE2004-828144; No Copyright; Avail: National Technical Information Service (NTIS)

The ultrashort pulse x-ray source developed at the Advanced Light Source at the Lawrence Berkeley Laboratory is based on electron slicing in storage rings, and generates (approx)100 femtosecond pulses of synchrotron radiation spanning wavelengths from the far-infrared to the hard x-ray region of the electromagnetic spectrum. The tunability of the source allows for the adaptation of a broad range of static x-ray spectroscopies to useful pump-probe measurements. Initial experiments are attempted on transition metal complexes that exhibit relatively large structural changes upon photo-excitation and which have excited-state evolution determined by strongly interacting structural, electronic and magnetic degrees of freedom. Specifically, iron(II) complexes undergo a spin-crossover transition upon optical irradiation. The dynamics of the transition involve a metal-to-ligand charge transfer, a (Delta)S=2 change in magnetic moment and 10% bond dilation in the first coordination shell of the iron. Studies of the electronic dynamics are studied with time-resolved optical absorption measurements. The current progress of time-resolved structural studies to complete the picture of the spin-crossover transition is presented.
NTIS
Light Sources; X Ray Spectroscopy

20050071639 Stanford Linear Accelerator Center, CA, USA, Institute of Space and Astronautical Science, Sagamihara, Japan, Tokyo Univ., Japan, Tokyo Inst. of Tech., Tokyo, Japan
Evolution of the Synchrotron Spectrum in MRK 421 During the 1998 Campaign
Tanihata, C.; Kataoka, J.; 2002; 16 pp.; In English
Report No.(s): DE2004-826549; SLAC-PUB-10249; No Copyright; Avail: Department of Energy Information Bridge

The uninterrupted 7-day ASCA observations of the TeV blazar Mrk 421 in 1998 have clearly revealed that X-ray flares occur repeatedly. In this paper, we present the results of the time-resolved spectral analysis of the combined data taken by ASCA, RXTE, BeppoSAX, and EUVE. In this object--and in many other TeV blazars--the precise measurement of the shape of the X-ray spectrum, which reflects the high energy portion of the synchrotron component, is crucial in determining the high energy cutoff of the accelerated electrons in the jet. Thanks to the simultaneous broadband coverage, we measured the 0.1-25 keV spectrum resolved on time scales as short as several hours, providing a great opportunity to investigate the detailed spectral evolution at the flares.
NTIS
Electrons; Synchrotrons; Spectrum Analysis

20050071647 Stanford Linear Accelerator Center, CA, USA
QCD Physics Opportunities in Low-Energy Electron-Positron Annihilation
Brodsky, S. J.; Nov. 2003; In English
Report No.(s): DE2004-826550; SLAC-PUB-10250; No Copyright; Avail: National Technical Information Service (NTIS)

The author surveys a number of interesting tests of quantum chromodynamics at the amplitude level which can be carried out in electron-positron annihilation and in photon-photon collisions at low energy. Some of the tests require e(sup +)e(sup -) center of mass energy as small as (radical)s = 2 GeV. Other tests which involve a spectrum of energies can be carried out advantageously at high energy facilities using the radiative return method. These include measurements of fundamental processes such as timelike form factors and transition amplitudes, timelike Compton scattering, timelike photon to meson transition amplitudes, and two-photon exclusive processes. Many of these reactions test basic principles of QCD such as hadronization at the amplitude level, factorization, and hadron helicity conservation, tools also used in the analysis of exclusive B and D decays. Measurements of the final-state polarization in hadron pair production determine the relative phase of the timelike form factors and thus strongly discriminate between analytic forms of models which fit the form factors in the space=like region.
NTIS
Collisions; Compton Effect; Hadrons; Mathematical Models; Pair Production; Quantum Chromodynamics

20050071649 Stanford Linear Accelerator Center, CA, USA
Search for B Decays into K(sup0) overbar K(sup0)
Sep. 2001; 18 pp.; In English
Report No.(s): DE2004-826707; SLAC-PUB-8978; No Copyright; Avail: Department of Energy Information Bridge

We present preliminary results of a search for B(sup 0) (yields) K(sup 0)(bar K)(sup 0) decays in the K(sub s)(sup 0)K(sub s)(sup 0) final state using a sample of approximately 23 million B(bar B) pairs collected by the BABAR detector at the PEP-II asymmetric B Factory at SLAC.
NTIS
Asymmetry; Particle Decay

20050080274 Stanford Univ., Stanford, CA USA
Studies of Electromagnetically Induced Transparency and Its Relation to Nonlinear Optics
Harris, S. E.; Dec. 2004; 20 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0599
Report No.(s): AD-A428921; No Copyright; Avail: CASI; A03, Hardcopy

This report summarizes our work on the use of electromagnetically induced transparency to make new types of optical devices. Key accomplishments during this program period include the generation of the first single-cycle optical pulse and the development of a radiation source with four octaves of bandwidth. In a second area of work we have demonstrated nonlinear optical processes at the lowest photon flux ever used.
DTIC
Nonlinear Optics

20050080343 Tulane Univ., New Orleans, LA USA
Assessment of Foreign Bridge Standards and Techniques
Lamanna, Anthony J.; Lok, Mustafa; Velazquez, Gerardo I.; Ray, James C.; Stanton, Terry R.; Sep. 2004; 131 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429078; ERDC/GSL-TR-04-9; No Copyright; Avail: Defense Technical Information Center (DTIC)

Turkish bridge design standards were studied and compared with American design specifications, with attention focused on the live load. The major difference between the two standards was that the live load in Turkish standards is given in tonnes, whereas, in the American Association of State Highway and Transportation Officials Standard Specifications for Highway Bridges (AASHTO 1996) it is in tons. Therefore, HS20 in Turkish standards is 10 percent heavier than HS20-44. Turkish bridges are currently designed to either HS20 or HS30, the latter being 65 percent heavier than HS20-44. There were some minor differences in other requirements due to conversion from U.S. customary units to metric units. Three types of Turkish bridges were analyzed using a service load approach according to AASHTO (1996) and using a Heavy Equipment Transporter as the live load. Only the primary loads, dead load, live load, and impact load were considered. The analysis did not include any modification for possible deterioration, damage, or aging of the bridges. Four of the tables provide the compressive

strength of concrete used in Turkey, the properties of steel used in Turkey and the USA, bending moment in interior stringers and transverse beams, and shear forces for each member type. (20 tables, 81 figures, 29 refs.)
DTIC
Design Analysis; United States

20050080364 University of Western Michigan, Kalamazoo, MI USA
Experimental and Theoretical Analyses of the Load Sequence Effects on Fatigue Crack Growth Resistance
Kujawski, Daniel; Goswami, Virender; Dec. 2004; 160 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0952
Report No.(s): AD-A429107; No Copyright; Avail: CASI; A08, Hardcopy

Modeling of the fatigue crack propagation based on damage accumulation process ahead of the crack tip has been developed, which utilizes stress and strain distribution ahead of the crack tip, estimated using Rice and elastic solutions. The methodology is based on the use of both Kmax and DK as contributing parameters to the driving force and damage accumulation. Weight function approach has been adopted to determine the Kres profile. Load interaction and overload effects have been modeled by the effect of Kres on the Kmax and DK. The predictions of the present approach have been compared to experimental data and reasonable agreement has been found.
DTIC
Crack Propagation; Damage; Fatigue (Materials); Fracture Strength; Loads (Forces)

20050080418 Oregon State Univ., Corvallis, OR USA
Turbulent and Mesoscale Flow in Stable Conditions
Mahrt, Larry; Jun. 2002; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0249
Report No.(s): AD-A429211; ARO-39781.2-EV; No Copyright; Avail: Defense Technical Information Center (DTIC)

The structure of the nocturnal boundary layer has been examined using seven levels of eddy correlation data on the main tower in CASES99 data. Turbulence generated above the nocturnal surface layer and below the nocturnal jet intermittently bursts downward toward the surface This flow regime cannot be properly modeled within existing formulations. A z-less formulation of the transport is combined with a traditional model to improve simulation of these conditions. The relationship between advection of turbulence and local shear-generation of turbulence is examined using the network of eddy correlation stations in CASES99. Advection of turbulent patches significantly influences the relationship between turbulence and shear as viewed using a single tower.
DTIC
Boundary Layers; Eddy Currents; Mesoscale Phenomena; Turbulent Flow

20050080420 Iowa Univ., Iowa City, IA USA
Optimal Subband Coding of Cyclostationary Signals
Dasgupta, Soura; Sep. 2003; 156 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0534
Report No.(s): AD-A429213; ARO-39188.1-CL; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of the award was to study the subband coding of cyclostationary signals. We have completely solved the problem of subband coding with uniform filter banks. We have also shown that our approach applies also to optimization of Discrete Multitone Transmission Systems. In the coming year we shall address the issue of nonuniform filter banks.
DTIC
Signal Encoding; Transmission Lines

20050080443 Delaware Univ., Newark, DE USA
Integrated Wide-Band Millimeter Wave Imaging System
Prather, Dennis W.; Dec. 2004; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0758
Report No.(s): AD-A429349; ELEG332143-122204; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this project, we developed and demonstrated the design, fabrication, and experimental characterization of a millimeter wave imaging system. To achieve these goals we employed our electromagnetic modeling expertise to design and refine the system specifications. A novel two-element all-diffractive millimeter wave imaging system has been implemented to

significantly reduce the overall size and weight of the system while maintaining mission criteria. We also set up a new and dedicated mmW characterization and testing system. The new test platform with a capability of 3D vector-based near field scanning allows us to fully characterize and simulate mmW radiation. Based on this testing system, the in-house fabricated diffractive mmW lens has been characterized and shown to have diffraction limited performance, which results in a demonstrated capability for mmW imaging. In addition, we investigated two broadband frequency-independent antennas: conical and planar spiral antennas, which offer possible integration into the mmW imaging system. Detailed achievements and progress made during the course of this effort are presented in this report.
DTIC
Broadband; Diffraction; Electromagnetic Radiation; Image Processing; Microwave Imagery; Millimeter Waves

20050080444 Naval Surface Warfare Center, Bethesda, MD USA
Wave Impact Analysis and Results Obtained from a Segmented Model of the High-Speed Sealift Trimaran Model 5594
Simone, Christina; Brady, Thomas F.; Jun. 2004; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A429350; NSWCCD-65-TR-2003/05; No Copyright; Avail: Defense Technical Information Center (DTIC)

Hydrodynamic loads testing was completed on a segmented, high-speed sealift (HSS) trimaran model, number 5594, having a scaled ratio 1:45. The model was comprised of six shell sections connected using a calibrated backspline with instrumentation to measure primary and secondary hull girder loading. This test was an evaluation by the Navy of a notional structural design for a lightweight high-speed hull form in support of the High Speed Sealift Program. Irregular wave experiments have been completed to evaluate primary and secondary structural loads and seakeeping performance. This report documents the secondary structural loads data analysis for the irregular wave test series. Model testing was performed at the NSWC Harold Saunders Maneuvering and Seakeeping (MASK) facility in June 2002 and ended with irregular wave testing in July 2002 on Carriage 2 of the David Taylor Model Basin. Maximum wave impact pressures from eight hull girder shell locations ranged from 13 psi to 64 psi. The foredeck green sea loading events ranged from 42 to 195 psi in Sea State 5 at 45 knots. The utility of these results will be realized through comparisons and validations of analytically based secondary load computations.
DTIC
High Speed; Hydrodynamics; Segments; Ship Hulls

71
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*.

20050071534 NASA Langley Research Center, Hampton, VA, USA
Dynamic Response of X-37 Hot Structure Control Surfaces Exposed to Controlled Reverberant Acoustic Excitation
Grosveld, Ferdinand W.; Rizzi, Stephen A.; Rice, Chad E.; December 14, 2004; 67 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 23-761-90-9K
Report No.(s): NASA/TM-2005-213519; No Copyright; Avail: CASI; A04, Hardcopy

This document represents a compilation of three informal reports from reverberant acoustic tests performed on X-37 hot structure control surfaces in the NASA Langley Research Center Structural Acoustics Loads and Transmission (SALT) facility. The first test was performed on a carbon-silicone carbide flaperon subcomponent on February 24, 2004. The second test was performed on a carbon-carbon ruddervator subcomponent on May 27, 2004. The third test was performed on a carbon-carbon flaperon subcomponent on June 30, 2004.
Author
Dynamic Response; X-37 Vehicle; Acoustic Excitation; Control Surfaces; Reverberation Chambers; Hot Surfaces; Control Systems Design

20050080284 Army Construction Engineering Research Lab., Champaign, IL USA
Sound Propagation Through a Forest: A Predictive Model
White, Michael J.; Swearingen, Michelle E.; Nov. 2004; 22 pp.; In English
Report No.(s): AD-A428938; ERDC/CERL MP-04-3; No Copyright; Avail: CASI; A03, Hardcopy

Previous attempts at modeling sound propagation through a forest have largely neglected the effects of a sound speed

profile. This paper presents a PE-based sound propagation model that includes forest effects. In addition to a simplified but realistic sound speed profile, the model includes ground impedance effects, bulk attenuation due to multiple scattering by tree trunks and canopy, and the usual spherical spreading and atmospheric absorption.
DTIC
Acoustic Velocity; Forests; Prediction Analysis Techniques; Predictions; Sound Propagation; Sound Transmission

20050080378 Woods Hole Oceanographic Inst., MA USA
Surface Wave Focusing and Acoustic Communications in the Surf Zone
Preisig, James C.; Deane, Grant B.; Oct. 2004; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0048; N00014-96-1-0120
Report No.(s): AD-A429129; WHOI-CONTRIB-11018; No Copyright; Avail: Defense Technical Information Center (DTIC)

The forward scattering of acoustic signals off of shoaling surface gravity waves in the surf zone results in a time-varying channel impulse response that is characterized by intense, rapidly fluctuating arrivals. In some cases, the acoustic focusing by the curvature of the wave crest results in the formation of caustics at or near a receiver location. This focusing and the resulting caustics present challenges to the reliable operation of phase coherent underwater acoustic communications systems that must implicitly or explicitly track the fluctuations in the impulse response. The propagation physics leading to focusing are studied with both experimental data and a propagation model using surface wave profiles measured during the collection of the experimental data. The deterministic experimental and modeled data show good agreement and demonstrate the stages of the focusing event and the impact of the high intensity arrivals and rapid fluctuations on the ability of an algorithm to accurately estimate the impulse response. The statistical characterization of experimental data shows that the focusing by surface gravity waves results in focused surface reflected arrivals whose intensity often exceeds that of the direct arrival. The focusing and caustic formation adversely impacts the performance of an impulse response estimation algorithm. (16 figures, 15 refs.)
DTIC
Acoustics; Communication; Focusing; Forward Scattering; Gravity Waves; Signal Transmission; Sound Transmission; Sound Waves; Surface Waves

20050080423 Science Applications International Corp., San Diego, CA USA
Analysis of Russian Hydroacoustic Data
Eneva, Mariana; Stevens, Jeffry L.; Murphy, John; Nov. 2004; 190 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DSWA01-97-C-0166
Report No.(s): AD-A429219; MTSD-DTR-00-16641; DTRA-TR-01-19; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this project is to better understand the coupling of energy from explosions near the water surface. The Institute of Dynamics of the Geospheres (ITG) has provided unique historical hydroacoustic data from Russian archives, featuring various combinations of depths of explosion. and distances and depths of recording. We analyze and model peak pressure measurements and hydrophone records from two underwater and one above-water nuclear explosions in Novaya Zemlya, as well as digitized data set from 1OO-kg TNT explosions in a reservoir. Observations are compared with theoretical estimates of pressure coupling coefficients (EM-I manual). REFMS software predictions of shock waves from underwater explosions, and LLNL modeling results.
DTIC
Underwater Acoustics; Underwater Explosions

20050080678 General Electric Aircraft Engines, Cincinnati, OH, USA
Acoustic and Aero-Mixing Experimental Results for Fluid Shield Scale Model Nozzles
Salikuddin, M.; Mengle, V. G.; Shin, H. W.; Majjigi, R. K.; February 2005; 632 pp.; In English
Contract(s)/Grant(s): NAS3-25951; WBS-22-714-09-46
Report No.(s): NASA/CR-2005-213213; E-14721; No Copyright; Avail: CASI; A99, Hardcopy

The principle objectives of this investigation are to evaluate the acoustic and aerodynamic characteristics of fluid shield nozzle concept and to assess Far 36, Stage 3 potential for fluid shield nozzle with Flade Cycle. Acoustic data for nine scale model nozzle configurations are obtained. The effects of simulated flight and geometric and aerothermodynamic flow variables on the acoustic behavior of the fluid shield are determined. The acoustic tests are aimed at studying the effect of: (1) shield thickness, (2) wrap angle, (3) mass flow and velocity ratios between shield and core streams at constant cycle specific thrust (i.e., mixed velocity), (4) porous plug, and (5) subsonic shield. Shadowgraphs of six nozzle configurations are obtained to

understand the plume flowfield features. Static pressure data on suppressor chutes in the core stream (shielded and unshielded) sides and on plug surface are acquired to determine the impact of fluid shield on base drag of the 36-chute suppressor nozzle and the thrust augmentation due to the plug, respectively.
Author
Acoustic Properties; Aerodynamic Characteristics; Aerodynamic Drag; Nozzle Geometry; Mass Flow Rate

20050080705 NASA Glenn Research Center, Cleveland, OH, USA
Flow Measurements and Multiple Pure Tone Noise From a Forward Swept Fan
Weir, Donald S.; Podboy, Gary G.; February 2005; 20 pp.; In English; 43rd AIAA Aerospace Sciences Meeting, 10-13 Jan. 2005, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 22-781-30-10
Report No.(s): NASA/TM-2005-213413; AIAA Paper 2005-1200; E-14931; No Copyright; Avail: CASI; A03, Hardcopy

A forward-swept fan, designated the Quiet High Speed Fan (QHSF), was tested in the NASA Glenn 9- by 15-foot Low Speed Wind Tunnel to investigate its noise reduction relative to a baseline fan of the same aerodynamic performance. The objective of the Quiet High Speed Fan was a 6-dB reduction in the Effective Perceived Noise Level relative to the baseline fan at the takeoff condition. The intent of the Quiet High Speed Fan design was to provide both a multiple pure tone noise reduction from the forward sweep of the fan rotor and a rotor-stator interaction blade passing tone noise reduction from a leaned stator. The tunnel noise data indicted that the Quiet High Speed Fan was quieter than the baseline fan for a significant portion of the operating line and was 6 dB quieter near the takeoff condition. Although reductions in the multiple pure tones were observed, the vast majority of the EPNdB reduction was a result of the reduction in the blade passing tone and its harmonics. Laser Doppler Velocimetry (LDV) and shroud unsteady pressure measurement data were obtained upstream of the QHSF and baseline rotors to improve the understanding of the shocks which propagate upstream of the two fans when they are operated at high speeds. The flow phenomena that produce multiple pure tone noise is discussed and compared to measurements of the fan acoustic inlet modes and the far field noise signature of the fan.
Author
Flow Measurement; Low Speed Wind Tunnels; Noise Reduction; Rotors; Turbofan Engines; Aeroacoustics; Swept Forward Wings

20050080744 Physics and Electronics Lab. TNO, The Hague, Netherlands
Losses due to Rough Surface Scattering and Wind-Generated Bubble Clouds
Ainslie, M. A.; June 2004; 91 pp.; In English
Contract(s)/Grant(s): TNO Proj. 015.31986
Report No.(s): TD-2004-0132; FEL-04-A066; Copyright; Avail: Other Sources

It is known that different low frequency active sonar (LFAS) sonar performance models, and therefore any tactical aid based on these models, sometimes make different predictions for nominally the same scenario. The discrepancies are believed to arise from different approximate treatments of sea surface interactions. The effect of wind on long range propagation is quantified, due to rough surface scattering and interaction with wind-generated bubbles. The effects of bubbles and rough surface scattering are found to be small when treated separately, but the combined effect is greater than the sum of the parts. It is shown that the action of the bubbles is to enhance the rough surface scattering by means of a lens action, and that without this enhancement the propagation loss is seriously underestimated.
Author
Acoustic Scattering; Underwater Acoustics; Sonar; Losses; Sea Roughness; Bubbles

72
ATOMIC AND MOLECULAR PHYSICS

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

20050061120 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Photodetachment of He(sup -)1s2s2p(sup 4)P(sup 0) in the Region of the 1s Threshold
Zatsarinny, O.; Gorczyca, T. W.; Fischer, C. Froese; Journal of Physics B; 2002; Volume 35, No. 4161; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources

No abstract available
Helium Atoms; Photodetachment

20050061124 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Superelastic Scattering of Electrons from Metastable He-like C4+ and O6+ Ions
Naser, A. S. Al; Landers, A. L.; Knutson, H.; Pole, D. J.; Hossain, S.; Haija, O. A.; Gorczyca, T. W.; Tanis, J. A.; Physical Review A; 2002; Volume 65; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-042709; Copyright; Avail: Other Sources
No abstract available
Elastic Scattering; Electron Scattering; Metastable State; Carbon; Oxygen Ions

20050061136 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Importance of Spin-Orbit Interactions for the He 2lnl' States Revealed by a Novel Use of Angle-Resolved Photoelectron Spectroscopy
Wills, A. A.; Sokell, E.; Gorczyca, T. W.; Feng, X.; Wiedenhoeft, M.; Canton, S. E.; Berrah, N.; J. Phys.; 2003; Volume B 35, No. L367; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Photoelectron Spectroscopy; Spin-Orbit Interactions; Helium Atoms; Atomic Energy Levels

20050061138 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Isoelectronic Study of Triply Excited Li-like States
Benis, E. P.; Zouros, T. J. M.; Gorczyca, T. W.; Zamkov, M.; Richard, P.; Journal of Physics B; 2003; Volume 36, pp. L341; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Isoelectronic Sequence; Atomic Excitations

20050061141 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Post-Collision Recapture in the K-Shell Photodetachment of Li(sup -)
Gorczyca, T. W.; Zatsarinny, O.; Zhou, H.-L.; Manson, S. T.; Felfli, Z.; Msezane, A. Z.; Physical Review A; 2003; Volume 68; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-050703(R); Copyright; Avail: Other Sources
No abstract available
Photodetachment; Lithium; Electron-Ion Recombination

20050061144 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Elastic Resonant and Non-Resonant Differential Scattering of Quasifree Electrons from B(sup 4+)(1s) and B(sup 3+)(1s(sup 2)) Ions
Benis, E. P.; Zouros, T. J. M.; Gorczyca, T. W.; Gonzalez, A. D.; Richard, P.; Physical Review A; 2004; Volume 69; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-052718; Copyright; Avail: Other Sources
No abstract available
Electron Scattering; Elastic Scattering; Boron; Ions

20050061145 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Large-Angle Elastic Resonant and Non-Resonant Scattering of Electrons by B(sup 3+)(1s(sup 2)) and B(sup 4+)(1s) Ions: Comparison of Experiment and Theory
Zouros, T. J. M.; Benis, E. P.; Gorczyca, T. W.; Phys. Rev.; 2003; Volume A 68; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-010701(R); Copyright; Avail: Other Sources
No abstract available
Electron Scattering; Elastic Scattering; Boron; Ions

20050080315 Washington State Univ., Pullman, WA USA

Ion Mobility Measurements in Organic Phases

Hill, Herbert H., Jr.; Aug. 2003; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-1-0350

Report No.(s): AD-A429001; ARO-44393.1-CH-11; No Copyright; Avail: Defense Technical Information Center (DTIC)

Liquid phase ion mobility spectrometry (LPIMS) is a novel analytical technique where ions are separated by electric field in a liquid medium. The electric field is established via a series of electrodes spaced evenly through the ion drift tube, similar to the drift tube design used in gas-phase IMS. Because no electrolyte is used in LPIMS, the method is a low current (i.e. low noise) method in which the current is carried by the ions produced in the ionization source. This report documented the first LPIMS spectra of aqueous samples drifting through an organic liquid phase. LPIMS spectra of aqueous ammonium nitrate and aqueous sodium chloride solutions were obtained using two different LPIMS designs. A single peak was observed for sodium ion with a reduced mobility Ko, of 5.3 x lO(-4) V(-1) s(-1), which is similar to the expected value of 5.7 x 10(-4) cm2 V(-1) s(-1).

DTIC

Ions; Mobility; Spectrometers

20050080425 Rochester Univ., NY USA

The Role of Ultrafast Shaped Pulses in Classical and Quantum Optics

Walmsley, Ian A.; Anderson, Matthew; Banaszek, Konrad; Erdmann, Reinhardt; U'Ren, Alfred; May 2003; 5 pp.; In English

Contract(s)/Grant(s): DAAG55-98-1-0447

Report No.(s): AD-A429221; ARO-38782.1-PH; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents the results of studies of the generation and characterization of Electron Paramagnetic Resonance (EPR) and the entangled bi-photon state using optical parametric downconversion (PDC) with ultrashort-duration pump pulses. The authors have advanced a method of generating photon pairs that are highly entangled in their continuous space-time degree of freedom and have developed theoretical tools for quantifying the degree of entanglement for this and other continuum-variable systems. In addition, they have shown for the first time the violation of a Bell-type inequality for the EPR state generated in parametric downconversion. The studies also show, theoretically, that it is possible to design sources such that the photon entanglement causes complete nonlocal cancellation of dispersion of arbitrary order, and demonstrate the increase in visibility using properly mode-matched photons. In addition, the authors have analyzed the effects of nonmeasured degrees of freedom of photons generated by PDC on the basic elements of linear optical quantum logic gates, such as a prototypical Bell-state analyzer. The results have implications for novel methods of quantum communications using both entangled and unentangled modes and photons. A list of 13 related manuscripts is included.

DTIC

Electron Paramagnetic Resonance; Photons; Quantum Optics; Wave Packets

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*.

20050061224 Technische Univ., Hanover, Germany, Babcock Noell Nuclear G.m.b.H., Wurzburg, Germany

Calculation of the Activity Inventory for the Triga Reactor at the Medical University of Hannover (MHH) in Preparation for Dismantling the Facility

Hampel, G.; Scheller, F.; Bernnat, W.; Pfister, G.; Kluas, U.; 2002; In English

Report No.(s): DE2004-828265; No Copyright; Avail: National Technical Information Service (NTIS)

It is planned to dismantle the TRIGA reactor facility at the Medical University of Hannover (MHH). Radioactive waste resulting from this dismantling will be disposed of externally, any remaining materials as well as the building structures will then be measured to ensure there is no residual activity. In preparation for this and to plan the techniques which will be used to dismantle the reactor, calculations were made in order to determine the amount of activity and the dose rates for the reactor tank and its inside components as well as for the biological shield and its radial beam tube.

NTIS

Nuclear Reactors; Dosage

20050070559

An Algorithm for the Transport of Anisotropic Neutrons

Tweed, J.; [2005]; 34 pp.; In English

Contract(s)/Grant(s): NCC1-396; No Copyright; Avail: CASI; A03, Hardcopy

One major obstacle to human space exploration is the possible limitations imposed by the adverse effect of long-term exposure to the space environment. Even before human spaceflight began, the potentially brief exposure of astronauts to the very intense random solar particle events (SPE) were of great concern. A new challenge appears in deep space exploration from exposure to the low-intensity heavy-ion flux of the galactic cosmic rays (GCR) since the missions are of long duration and the accumulated GCR exposures can be high. Because cancer induction rates increase behind low to rather large thicknesses of aluminum shielding, according to available biological data on mammalian exposures to GCR like ions, the shield requirements for a Mars mission are prohibitively expensive in terms of mission launch costs. Therefore, a critical issue in the Human Exploration and Development of Space enterprise is cost effective mitigation of risk associated with ionizing radiation exposure. In order to estimate astronaut risk to GCR exposure and associated cancer risks and health hazards, it is necessary to do shield material studies. To determine an optimum radiation shield material it is necessary to understand nuclear interaction processes such as fragmentation and secondary particle production which is a function of energy dependent cross sections. This requires knowledge of material transmission characteristics either through laboratory testing or improved theoretical modeling. Here ion beam transport theory is of importance in that testing of materials in the laboratory environment generated by particle accelerators is a necessary step in materials development and evaluation for space use. The approximations used in solving the Boltzmann transport equation for the space setting are often not sufficient for laboratory work and those issues are a major emphasis of the present work.

Derived from text

Algorithms; Mathematical Models; Transport Theory; Anisotropy; Neutrons

74
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*.

20050061313 Electric Power Research Inst., Palo Alto, CA, USA

Multi-Photon Phosphor Feasibility Research

2002; In English

Report No.(s): DE2004-825548; No Copyright; Avail: National Technical Information Service (NTIS)

Development of multi-photon phosphor materials for discharge lamps represents a goal that would achieve up to a doubling of discharge (fluorescent) lamp efficacy. This report reviews the existing literature on multi-photon phosphors, identifies obstacles in developing such phosphors, and recommends directions for future research to address these obstacles. To critically examine issues involved in developing a multi-photon phosphor, the project brought together a team of experts from universities, national laboratories, and an industrial lamp manufacturer.

NTIS

Phosphors; Luminaires; Fluorescence; Feasibility Analysis

20050071569 Stanford Linear Accelerator Center, CA, USA, Brookhaven National Lab., Upton, NY, USA

X-ray Production by Cascading Stages of a High-Gain Harmonic Generation Free-Electron Laser I: Basic Theory

Wu, J.; Yu, L. H.; Jun. 2004; 28 pp.; In English

Report No.(s): DE2004-827312; SLAC-PUB-10494; No Copyright; Avail: Department of Energy Information Bridge

We present the calculation on the performance of a High Gain Harmonic Generation (HGHG) X-ray Free Electron Laser (FEL) based on the high quality electron beam from the proposed Photoinjected Energy Recovery Linac (PERL) at the NSLS. We consider several sets of e-beam parameters. The calculation indicates that it is possible to produce a fully coherent FEL with a wavelength around 10 Angstrom, with a peak power of several GW. The high order harmonics will also be produced with a significant amount of peak power. One further attractive feature is the possibility to produce ultra short radiation pulses of about 10 fs based on such HGHG scheme.

NTIS

Free Electron Lasers; Electron Beams

20050071573 Swedish Defence Research Establishment, Linkoeping
CEPA8 JP8.11 Laserstralstyrning Systemstudie (CEPA8 JP8. 11 Laser Beam Steering System Study)
Sjoeqvist, L.; Steinvall, O.; Mar. 2004; In English
Report No.(s): PB2005-101247; FOI-R-1235-SE; No Copyright; Avail: National Technical Information Service (NTIS)

This report contains a system study related to a CEPA8 collaborative six nation project on 'Laser Beam Steering.' The main objectives of the study were to identify potential benefits of using innovative beam steering and aberration correction techniques (adaptive optics) in a beam director for a DIRCM system. The study addresses issues such as scenarios, influence of perturbations, significant performance parameters, and figure of merits, different architectures and performance calculations. Interactions between subsystems and components are also discussed. The outputs from the study contain a discussion on critical technical issues and possible performance improvements with implementation of adaptive optics. In addition to the DIRCM application air-to-ground targeting is briefly discussed.
NTIS
Laser Beams; Beam Steering; Adaptive Optics

75
PLASMA PHYSICS

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

20050061119 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination (via N=2-\gN'=2 Core Excitations) and Radiative Recombination of Fe XX: Laboratory Measurements and Theoretical Calculations
Savin, D. W.; Behar, E.; Kahn, S. M.; Gwinner, G.; Saghiri, A. A.; Schmitt, M.; Grieser, M.; Repnow, R.; Schwalm, D.; Wolf, A., et al.; Astrophysical Journal; 2002; Volume 138, pp. 337; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources

No abstract available
Radiative Recombination; Iron

20050061140 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination Data for Dynamic Finite-Density Plasmas, 2, The Oxygen Isoelectronic Sequence
Zatsarinny, O.; Gorczyca, T. W.; Korista, K. T.; Badnell, N. R.; Savin, D. W.; Oxygen Iselectronic Sequence, Astronomy and Astrophysics; 2003; Volume 412, pp. 587; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources

No abstract available
Electron-Ion Recombination; Isoelectronic Sequence; Oxygen Atoms; Plasmas (Physics)

20050061152 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination Data for Dynamic Finite-Density Plasmas. III. The Carbon Isoelectronic Sequence, III, The Carbon Isoelectronic Sequence
Zatsarinny, O.; Gorczyca, T. W.; Korista, K. T.; Badnell, N. R.; Savin, D. W.; Astronomy and Astrophysics; 2004; Volume 417, No. 1173; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources

No abstract available
Electron-Ion Recombination; Plasmas (Physics); Carbon; Isoelectronic Sequence

20050061223 Princeton Univ., NJ
Initial Operation of the NSTX Fast Tangential Soft X-Ray Camera
Stratton, B. C.; Feder, R.; von Goeler, S.; Renda, G. F.; Lowrance, J. L.; May 2004; 20 pp.; In English
Report No.(s): DE2004-827939; PPPL-3952; No Copyright; Avail: Department of Energy Information Bridge

Fast, two-dimensional, soft x-ray imaging is a powerful technique for the study of MHD instabilities in tokamak plasmas. We have constructed an ultra-fast frame rate soft x-ray camera for the National Spherical Torus Experiment. It is based on a recently developed 64 x 64 pixel CCD camera capable of capturing 300 frames at up to 500,000 frames per second. A pinhole aperture images the plasma soft x-ray emission (0.2-10 keV) onto a P47 scintillator deposited on a fiber-optic faceplate; the

scintillator visible light output is detected and amplified by a demagnifying image intensifier and lens-coupled to the CCD chip. A selection of beryllium foils provides discrimination of low-energy emission. The system is installed on NSTX with a wide-angle tangential view of the plasma. Initial plasma data and an assessment of the system performance are presented.
NTIS
CCD Cameras; X Ray Imagery; Magnetohydrodynamic Stability; Emission Spectra

20050061231 Princeton Univ., NJ
Simultaneous Microwave Imaging System for Density and Temperature Fluctuation Measurements on TEXTOR
Park, H.; Mazzucato, E.; Munsat, T.; Domier, C. W.; Johnson, M.; May 2004; In English
Report No.(s): DE2004-827935; PPPL-3951; No Copyright; Avail: National Technical Information Service (NTIS)

Diagnostic systems for fluctuation measurements in plasmas have, of necessity, evolved from simple 1-D systems to multi-dimensional systems due to the complexity of the MHD and turbulence physics of plasmas illustrated by advanced numerical simulations. Using the recent significant advancements in millimeter wave imaging technology, Microwave Imaging Reflectometry (MIR) and Electron Cyclotron Emission Imaging (ECEI), simultaneously measuring density and temperature fluctuations, are developed for TEXTOR. The MIR system was installed on TEXTOR and the first experiment was performed in September, 2003. Subsequent MIR campaigns have yielded poloidally resolved spectra and assessments of poloidal velocity.
NTIS
Microwave Imagery; Temperature Measurement; Density Measurement

20050061252 Princeton Univ., NJ
Optimized Loading for Particle-in-Cell Gyrokinetic Simulations
Lewandowski, J. L. V.; May 2004; 34 pp.; In English
Report No.(s): DE2004-827943; PPPL-3956; No Copyright; Avail: Department of Energy Information Bridge

The problem of particle loading in particle-in-cell gyrokinetic simulations is addressed using a quadratic optimization algorithm. Optimized loading in conguration space dramatically reduces the short wavelength modes in the electrostatic potential that are partly responsible for the nonconservation of total energy; further, the long wavelength modes are resolved with good accuracy. As a result, the conservation of energy for the optimized loading is much better that the conservation of energy for the random loading. The method is valid for any geometry and can be coupled to optimization algorithms in velocity space.
NTIS
Kinetic Equations; Simulation; Electrostatics; Energy Conservation

20050061263 Department of Energy, Washington, DC
Scientific Report (2002-2004): Studies of the Nonlinear Interactions between Optical Mixing-Controlled Stimulated Scattering Instabilities in Laser-Produced Plasmas
2004; In English
Report No.(s): DE2004-825213; No Copyright; Avail: National Technical Information Service (NTIS)

OAK-B135 An overview of our work as well as two recent publications are contained in this scientific report. The work reported here revolves around the discovery of new coherent nonlinear kinetic waves in laser produced plasmas, we call KEEN waves (kinetic, electrostatic electron nonlinear waves), and optical mixing experiments on the Imega laser system at LLE with blue-green light for the exploration of ways to suppress parametric instabilities in long scale length, long pulse width laser-plasmas such as those which will be found on NIF or LMJ.
NTIS
Laser Plasmas; Electrostatic Waves

20050061307 Princeton Univ., NJ
Study of Magnetohydrodynamic Surface Waves on Liquid Gallium
Ji, H.; Fox, W.; Pace, D.; Rappaport, H. L.; May 2004; 40 pp.; In English
Report No.(s): DE2004-827940; PPPL-3953; No Copyright; Avail: Department of Energy Information Bridge

Magnetohydrodynamic (MHD) surface waves on liquid gallium are studied theoretically and experimentally in the small magnetic Reynolds number limit. A linear dispersion relation is derived when a horizontal magnetic field and a horizontal electric current is imposed. No wave damping is found in the shallow liquid limit while waves always damp in the deep liquid

limit with a magnetic field parallel to the propagation direction. When the magnetic field is weak, waves are weaklyected, while in the opposite limit waves are strongly damped with shortened wavelengths. In a table-top experiment, planar MHD surface waves on liquid gallium are studied in detail in the regime of weak magnetic field and deep liquid. A non-invasive diagnostic accurately measures surface waves at multiple locations by reflecting the surface onto a screen, which is recorded by an Intensified-CCD camera. The measured dispersion relation is consistent with the linear theory with a reduced surface tension likely due to surface oxidation.
NTIS
Magnetohydrodynamic Waves; Liquid Surfaces; Gallium

20050061315 Princeton Univ., NJ
Development of the Megahertz Planar Laser-Induced Fluorescence Diagnostic for Plasma Turbulence Visualization
Kuritsyn, A.; Levinton, F. M.; Apr. 2004; In English
Report No.(s): DE2004-827928; PPPL-3948; No Copyright; Avail: National Technical Information Service (NTIS)

A megahertz LIF-based diagnostic system for measuring ion density fluctuations in two spatial dimensions is described. Well resolved spatial and temporal 2D images of turbulent structures will be useful in understanding ion turbulence in magnetically confined plasmas which is a key factor in the performance of fusion experimental devices. A sheet beam of a megahertz repetition rate tunable Alexandrite laser is used to excite ion emission from argon plasma. The fluorescence emitted from the plane of the laser beam is detected with a narrow band interference filter and intensified ultra-fast CCD camera providing 2D images of relative ion density fluctuations every microsecond. It is expected that the edge plasma on fusion devices will be accessible to this technique.
NTIS
Plasma Turbulence; Ion Density (Concentration); Plasma Control

20050071626 Princeton Univ., NJ
Phenomenology of Compressional Alfven Eigenmodes
Fredrickson, E. D.; Gorelenkov, N. N.; Menard, J.; May 2004; In English
Report No.(s): DE2004-827942; PPPL-3955; No Copyright; Avail: National Technical Information Service (NTIS)

Coherent oscillations with frequency 0.3 (le0) (omega)/(omega)(sub ci) (le) 1, are seen in the National Spherical Torus Experiment (M. Ono, S.M. Kaye, Y-K.M. Peng, et al., Nucl. Fusion 40, 557 (2000)). This paper presents new data and analysis comparing characteristics of the observed modes to the model of compressional Alfven eigenmodes (CAE). The toroidal mode number has been measured and is typically between 7 \h n \h 9. The polarization of the modes, measured using an array of four Mirnov coils, is found to be compressional. The frequency scaling of the modes agrees with the predictions of a numerical 2-D code, but the detailed structure of the spectrum is not captured with the simple model. The fast ion distribution function, as calculated with the beam deposition code in TRANSP (R.V. Budny, Nucl. Fusion 34, 1247 (1994)), is shown to be qualitatively consistent with the constraints of the Doppler-shifted cyclotron resonance drive model. This model also predicts the observed scaling of the low frequency limit for CAE.
NTIS
Cyclotron Resonance; Distribution Functions

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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*.

20050070719 Alabama Univ., Huntsville, AL, USA
Dissipating Step Bunches during Crystallization under Transport Control
Lin, Hong; Yau, S.-T.; Vekilov, Peter, G.; Physical Review E (Statistical, Nonlinear, and Soft Matter Physics); March 25, 2003; Volume 67; 8 pp.; In English
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources

In studies of crystal formation by the generation and spreading of layers, equidistant step trains are considered unstable---bunches and other spatiotemporal patterns of the growth steps are viewed as ubiquitous. We provide an example to the opposite. We monitor the spatiotemporal dynamics of steps and the resulting step patterns during crystallization of the proteins ferritin and apoferritin using the atomic force microscope. The variations in step velocity and density are not

correlated, indicating the lack of a long-range attraction between the steps. We show that (i) because of its coupling to bulk transport, nucleation of new layers is chaotic and occurs at the facet edges, where the interfacial supersaturation is higher; (ii) step bunches self-organize via the competition for supply from the solution; and, (iii) bunches of weakly interacting steps decay as they move along the face. Tests by numerical modeling support the conclusions about the mechanisms underlying our observations. The results from these systems suggest that during crystallization controlled by transport, with weakly or noninteracting growth steps, the stable kinetic state of the surface is an equidistant step train, and step bunches only arise during nucleation of new layers. Since nucleation only occurs at a few sites on the surface, the surface morphology may be controllably patterned or smoothened by locally controlling nucleation.
Author
Crystallization; Crystal Growth; Nucleation; Crystal Morphology

20050070810 Houston Univ., TX, USA
Phase-Shifting Interferometry for the Study of the Spatio-Temporal Evolution of Crystal-Solution Interfaces
Vekilov, Peter G.; Giliko, O.; [2002]; In English; 2002 Annual Meeting of the American Institute of Chemical Engineers, 3-8 Nov. 2002, Indianapolis, IN, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Interferometry; Crystals; Solutions; Interfaces

20050070844 NASA Marshall Space Flight Center, Huntsville, AL, USA
Diffusion-limited Kinetics of the Solution-solid Phase Transition of Molecular Substances
Petsev, D. N.; Chen, K.; Gliko, O.; Vekilov, P. G.; 2002; In English; 19th Conference on Crystal Growth and Epitaxy, 2-5 Jun. 2002, Fallen Leaf Lake, CA, USA
Contract(s)/Grant(s): NAG8-1854; Copyright; Avail: Other Sources
No abstract available
Diffusion; Kinetics; Phase Transformations; Solid Solutions

20050071549 Stanford Linear Accelerator Center, Stanford, CA, USA
Revisiting e(sup-)e(sup-) Switchover in the NLC Linac
Larsen, R. S.; 2004; In English
Report No.(s): DE2004-826986; SLAC-PUB-10452; No Copyright; Avail: National Technical Information Service (NTIS)
This paper is an extension of a talk given in December 1999 which discussed various options for reconfiguring magnets and power sources to convert the NLC to e(sup -)e(sup -) operation. At that time three different configurations were examined and a Directional Reversal model was recommended in order to avoid the difficulties of polarity reversal with permanent magnets anticipated in the main linac at that time. Since permanent magnets are no longer in the baseline, a Polarity Reversal scheme becomes more attractive.
NTIS
Linear Accelerators; Permanent Magnets; Polarity

20050071567 Stanford Linear Accelerator Center, Stanford, CA, USA, Utah Univ., Salt Lake City, UT, USA
Markov Chain Monte Carlo Exploration of Minimal Supergravity with Implications for Dark Matter
Baltz, E. A.; Gondolo, P.; Jul. 2004; In English
Report No.(s): DE2004-827306; SLAC-PUB-10566; No Copyright; Avail: National Technical Information Service (NTIS)
We explore the full parameter space of Minimal Supergravity (mSUGRA), allowing all four continuous parameters (the scalar mass m(sub 0), the gaugino mass m(sub 1/2), the trilinear coupling A(sub 0), and the ratio of Higgs vacuum expectation values tan (beta)) to vary freely. We apply current accelerator constraints on sparticle and Higgs masses, and on the b (yields) s(gamma) branching ratio, and discuss the impact of the constraints on g(sub (mu))-2. To study dark matter, we apply the WMAP constraint on the cold dark matter density. We develop Markov Chain Monte Carlo (MCMC) techniques to explore the parameter regions consistent with WMAP, finding them to be considerably superior to previously used methods for exploring supersymmetric parameter spaces. Finally, we study the reach of current and future direct detection experiments in light of the WMAP constraint.
NTIS
Supergravity; Particle Accelerators

20050071575 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Determining the Surface and Interface Structure of Nanomaterials
Van Hove, M. A.; 2004; 12 pp.; In English
Report No.(s): DE2004-828770; No Copyright; Avail: Department of Energy Information Bridge

This paper informally speculates on the challenges of determining the atomic-scale surface and interface structure of nanomaterials. The relative capabilities of different techniques are compared. This includes discussion of theoretical methods needed to interpret experimental techniques.

NTIS
Nanostructure (Characteristics); Atomic Structure; Interfaces

20050080415 Massachusetts Inst. of Tech., Lexington, MA USA
Solid State Research
Shaver, David C.; Aug. 2004; 66 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A429207; ESC-TR-2005-052; ESC-TR-2005-052; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report covers in detail the research work of the Solid State Division at Lincoln Laboratory for the period 1 May through 31 July 2004. The topics covered are Quantum Electronics, Electro-optical Materials and Devices, Submicrometer Technology, Biosensor and Molecular Technologies, Advanced Imaging Technology, Analog Device Technology, and Advanced Silicon Technology. Funding is provided by several DoD organizations-including the Air Force, Army, DARPA, MDA, Navy, NSA, and OSD and also by the DOE, NASA, and NIST.

DTIC
Military Technology; Research and Development; Solid State

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*.

20050070951 Tottori Univ., Japan
A Project Based Learning Program Collaborated with Local Enterprise
Kondo, Yasuo; Tanaka, Hisataka; Miyachika, Kouitsu; Akao, Takahiro; Progress of Machining Technology; December 2004, pp. 969-974; In English; See also 20050070885; Copyright; Avail: Other Sources

The Department of Mechanical Engineering of Tottori University has begun to use a Project Based Learning technique for undergraduate student course since 2002. In the PBL program, the second and third grade students work with classmates and incumbent engineers to solve a technical subject offered from a local enterprise. The PBL can give intellectual curiosity, self-initiative and creativity to the students. But good reputations are not sufficient for our PBL program to be successful. It is vital that all participants, students, professors and companies, have to recognize the significance of program and contribute to it.

Author
Education; Industries; Students; Engineers; Engineering; University Program

20050071031 Yonago National Coll. of Technology, Yonago, Japan
Problem-Based Learning Programs Aiming at Practical Application of Knowledge of Specialized Subjects
Yamaguhi, Kenji; Kawazoe, Hisami; Kondo, Yasuo; Sakamoto, Satoshi; Progress of Machining Technology; December 2004, pp. 1001-1006; In English; See also 20050070885; Copyright; Avail: Other Sources

What is the key issue in engineering education is to enhance student's motivation to learn and to improve student's problem-solving skills. The department of mechanical engineering of Yonago national college of technology has been introduced Problem Based Learning programs aiming to obtain the educational effect that cannot be obtained by the lecture only. A specialized curriculum is gradually developed from the acquisition of basic knowledge to the study of higher specialized subjects. Two PBL programs have been additionally introduced to each stage. One is to raise the student's motivation to study for lower-grade class, and the other to apply specialized knowledge practically for upper-grade class. The

educational effects were confirmed by the questionnaire about each PBL. As a result, the PBL programs are effective to the engineer education.
Author
Education; Engineering; Students; Problem Solving; Learning

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20050070870 Covault (Craig), Orlando, FL, USA
Alenia, to the Moon
Covault, Craig; Aviation Week and Space Technology; February 07, 2005; Volume 60, No. 6, pp. 30-32; In English; Copyright; Avail: Other Sources

Northrop Grumman Boeing's proprietary plan to integrate 1taiy,s Alenia into its Crew Exploration Vehicle (CEV) proposal to NASA will give Northrop Grumman and Boeing a European partner to counterbalance EADS teaming with Lockheed Martin to create a shuttle replacement that can also return astronauts to the Moon. This second European participant beyond EADS could also force NASA to face different international cooperative options for exploration as opposed to the blanket approach the agency used to secure European, Canadian and Japanese cooperation for the International Space Station.
Derived from text
International Cooperation; Moon; International Space Station

20050070871 Covault (Craig), Orlando, FL, USA
Coupling Moon/Mars
Covault, Craig; Aviation Week and Space Technology; February 07, 2005; Volume 62, No. 6; 3 pp.; In English; Copyright; Avail: Other Sources

The joint NASA/industry team laying out the new U.S. plan for the future robotic and eventual human exploration of Mars will meet this week to formulate an initial outline of a new Mars-exploration road map. A key tenet of the plan will be to form course that can be closely aligned with similar effort underway for renewed robotic and human exploration of the Moon. The lunar team will meet again in late March.
Derived from text
Robotics; Moon; Mars (Planet)

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*.

20050061219 National Science Foundation, Arlington, VA
Knowledge Lost in Information. Report of the NSF Workshop on Research Directions for Digital Libraries
Jun. 2003; 40 pp.; In English
Report No.(s): PB2005-102543; No Copyright; Avail: CASI; A03, Hardcopy

Digital libraries are transforming research, scholarship, and education at all levels. Vast quantities of information are being collected and stored online, and organized to be accessible to everyone. Substantial improvements in scholarly productivity are already apparent. Digital resources have demonstrated the potential to advance scholarly productivity, easily doubling research output in many fields within the next decade. These resources can also become primary resources for education, holding the potential for advances in lifelong learning that have been sought for many years. But such progress will not be achieved without investment. This report details the nature of the federal investment required to sustain the pace of progress.
NTIS
On-Line Systems; Integrated Library Systems; Education; Digital Techniques

20050061238 Duke Univ., Durham, NC, USA
Evaluation of an Adaptive Patient Data Entry Interface
Lobach, D. F.; 2004; 66 pp.; In English
Report No.(s): PB2005-101337; No Copyright; Avail: CASI; A04, Hardcopy

Background: Past efforts to collect clinical information using computers have had limited utility because they required technical expertise. Objective: To demonstrate the effectiveness of a computer system that uses multimedia and touch screen technology to adapt the human-computer interface to the native language, reading literacy, and computer literacy of the user. Design: Randomized, cross-over controlled trial. Setting: An academic family medicine clinic and an indigent adult medicine clinic. Participants: 705 adult patients. Measurements: Completeness measured as breadth of information collected (fraction of questions answered) and depth of information collected (comparison of questionnaire-collected information to the patients' medical records) and clinician preferences for information supplied by each questionnaire type.

NTIS

Human-Computer Interface; Patients; Adaptive Control; Clinical Medicine; Data Processing

20050061322 Institut National de Recherche d'Informatique et d'Automatique, Sophia Antipolis, France
Querying Semi-Structured Data
Abiteboul, Serge; Jan. 1997; 17 pp.; In English
Contract(s)/Grant(s): F33615-93-1-1339; F306-95-C-0119
Report No.(s): AD-A428473; No Copyright; Avail: CASI; A03, Hardcopy

The amount of data of all kinds available electronically has increased dramatically in recent years. The data resides in different forms, ranging from unstructured data in the systems to highly structured in relational database systems. Data is accessible through a variety of interfaces including Web browsers, database query languages, application-specic interfaces, or data exchange formats. Some of this data is raw data, e.g., images or sound. Some of it has structure even if the structure is often implicit, and not as rigid or regular as that found in standard database systems. Sometimes the structure exists but has to be extracted from the data. Sometimes also it exists but we prefer to ignore it for certain purposes such as browsing. We call here semi-structured data this data that is (from a particular viewpoint) neither raw data nor strictly typed, i.e., not table-oriented as in a relational model or sorted-graph as in object databases. As will seen later when the notion of semi-structured data is more precisely de ned, the need for semi-structured data arises naturally in the context of data integration, even when the data sources are themselves well-structured. Although data integration is an old topic, the need to integrate a wider variety of data- formats (e.g., SGML or ASN.1 data) and data found on the Web has brought the topic of semi-structured data to the forefront of research. The main purpose of the paper is to isolate the essential aspects of semi-structured data. We also survey some proposals of models and query languages for semi-structured data. In particular, we consider recent works at Stanford U. and U. Penn on semi-structured data. In both cases, the motivation is found in the integration of heterogeneous data.

DTIC

Data Management

20050071065 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
Manufacturing Knowledge Management and Implementation in a PDM System
Wang, Yucheng; Qiao, Lihong; Progress of Machining Technology; December 2004, pp. 873-878; In English; See also 20050070885
Contract(s)/Grant(s): 2002AA414410; Copyright; Avail: Other Sources

This paper discusses the concept of manufacturing knowledge and basic issues related to the manufacturing knowledge management and its implementation in PDM systems, including knowledge acquisition, classification and representation. An implementation practice of manufacturing knowledge management based on the research and development on an integrated process planning and management system is introduced in the paper.

Author

Knowledge; Data Management; Industrial Management; Manufacturing

20050071611 Department of Health and Human Services, Washington, DC, USA
Lifetime of Good Health. Your Guide to Staying Healthy
2003; 22 pp.; In English
Report No.(s): PB2005-102631; No Copyright; Avail: CASI; A03, Hardcopy

No abstract available

Information Systems; Females; Health

20050071614 Massachusetts Inst. of Tech., Cambridge, MA, USA, Carnegie-Mellon Univ., Pittsburgh, PA
KDI Initiative: Multidisciplinary Scientific Collaborations
Cummings, J.; Kiesler, S.; Dec. 2003; In English
Report No.(s): PB2005-102622; No Copyright; Avail: National Technical Information Service (NTIS)
The principle question we address in this report is whether, and how, scientific collaborative projects involving multidisciplinarity and geographic dispersion achieve successful outcomes.
NTIS
Research Management; Geographic Distribution

20050071615 Miami Univ., Coral Gables, FL, USA
Cuba Transition Project: Cuba: Fundamental Telecommunications Plan
Cereijo, M.; 2003; 72 pp.; In English
Report No.(s): PB2005-102618; No Copyright; Avail: CASI; A04, Hardcopy
The purpose of this study is to evaluate the existing telephone network in Cuba, to recommend an interim plan for Cubas essential communications with the rest of the world (after a transition from the current government), and to provide an order-of-magnitude analysis of the cost of modernizing Cubas current network to meet short- and longterm demands.
NTIS
Communication Networks; Cuba; Telecommunication; Telephones

20050071616 PACT, Inc., NY, USA, Catholic Relief Services, NY, USA
MISONGA: Managing Information and Strengthening Organizations for Networked Governance Approaches. Annual Report
Dufils, J. M.; Oct. 2004; In English
Report No.(s): PB2005-102625; No Copyright; Avail: National Technical Information Service (NTIS)
In May 2004, Pact Inc. and Catholic Relief Services (CRS) Madagascar received funding from the USAID mission in Madagascar to jointly implement the MISONGA (Managing Information and Strengthening Organisations for Networked Governance Approaches) project. This project aims to promote good governance and democracy throughout key, targeted areas of Madagascar. The MISONGA project has three main objectives: (1) To promote a deeper and stronger civil society. (2) To improve information flow between the citizenry and government and all stakeholders for development. (3) To improve government responsiveness by addressing the needs and concerns of citizens. This is the first annual report for the MISONGA project and covers activities from 25 May 2004 to 30 September 2004.
NTIS
Information Flow; Madagascar; Information Systems

20050071629 Congressional Research Service, Washington, DC, USA
Access to Government Information in the USA. Updated January 7, 2005
Relyea, H. C.; Jan. 2005; 8 pp.; In English
Report No.(s): PB2005-102577; No Copyright; Avail: CASI; A02, Hardcopy
The Constitution of the USA makes no specific allowance for any one of the co-equal branches to have access to information held by the others and contains no provision expressly establishing a procedure for, or a right of, public access to government information. Nonetheless, Congress has legislated various public access laws. These include two records access statutes--the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a)--and two meetings access statutes--the Federal Advisory Committee Act (5 U.S.C. App.) and the Government in the Sunshine Act (5 U.S.C. 552b). Moreover, due to the American separation of powers model of government, interbranch conflicts over the accessibility of information are neither unexpected nor necessarily destructive. The federal courts, historically, have been reluctant to review and resolve political questions involving information disputes between Congress and the executive branch. Although there is considerable interbranch cooperation, such conflicts probably will continue to occur on occasion.
NTIS
Information Dissemination; Regulations

20050080326 Army Command and General Staff Coll., Fort Leavenworth, KS USA
The 7-Step Model - A Relevant and Ready Tool for the Future Force
Hammel, Michaele M.; May 2004; 54 pp.; In English
Report No.(s): AD-A429039; No Copyright; Avail: Defense Technical Information Center (DTIC)

The 7-step model of the MDMP is a tried and proven process. However, some critics argue it is not the right decision-making and planning tool for the future force. The 7-step model is a deliberate process requiring a significant amount of time when all of the steps are executed. Naturalistic decision-making theories, like recognition-primed decision-making (RPD), are thought to be more applicable for the future force. To determine the relevancy of the 7-step model for the future force, this study first reviewed the purpose of decision-making and various decision-making theories. Next, the Cold War environment and the Contemporary Operating Environment were compared to determine if the environment that the Army operates within has significantly changed. Then, the study applied three criteria, applicability, adherence and joint commonality, to the 7-step model to determine the relevancy of the 7-step model for the future force. Through this research, the 7-step model was determined still applicable for the future force. The deliberate, systematic decision-making models are designed to aid decision-makers when the problems are complex or when the decision-makers are inexperienced. The naturalistic decision-making theories explain how experienced people within their areas of expertise make decisions. The Contemporary Operating Environment is full of uncertainty. The future force is expected to go to battle with an unknown enemy who will use unfamiliar tactics. Additionally, as the Army promotes officers into new positions, regardless of their experience, they are placed in a new situation. The uncertainty of the Contemporary Operating Environment coupled with the various level of experience of military decision-makers support the need for a deliberate process. However, the research did find merit in the recognition-primed decision-making process. The Army should continue to instruct the 7-step model to junior leaders. The Army should also adopt
DTIC
Decision Making

20050080355 Gryphon Technologies, LLC, Riverdale, MD USA
Contractor's Progress, Status and Management Report
Chadwick, Mark; Lawson, Lon; Nov. 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-C-0195
Report No.(s): AD-A429093; No Copyright; Avail: Defense Technical Information Center (DTIC)

Each of our personnel had an unusually busy month. The Expeditionary Warfare Operations Division was active! The Financial Analyst continued to work solo in the FMT office during the crucial time of closing one fiscal year and commencing a new one. Dominating his effort was reconciling a newly imposed FRC structure and the corresponding distribution of funds to each. The Project Engineers were each heavily involved in their respective Thrust Areas and both traveled extensively. We hired our two new employees. Our new WEB/Graphics person hit the deck running providing extensive direct support to Code 35. Our new Executive Administrator had a similar experience. She learned immediately how appreciated her coming aboard was; and she rose to the occasion.
DTIC
Contractors; Finance; Handbooks; Management Planning

20050080359 Ohio State Univ., Columbus, OH USA
Personnel Detection Technology Assessment Final Report
Baertein, Brian; Moses, Randolph; Apr. 2003; 51 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0349
Report No.(s): AD-A429098; OSU-ESL-743391-2; ARO-44372.1-EL; No Copyright; Avail: Defense Technical Information Center (DTIC)

The sensor and processing technologies relevant to detection of dismounted personnel (hereafter, simply 'personnel detection') were investigated. The need to detect personnel arises in a variety of military and civilian situations. To provide a basis on which to compare sensor and processing technologies, we defined five baseline military scenarios in which personnel detection would be necessary. The distinctive characteristics of personnel were enumerated, and sensors with the potential to detect those characteristics were studied. The sensor study suggests that while many sensors are very mature, restrictions exist on each of the sensors that prevent any one technology from meeting the requirements defined by the scenarios. In particular, few of the sensors have adequate range for perimeter control and covert detection/tracking scenarios. It was concluded that, in general, fusion of data from distributed sensor networks will be required to meet the scenario requirements. Recommendations are provided for specific sensor development, data collection, and processing algorithm development.
DTIC
Multisensor Fusion; Personnel; Technology Assessment

20050080592 Correlations Co., Socorro, NM, USA, Coral Production Corp., Denver, CO, USA
Data Mining at the Nebraska Oil and Gas Commission
2004; In English
Report No.(s): DE2004-825386; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this study of the hearing records is to identify factors that are likely to impact the performance of a waterflood in the Nebraska panhandle. The records consisted of 140 cases. Most of the hearings were held prior to 1980. Many of the records were incomplete, and data believed to be key to estimating waterflood performance such as Dykstra-Parson permeability distribution or relative permeability were absent. New techniques were applied to analyze the sparse, incomplete dataset. When information is available, but not clearly understood, new computational intelligence tools can decipher correlations in the dataset. Fuzzy ranking and neural networks were the tools used to estimate secondary recovery from the Cliff Farms Unit. The hearing records include 30 descriptive entries that could influence the success or failure of a waterflood. Success or failure is defined by the ratio of secondary to primary oil recovery (S/P). Primary recovery is defined as cumulative oil produced at the time of the hearing and secondary recovery is defined as the oil produced since the hearing date. Fuzzy ranking was used to prioritize the relevance of 6 parameters on the outcome of the proposed waterflood. The 6 parameters were universally available in 44 of the case hearings. These 44 cases serve as the database used to correlate the following 6 inputs with the respective S/P. (1) Cumulative Water oil ratio, bbl/bbl; (2) Cumulative Gas oil ratio, mcf/bbl; (3) Unit area, acres; (4) Average Porosity, (5) Average Permeability, md; (6) Initial bottom hole pressure, psi. A 6-3-1 architecture describes the neural network used to develop a correlation between the 6 input parameters and their respective S/P.
NTIS
Data Mining; Oils; Nebraska

20050080593 Parsons Corp., Denver, CO, USA
Managing Decommissioning Projects Using D&D TRAK
Stegen, R. L.; Wilkinson, R. H.; Frink, P. G.; 2003; 14 pp.; In English
Report No.(s): DE2004-827465; No Copyright; Avail: Department of Energy Information Bridge

Numerous buildings throughout the DOE complex are being decommissioned. The decommissioning process typically includes dismantling equipment and utility systems for disposal, decontaminating remaining surfaces to meet regulatory limits, demolishing the building structure, and remediating the surrounding environment to address any historical releases. Typically, a large amount of information and radiation survey data needs to be processed and evaluated. Rapid assessment of project information is required to effectively manage unanticipated conditions that are frequently encountered as building components are dismantled. Parsons has developed a relational database called D&D TRAK to estimate, plan, manage, and track decommissioning projects. D&D TRAK has been successfully used at DOE and other federal facilities to terminate radioactive licenses thus allowing the unrestricted free-release of these buildings to public and private sectors.
NTIS
Buildings; Decommissioning; Relational Data Bases

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20050080697 Physics and Electronics Lab. TNO, The Hague, Netherlands
ANNCP WG IX Collaborative Project 16 (CP16) on Analysis of Maritime Operations other than War
Rutledal, Frode; West, David; Fitski, Hilvert; October 2004; 157 pp.; In English
Report No.(s): FEL-04-A221; Copyright; Avail: Other Sources

ANNCP WG IX is a collaborative program between the defence research institutes FFI in Norway, TNO-FEL in The Netherlands and Dstl in the UK. Collaborative Project 16 (CP16) under this program has investigated issues regarding the analysis of Maritime Operations Other Than War (MarOOTW). CP16 started in August 2002 and finished in August 2004. During this period there has been held a total of seven meetings, generally of a 3-day duration, and one videoconference. The objective of CP16 has been to exchange, and validate by review, ideas and approaches for the analysis of MarOOTW.
Derived from text
Military Operations; Warfare; Armed Forces (Foreign)

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.

20050061337 Westinghouse TRU Solutions, LLC, Albuquerque, NM, USA
Development of the TRU Waste Transportation Fleet - A Success Story
Brown, M.; Devarakonda, M.; Morrison, C.; Feb. 2003; In English
Report No.(s): DE2004-826249; No Copyright; Avail: National Technical Information Service (NTIS)

Since March 1999, the Waste Isolation Pilot Plant (WIPP), located in southeastern New Mexico, has been operated by the U.S. Department of Energy (DOE), Carlsbad Field Office (CBFO), as a repository for the permanent disposal of defense-related transuranic (TRU) waste. More than 1,450 shipments of TRU waste for WIPP disposal have been completed, and the WIPP is currently receiving 12 to 16 shipments per week from five DOE sites around the nation. One of the largest fleets of Type B packagings supports the transportation of TRU waste to WIPP. This paper discusses the development of this fleet since the original Certificate of Compliance (C of C) for the Transuranic Package Transporter-II (TRUPACT-II) was issued by the U.S. Nuclear Regulatory Commission (NRC) in 1989. Evolving site programs, closure schedules of major sites, and the TRU waste inventory at the various DOE sites have directed the sizing and packaging mix of this fleet. This paper discusses the key issues that guided this fleet development.
NTIS
Inventories; Waste Disposal; Transportation; Packaging

20050070860
Slovak Nuclear Regulatory Body Position in the Transport of Radioactive Waste
Homola, J.; 2003; 12 pp.; In English
Report No.(s): DE2004-826256; No Copyright; Avail: Department of Energy Information Bridge

This paper describes safety requirements for transport of radioactive waste in Slovakia and the role of regulatory body in the transport licensing and assessment processes. Importance of radioactive waste shipments have been increased since 1999 by starting of NPP A-1 decommissioning and operation of near surface disposal facility. Also some information from history of shipment as well as future activities are given. Legal basis for radioactive waste transport is resulting from IAEA recommendations in this area. Different types of transport equipment were approved by regulatory body for both liquid and solid waste and transportation permits were issued to their shipment. Regulatory body attention during evaluation of transport safety is focused mainly on ability of individual packages to withstand different transport conditions and on safety analyses performed for transport equipment for liquid waste with high frequency of shipments. During past three years no event was occurred in connection with radioactive waste transport in Slovakia.
NTIS
Solid Wastes; Safety; Radioactive Wastes

20050070886 Fanuc Ltd, Yamanashi, Japan
DD Drive Technology on Machine Tool
Sogabe, Masatoyo; Progress of Machining Technology; December 2004, pp. 1-6; In English; See also 20050070885; Copyright; Avail: Other Sources

Application of DD drive on machine tool-direct drive using linear motor and torque motor is now spreading. On the other hand, conventional drive using reducer has been improved to realize higher speed and longer life. In this paper, the author make comparison of DD motor drive and conventional drive, and explains the status.
Author
Machine Tools; Torque Motors; Technology Utilization

20050071646 Nevada Commission on Nuclear Projects, Carson City, NV, USA
Implications of the Baltimore Rail Tunnel Fire for Full-Scale Testing of Shipping Casks
Halstead, R. J.; Dilger, F.; 2003; 18 pp.; In English
Report No.(s): DE2004-827637; No Copyright; Avail: Department of Energy Information Bridge

The U.S. Nuclear Regulatory Commission (NRC) does not currently require full-scale physical testing of shipping casks as part of its certification process. Stakeholders have long urged NRC to require full-scale testing as part of certification. NRC

is currently preparing a full-scale casktesting proposal as part of the Package Performance Study (PPS) that grew out of the NRC reexamination of the Modal Study. The State of Nevada and Clark County remain committed to the position that demonstration testing would not be an acceptable substitute for a combination of full-scale testing, scale-model tests, and computer simulation of each new cask design prior to certification. Based on previous analyses of cask testing issues, and on preliminary findings regarding the July 2001 Baltimore rail tunnel fire, the authors recommend that NRC prioritize extra-regulatory thermal testing of a large rail cask and the GA-4 truck cask under the PPS. The specific fire conditions and other aspects of the full-scale extra-regulatory tests recommended for the PPS are yet to be determined. NRC, in consultation with stakeholders, must consider past real-world accidents and computer simulations to establish temperature failure thresholds for cask containment and fuel cladding. The cost of extra-regulatory thermal testing is yet to be determined.
NTIS
Barrels (Containers); Full Scale Tests; Cladding; Failure; Fires

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*.

20050070800 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Visualization, Analysis and Subsetting Tools for EOS Aura Data Products in HDF-EOS5
Johnson, J.; Ahmad, S.; Gopalan, A.; Smith, P.; Leptoukh, G.; Kempler, S.; [2004]; 1 pp.; In English; AGU Fall Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; No Copyright; Avail: Other Sources; Abstract Only

Aura data products are among the first to use the new version 5 of the Hierarchical Data Format for the Earth Observing System, or HDF-EOS5. This presentation discusses the common HDF-EOS5 file layout that is adopted for most of the EOS Aura standard data products. Details of the various tools that can be used to access, visualize and subset these data will also be provided. Aura, the NASA Earth Observing System's atmospheric chemistry mission, was successfully launched July 15, 2004. The Aura spacecraft includes four instruments: the High Resolution Dynamics Limb Sounder (HIRDLS), the Microwave Limb Sounder (MLS), the Ozone Monitoring Instrument (OMI), and the Tropospheric Emission Spectrometer (TES). Data from the HIRDLS, MLS and OMI will be archived at the NASA Goddard Earth Sciences (GES) Distributed Active Archive Center (DAAC), while TES data will be archived at the NASA Langley Research Center DAAC. For more information see http://daac.gsfc.nasa.gov/.
Author
Earth Observing System (EOS); Earth Sciences; Atmospheric Chemistry; NASA Space Programs

20050070809 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Introduction to Message-Bus Architectures for Space Systems
Smith, Danford; Gregory, Brian; [2005]; 4 pp.; In English; Ground Station Architecture Workshop, 1-3 Mar. 2005, Manhattan Beach, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

This course presents technical and programmatic information on the development of message-based architectures for space mission ground and flight software systems. Message-based architecture approaches provide many significant advantages over the more traditional socket-based one-of-a-kind integrated system development approaches. The course provides an overview of publish/subscribe concepts, the use of common isolation layer API's, approaches to message standardization, and other technical topics. Several examples of currently operational systems are discussed and possible changes to the system discussed and time for questions and answers will be provided.
Author
Aerospace Systems; Systems Engineering; Messages; Systems Integration; Computer Programs

89
ASTRONOMY

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

20050070838 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-ray Monitoring of eta Carinae: Variations on a Theme
Corcoran, M. F.; [2004]; 46 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We present monitoring observations by the Rossi X-ray Timing Explorer of the 2-10 keV X-ray emission from the supermassive star eta Carinae from 1996 through late 2003. These data cover more than one of the stellar variability cycles in temporal detail and include especially detailed monitoring through two X-ray minima. We compare the current X-ray minimum which began on June 29, 2003 to the previous X-ray minimum which began on December 15, 1997, and refine the X-ray period to 2024 days. We examine the variations in the X-ray spectrum with phase and with time, and also refine our understanding of the X-ray peaks which have a quasi-period of 84 days, with significant variation. Cycle-to-cycle differences are seen in the level of X-ray intensity and in the detailed variations of the X-ray flux on the rise to maximum just prior to the X-ray minimum. Despite these differences the similarities between the decline to minimum, the duration of the minimum, and correlated variations of the X-ray flux and other measures throughout the electromagnetic spectrum leave little doubt that that the X-ray variation is strictly periodic and produced by orbital motion as the wind from eta Carinae collides with the wind of an otherwise unseen companion.
Author
X Ray Binaries; Supermassive Stars; Astronomy; X Ray Spectroscopy

20050070840 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Virtual Observatory Science Applications
McGlynn, Tom; [2005]; 1 pp.; In English; AAS Conference, Jan. 2005, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

Many Virtual-Observatory-based applications are now available to astronomers for use in their research. These span data discovery, access, visualization and analysis. Tools can quickly gather and organize information from sites around the world to help in planning a response to a gamma-ray burst, help users pick filters to isolate a desired feature, make an average template for z=2 AGN, select sources based upon information in many catalogs, or correlate massive distributed databases. Using VO protocols, the reach of existing software tools and packages can be greatly extended, allowing users to find and access remote information almost as conveniently as local data. The talk highlights just a few of the tools available to scientists, describes how both large and small scale projects can use existing tools, and previews some of the new capabilities that will be available in the next few years.
Author
Observatories; Scientific Visualization; Virtual Reality

20050070857 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evolution of a Low Luminosity Outburst of the Black Hole Candidate H1743-322
Swank, J.; Markwardt, C.; Rupen, M.; Mioduszewski, A.; Dhawa, V.; [2005]; 1 pp.; In English; American Astronautical Society Meeting, 9-12 Jan. 2005, San Diego, CA, USA; Copyright; Avail: Other Sources; Abstract Only

The black hole candidate X-ray transient H1743-322 = IGR J1746-3213 = XTE J17464-3213 had a bright outburst starting in March 2003, which reached a peak flux around 1.3 Crab and lasted nearly 2/3 of a year. After a similar period in apparent quiescence (below approx. 1 mCrab), the source began another outburst in July 2004, this time rising only to about 1/4 Crab and decaying in about 4.5 months. It appeared with an optically thick disk and a steep power law component (number index approx. 3), and began a steady increase, with mild spectral change. After 50 days, a hard power-law component appeared, along with low frequency quasiperiodic oscillations. Gradual decay of both components began, but after another month the soft component dropped faster and left the source in a harder state to continue the decay. The Very Large Array found no radio activity during the first month, but a 2 mJy radio source appeared during the X-ray rise. Evidence for jet ejection corresponding to changes in the X-ray source will be discussed in connection with interpretation of the system.
Author
Black Holes (Astronomy); Bursts; X Ray Astronomy; X Ray Sources

20050071100 NASA Goddard Space Flight Center, Greenbelt, MD, USA
EGRET Diffuse Gamma Ray Maps Between 30 MeV and 10 GeV
Cillis, A, N.; Hartman, R. C.; [2004]; 24 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents all-sky maps of diffuse gamma radiation in various energy ranges between 30 MeV and 10 GeV, based on data collected by the EGRET instrument on the Compton Gamma Ray Observatory. Although the maps can be used for a variety of applications. the immediate goal is the generation of diffuse gamma-ray maps which can be used as a diffuse background/foreground for point source analysis of the data to be obtained from new high-energy gamma-ray missions like GLAST and AGILE. To generate the diffuse gamma maps from the raw EGRET maps, the point sources in the Third EGRET

Catalog were subtracted out using the appropriate point spread function for each energy range. After that, smoothing was performed to minimize the effects of photon statistical noise. A smoothing length of 1 deg vas used for the Galactic plane maps. For the all-sky maps, a procedure was used which resulted in a smoothing length roughly equivalent to 4 deg. The result of this work is 16 maps of different energy intervals for absolute value of b \h or equal to 20 deg, and 32 all-sky maps, 16 in equatorial coordinates (J2000) and 16 in Galactic coordinates.
Author
Gamma Ray Astronomy; Sky Surveys (Astronomy); Astronomical Maps

20050080288 Air Force Research Lab., Hanscom AFB, MA USA
The Surface Properties of Asteroids
Price, Stephan D.; Apr. 2003; 11 pp.; In English
Contract(s)/Grant(s): Proj-1010
Report No.(s): AD-A428945; AFRL-VS-HA-TR-2005-1103; No Copyright; Avail: CASI; A03, Hardcopy

The physical characteristics of asteroid surfaces are best defined by direct measurements, few of which currently exist. Thus, inferences from indirect observations must be made. From the limited visible and radar imagery heavy cratering marks the asteroid surfaces and the surfaces are rough at all scales. For those asteroids with both a size and mass determination, only the largest bodies have bulk densities close to those expected from their meteoritic analogs. The smaller asteroids have large-scale porosities of 20% and greater; the objects with highest macroporosity are likely to be rubble piles while the denser ones may be heavily fractured coherent objects. The regoliths on the larger asteroids appear to be at least centimeters deep, while infrared measurements on the smaller objects argue for either a much thinner regolith or a bare surface; although direct imagery on the modest sized near-Earth asteroid 433 Eros indicates a regolith that is meters deep. Visual and infrared spectra clearly show that the silicates olivine and pyroxene are present on many asteroids and indicate the spectral signature of hydrated minerals in several low Albedo asteroids. Disk integrated photometry and radiometry provide clues as to the surface porosity and roughness and the fraction of surface covered by craters. Microwave, radio and radar measurements can penetrate the surface regolith, yielding information on the particle size distribution, and the nature of the underlying material. Modeling of the radiative transfer within the surface and deeper layers of an asteroid is required to accurately interpret these disk integrated measurements in terms of realistic physical parameters. Although the modeling has become sophisticated, additional components as well as more extensive and accurate measurements are required to derive an unambiguous picture of the asteroid surface layers from the indirect observations.
DTIC
Asteroids; Surface Properties

90
ASTROPHYSICS

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

20050061118 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Shortcomings of the R-Matrix Method for Determining Dielectronic Recombination Rate Coefficients
Gorczyca, T. W.; Badnell, N. R.; Savin, D. W.; Physical Review A; 2002; Volume 65; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-062707; Copyright; Avail: Other Sources
No abstract available
Matrix Methods; Recombination Coefficient

20050061134 NASA Goddard Space Flight Center, Greenbelt, MD, USA
K-Shell Photodetachment from C(sup -): Experiment and Theory
Gibson, N. D.; Walter, C. W.; Zatsarinny, O.; Gorczyca, T. W.; Ackerman, G. D.; Bozek, J. D.; Martins, M.; McLaughlin, B. M.; Berrah, N.; Physical Review A; 2003; Volume 67; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-030703(R); Copyright; Avail: Other Sources
No abstract available
Astrophysics; Atomic Physics; Photodetachment

20050061142 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Radiation Damping Effects on L-Shell Photoionization Cross Sections of O-Like Fe XIX and N-Like Recombination Rate Coefficients for Fe XX
McLaughlin, B. M.; Gorczyca, T. W.; Keenan, F. P.; Bell, K. L.; Mon. Not. R. Astron. Soc.; 2001; Volume 328, No. 442; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Computerized Simulation; Atomic Physics; Radiation Effects; Photoionization

20050061148 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination Data for Dynamic Finite-Density Plasmas., VII, The Fluorine Isoelectronic Sequence, Astronomy and Astrophysics
Zatsarinny, O.; Gorczyca, T. W.; Korista, K. T.; Badnell, N. R.; Savin, D. W.; [2005]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Electron-Ion Recombination; Fluorine; Isoelectronic Sequence; Atomic Physics; Astrophysics

20050061156 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Interference Effects in the Auger Decay of the Ar 2p(sup--1)3d Resonances
Nayandin, O.; Gorczyca, T. W.; Wills, A. A.; Langer, B.; Bozek, J. D.; Berrah, N.; Phys. Rev.; 2001; Volume A 64, pp. 2001; In English
Contract(s)/Grant(s): NAG5-9581
Report No.(s): Article-022505; Copyright; Avail: Other Sources
No abstract available
Astrophysics; Atomic Physics; Computerized Simulation

20050061157 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination Data for Dynamic Finite-Density Plasmas, VII, The Neon Isoelectronic Sequence
Zatasarinny, O.; Gorczyca, T. W.; Korista, K. T.; Badnell, N. R.; Savin, D. W.; Astronomy and Astrophysics; 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Electron-Ion Recombination; Isoelectronic Sequence; Neon; Plasmas (Physics); Atomic Physics

20050061158 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Assessment of the Fluorescence and Auger Data Base Used in Plasma Modeling
Gorczyca, T. W.; Kodituwakku, C. N.; Korista, K. T.; Zatsarinny, O.; Badnell, N. R.; Behar, E.; Chen, M. H.; Savin, D. W.; Astrophysical Journal; 2003; Volume 592, No. 636; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Fluorescence; Data Bases; Plasmas (Physics)

20050061159 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination of Fe XIX Forming Fe, 18, Laboratory Measurements and Theoretical Calculations
Savin, D. W.; Kahn, S. M.; Linkeman, A.; Saghiri, A. A.; Schmitt, M.; Grieser, M.; Repnow, R.; Schwalm, D.; Wolf, A.; Bartsch, T., et al.; Astrophysical Journal; 2002; Volume 576, pp. 1098; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No absract available
Author
Electron-Ion Recombination; Astrophysics; Atomic Physics; Iron

20050061160 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Improved Simulations of Astrophysical Plasmas: Computation of New Dielectronic Recombination Data, in Spectroscopic Challenges of Photoionized Plasmas
Gorczyca, T. W.; Korista, K. T.; Ferland, G. J., Editor; Savin, D. W., Editor; 2001; 2 pp.; In English; Astronomical Society of the Pacific, 2001, Provo, UT, USA
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Astrophysics; Computerized Simulation; Plasmas (Physics); Electron-Ion Recombination

20050061161 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination Data for Dynamic Finite-Density Plasmas, I, Goals and Methodology
Badnell, N. R.; OMullane, M. G.; Summers, H. P.; Altun, Z.; Bautista, M. A.; Colgan, J.; Gorczyca, T. W.; Mitnik, D. M.; Pindzola, M. S.; Zatsarinny, O.; Astronomy and Astrophysics; 2003; Volume 406, No. 1151; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Electron-Ion Recombination; Data Processing; Atomic Physics; Astrophysics

20050061162 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Dielectronic Recombination of Fe XXII via N = 2 -\g N' = 2 Core Excitations
Savin, D. W.; Kahn, S. M.; Gwinner, G.; Grieser, M.; Repnow, R.; Saathoff, G.; Schwalm, D.; Wolf, A.; Mueller, A.; Schippers, S., et al.; Astrophysical Journal; 2003; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9581; Copyright; Avail: Other Sources
No abstract available
Electron-Ion Recombination; Excitation; Iron; Astrophysics

20050061251 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Motions and Initial Conditions in Star-Forming Dense Cores
Myers, Philip C.; January 2005; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13050
Report No.(s): Rept-2; No Copyright; Avail: Other Sources; Abstract Only
The main focus was the study of star-forming regions through high spectral- and spatial resolution observations of millimeter-wavelength lines, and through models of the observations. The main accomplishments in 2003-2004 supported by this grant are included.
Derived from text
Cores; Star Formation; Astrophysics; Stellar Motions

20050061311 Pennsylvania State Univ., PA, USA
Transmissive Microshutter Array Technology Development Program
Ge, Jian; January 2005; 4 pp.; In English
Contract(s)/Grant(s): NAG5-13320; No Copyright; Avail: CASI; A01, Hardcopy
This is a one-year program starting on April 15,2003 to develop two infrared silicon grism for Rapid Visible and Infrared Multiple Object Spectrometer (RIVMOS) for observations in 1.1 - 5 microns.
Derived from text
Silicon; Infrared Spectrometers; Infrared Radiation; Arrays; Technology Utilization

20050070578 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Discrete X-Ray Source Populations and Star Formation History in Nearby Galaxies
Zezas, Andreas; Hasan, Hashima, Technical Monitor; February 2005; 4 pp.; In English
Contract(s)/Grant(s): NAG5-13056; No Copyright; Avail: CASI; A01, Hardcopy
This program aims in understanding the connection between the discrete X-ray source populations observed in nearby galaxies and the history of star-formation in these galaxies. The ultimate goal is to use this knowledge in order to constrain X-ray binary evolution channels. For this reason although the program is primarily observational it has a significant modeling component. During the second year of this study we focused on detailed studies of the Antennae galaxies and the Small

Magellanic Cloud (SMC). We also performed the initial analysis of the 5 galaxies forming a starburst-age sequence. Derived from text

X Ray Sources; Star Formation; Starburst Galaxies

20050070866 NASA Goddard Space Flight Center, Greenbelt, MD, USA

High-Energy Emission From Millisecond Pulsars

Harding, Alice K.; Usov, Vladimir V.; Muslimov, Alex G.; [2004]; 34 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The X-ray and gamma-ray spectrum of rotation-powered millisecond pulsars is investigated in a model for acceleration and pair cascades on open field lines above the polar caps. Although these pulsars have low surface magnetic fields, their short periods allow them to have large magnetospheric potential drops, but the majority do not produce sufficient pairs to completely screen the accelerating electric field. In these sources, the primary and secondary electrons continue to accelerate to high altitude and their Lorentz factors are limited by curvature and synchrotron radiation reaction. The accelerating particles maintain high Lorentz factors and undergo cyclotron resonant absorption of radio emission, that produces and maintains a large pitch angle, resulting in a strong synchrotron component. The resulting spectra consist of several distinct components: curvature radiation from primary electrons dominating from 1 - 100 GeV, synchrotron radiation from primary and secondary electrons dominating up to about 100 MeV, and much weaker inverse-Compton radiation from primary electrons a t 0.1 - 1 TeV. We find that the relative size of these components depends on pulsar period, period derivative, and neutron star mass and radius with the level of the synchrotron component also depending sensitively on the radio emission properties. This model is successful in describing the observed X-ray and gamma-ray spectrum of PSR J0218+4232 as synchrotron radiation, peaking around 100 MeV and extending up to a turnover around several GeV. The predicted curvature radiation components from a number of millisecond pulsars, as well as the collective emission from the millisecond pulsars in globular clusters, should be detectable with AGILE and GLAST. We also discuss a hidden population of X-ray-quiet and radio-quiet millisecond pulsars which have evolved below the pair death line, some of which may be detectable by telescopes sensitive above 1 GeV. Subject headings: pulsars: general - radiation mechanisms: nonthermal - stars: neutron - gamma rays: theory
Author

Emission Spectra; Polar Caps; Radiation Effects; X Rays; Gamma Ray Spectra

20050070867 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Illinois Univ., Urbana, IL, USA

A Survey of Large Molecules toward the Protoplanetary Nebula CRL 61 8

Remijan, Anthony J.; Wyrowski, Friedrich; Friedel, Douglas N.; Meier, David S.; Snyder, Lewis E.; [2005]; 28 pp.; In English
Contract(s)/Grant(s): NSF AST-99-81363; RTOP 188-02-02-01; Copyright; Avail: CASI; A03, Hardcopy

We present the results of our survey toward the protoplanetary nebula CRL 618 for several large, highly saturated, oxygen bearing organic molecules of biological importance including acetaldehyde (CH3CHO), acetic acid (CH3OOH), dimethyl ether (CH3OCH3), ethanol (CH3CH2OH), formic acid (HCOOH) and methyl formate (HCOOCH3); large carbon chain molecules including methyl cyanide (CH3CN) , methylcyanoacetylene (CH3C3N), cyanoacetylene (HC3N), cyanodiacetylene (HC5N), and C6H; and finally smaller molecules including SO-34, SO2, O(C-34)S and MgNC. No biologically important organic molecules were detected. However, we report the first interferometric detections of CH3CN and vibrationally excited HC3N and HC5N toward this source. The temperature and distribution of CH3CN toward CRL 618 indicates it is formed in the outer envelope surrounding the UC HII region. Furthermore, the P-Cygni line profile and corresponding channel maps of vibrationally excited HC5N supports its distribution in the extended envelope expanding radially from the central star. The detection of vibrationally excited HC3N confirmed the temperature structure and column density of HC3N in the inner envelope found by Wyrowski and colleagues (2003). Finally, our observations clearly indicate that CRL 618 is a good source of large carbon chain species but is a very poor source to detect or produce organic species of biological importance.
Author

Molecules; Nebulae; Oxygen; Asymptotic Giant Branch Stars

20050070884 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Modeling the Spin Equilibrium of Neutron Stars in LMXBs Without Gravitational Radiation

Andersson, N.; Glampedakis, K.; Haskell, B.; Watts, A. L.; [2004]; 13 pp.; In English
Contract(s)/Grant(s): PPA/G/2002/00038
Report No.(s): astro-ph/0411747-v1; Copyright; Avail: Other Sources

In this paper we discuss the spin-equilibrium of accreting neutron stars in LMXBs. We demonstrate that, when combined

with a naive spin-up torque, the observed data leads to inferred magnetic fields which are at variance with those of galactic millisecond radiopulsars. This indicates the need for either additional spin-down torques (eg. gravitational radiation) or an improved accretion model. We show that a simple consistent accretion model can be arrived at by accounting for radiation pressure in rapidly accreting systems (above a few percent of the Eddington accretion rate). In our model the inner disk region is thick and significantly sub-Keplerian, and the estimated equilibrium periods are such that the LMXB neutron stars have properties that accord well with the galactic millisecond radiopulsar sample. The implications for future gravitational-wave observations are also discussed briefly.
Author
Neutron Stars; Stellar Rotation; Stellar Models; X Ray Binaries

20050071079 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Chandra Deep X-ray Observation of a Typical Galactic Plane Region and Near-Infrared Identification
Ebisawa, K.; Tsujimoto, M.; Paizis, A.; Hamaguichi, K.; Bamba, A.; Cutri, R.; Kaneda, H.; Maeda, Y.; Sato, G.; Senda, A., et al.; November 04, 2004; 55 pp.; In English
Contract(s)/Grant(s): NCC5-6261; Copyright; Avail: CASI; A04, Hardcopy

Using the Chandra Advanced CCD Imaging Spectrometer Imaging array (ACIS-I), we have carried out a deep hard X-ray observation of the Galactic plane region at (l,b) approx. (28.5 deg,0.0 deg), where no discrete X-ray source has been reported previously. We have detected 274 new point X-ray sources (4 sigma confidence) as well as strong Galactic diffuse emission within two partidly overlapping ACIS-I fields (approx. 250 sq arcmin in total). The point source sensitivity was approx. 3 x 10(exp -15)ergs/s/sq cm in the hard X-ray band (2-10 keV and approx. 2 x 10(exp -16) ergs/s/sq cm in the soft band (0.5-2 keV). Sum of all the detected point source fluxes account for only approx. 10 % of the total X-ray fluxes in the field of view. In order to explain the total X-ray fluxes by a superposition of fainter point sources, an extremely rapid increase of the source population is required below our sensitivity limit, which is hardly reconciled with any source distribution in the Galactic plane. Therefore, we conclude that X-ray emission from the Galactic plane has truly diffuse origin. Only 26 point sources were detected both in the soft and hard bands, indicating that there are two distinct classes of the X-ray sources distinguished by the spectral hardness ratio. Surface number density of the hard sources is only slightly higher than observed at the high Galactic latitude regions, strongly suggesting that majority of the hard X-ray sources are active galaxies seen through the Galactic plane. Following the Chandra observation, we have performed a near-infrared (NIR) survey with SOFI at ESO/NTT to identify these new X-ray sources. Since the Galactic plane is opaque in NIR, we did not see the background extragalactic sources in NIR. In fact, only 22 % of the hard sources had NIR counterparts which are most likely to be Galactic origin. Composite X-ray energy spectrum of those hard X-ray sources having NIR counterparts exhibits a narrow approx. 6.7 keV iron emission line, which is a signature of Galactic quiescent cataclysmic variables (CVs).
Author
Milky Way Galaxy; X Ray Astronomy; Galactic Structure; Infrared Astronomy; Diffuse Radiation

20050071101 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Highest-Energy Photons Seen by the Energetic Gamma-Ray Experiment Telescope (EGRET) on the Compton Gamma Ray Observatory
Thompson, D. J.; Bertsch, D. L.; ONeal, R. H., Jr.; [2005]; 30 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

During its nine-year lifetime, the Energetic Gamma Ray Experiment Telescope (EGBET) on the Compton Gamma Ray Observatory (CGRO) detected 1506 cosmic photons with measured energy E\g10 GeV. Of this number, 187 are found within a 1 deg of sources that are listed in the Third EGRET Catalog and were included in determining the detection likelihood, flux, and spectra of those sources. In particular, five detected EGRET pulsars are found to have events above 10 GeV, and together they account for 37 events. A pulsar not included in the Third EGRET Catalog has 2 events, both with the same phase and in one peak of the lower-energy gamma-ray light-curve. Most of the remaining 1319 events appear to be diffuse Galactic and extragalactic radiation based on the similarity of the their spatial and energy distributions with the diffuse model and in the E\g100, MeV emission. No significant time clustering which would suggest a burst was detected.
Author
Gamma Ray Astronomy; Photons; Gamma Rays; Gamma Ray Observatory; Gamma Ray Telescopes; Gamma Ray Sources (Astronomy)

20050071556 NASA Marshall Space Flight Center, Huntsville, AL, USA, Universities Space Research Association,

Huntsville, AL, USA, , Santa Cruz, CA, USA, , UK

Chandra Observations of the X-ray Environs of SN 1998 bw/GRB 980425

Kouveliotou, C.; Woosley, S. E.; Patel, S. K.; Levan, A.; Blanford, R.; 2004; In English

Report No.(s): DE2004-827302; No Copyright; Avail: National Technical Information Service (NTIS)

We report X-ray studies of the environs of SN 1998bw and GRB 980425 using the Chandra X-Ray Observatory 1281 days after the GRB. Eight X-ray point sources were localized, three and five each in the original error boxes--S1 and S2--assigned for variable X-ray counterparts to the GRB by BeppoSAX. The sum of the discrete X-ray sources plus continuous emission in S2 observed by CXO on day 1281 is within a factor of 1.5 of the maximum and the upper limits seen by BeppoSAX. We conclude that S2 is the sum of several variable sources that have not disappeared, and therefore is not associated with the GRB. Within S1, clear evidence is seen for a decline of approximately a factor of 12 between day 200 and day 1281. One of the sources in S1, S1a, is coincident with the well-determined radio location of SN 1998bw, and is certainly the remnant of that explosion. The nature of the other sources is also discussed. Combining our observation of the supernova with others of the GRB afterglow, a smooth X-ray light curve, spanning (approx) 1300 days, is obtained by assuming the burst and supernova were coincident at 35. 6 Mpc. When this X-ray light curve is compared with those of the X-ray 'afterglows' of ordinary GRBs, X-ray Flashes, and ordinary supernovae, evidence emerges for at least two classes of lightcurves, perhaps bounding a continuum.

NTIS

Starburst Galaxies; Stars

20050080440 Aerospace Corp., El Segundo, CA USA

Optical Darkening During Space Environmental Effects Testing - Contaminant Film Analyses

Fuqua, P. D.; Morgan, B. A.; Adams, P. M.; Meshishnek, M. J.; Sep. 2004; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8802-O4-C-0001

Report No.(s): AD-A429306; TR-2004(8586)-1; SMC-TR-05-06; No Copyright; Avail: Defense Technical Information Center (DTIC)

As a part of a space environmental effects test, two samples used as contamination monitors exhibited slight darkening. Analysis by ellipsometry indicates that l2oA of highly absorptive material had been deposited on them. Static SIMS confirms that a contaminant material was deposited during the test. It further suggests that the contaminant film is composed of polymerized silicones and hydrocarbons. An attempt to use grazing-angle FTIR spectroscopy to identify the film led to inconclusive results.

DTIC

Aerospace Environments; Contaminants; Darkening; Environment Effects

91
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*.

20050061255 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Nanometer-scale Measurements of Ferrous-Ferric Ratios in Chondritic Cronstedtite

Zega, T. J.; Garvie, L. A. J.; Buseck, P. R.; March 2002; 2 pp.; In English; Lunar and Planetary Scientific Conference XXXIII, March 2002, Houston, TX, USA

Contract(s)/Grant(s): NAG5-9352

Report No.(s): Rept-2021; No Copyright; Avail: Other Sources

No abstract available

Chondrites; Ferric Ions; Nanotechnology

20050061258 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Origin of Polycyclic Aromatic Hydrocarbons in Carbonaceous Chondrites

Zare, R. N.; Plows, F.; Elsila, J.; Buseck, P. R.; 2002; 2 pp.; In English; 224th Am. Chem. Soc. Natl. Mtg., August 2002, Boston, MA, USA

Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources

No abstract available

Carbonaceous Chondrites; Polycyclic Aromatic Hydrocarbons; Cosmochemistry; Mineralogy

20050061265 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Studies of Circumstellar Disk Evolution
Hartmann, Lee W.; January 2005; 5 pp.; In English
Contract(s)/Grant(s): NAG5-13210; No Copyright; Avail: CASI; A01, 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; Astrophysics

20050061270 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A High-resolution Transmission Electron Microscope Study of Fine-grained Phosphates in Metal from the Bishunpur LL3.1 Ordinary Chondrite
Johnson, C. L.; Lauretta, D. S.; Buseck, P. R.; Meteorites and Planetary Science 35, Supplement A84; August 2000; 2 pp.; In English; 63rd Annual Meeting of the Meteorological Society, August 2000, Chicago, IL, USA
Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources

No abstract available
Chondrites; High Resolution; Meteoritic Composition; Phosphates; Metals; Transmission Electron Microscopy

20050061272 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Inductively Coupled Plasma Mass Spectrometry Measurements of Bulk Mercury Abundances and Isotopic Ratios in Murchison (CM) and Allende (CV)
Lauretta, D. S.; Klaue, B.; Blum, J. D.; Buseck, P. R.; Meteorities Supplment; August 2000; Volume 35, pp. A95-A96; In English; 63rd Annual Meeting of the Meteoritical Society, 2000, Chicago, IL, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources

No abstract available
Abundance; Inductively Coupled Plasma Mass Spectrometry; Mass Spectroscopy; Mercury (Metal); Murchison Meteorite; Allende Meteorite; Isotope Ratios

20050061318 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Troilite-Silicate-Metal Inclusions and Rims in the Bishunpur LL3.1 Chondrite: Products of Impact-induced Mobilization on a Primitive Asteroid
Kojima, T.; Lauretta, D. S.; Buseck, P. R.; 2001; 2 pp.; In English; Lunar Planet. Sci. Conference XXXII, Abstract #1250, March 2001, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources

No abstract available
Asteroids; Chondrites; Inclusions; Meteoritic Composition; Silicates; Troilite; Mobility

20050061320 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mineralogy of a Fine-grained Rim within the Cold Bokkeveld CM Chondrite: A Transmission Electron Microscope Study
Zega, T. J.; Buseck, P. R.; Meteoritics and Planetary Science; 2000; Volume 35, No. A177; 2 pp.; In English; 63rd Ann. Mtg. Meteoritical Soc., August 2000, Chicago,IL, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources

No abstract available
Cold Bokkeveld Meteorite; Mineralogy; Granular Materials; Transmission Electron Microscopy

20050061328 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Analysis of Labile Trace Elements in CM and CV Carbonaceous Chondrites Using Inductively Coupled Plasma-mass Spectrometry
Lauretta, D. S.; Klaue, B.; Blum, J. D.; Buseck, P. R.; Lunar Planet. Sci. Conf. XXXII; 2001; Volume 1356; 2 pp.; In English; Lunar Planet. Sci. Conf. XXXII, March 2001, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Carbonaceous Chondrites; Inductively Coupled Plasma Mass Spectrometry; Thermal Analysis; Trace Elements

20050061333 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Nanometer-scale Measurements of Ferrous-ferric Ratios in Chondritic and Terrestrial Cronstedite
Zega, T. J.; Garvie, L. A. J.; Buseck, P. R.; IMA Abstr., Abstr. TH6; 2002; 2 pp.; In English; 18th Mtg. International Min. Assn., Sep. 2002, Edinburgh, Scotland, UK
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Chondrites; Ferric Ions

20050061334 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Polycyclic Aromatic Hydrocarbons in Two Carbonaceous Chondrites Predate Parent-body Formation
Elsila, J. E.; Plows, F. L.; Zare, R. N.; Buseck, P. R.; Meteoritics and Planet. Sci.; 2002; Volume 37, No. A44; 2 pp.; In English; 65th Ann. Mtg. Meteoritical Soc., July 2002
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Carbonaceous Chondrites; Polycyclic Aromatic Hydrocarbons; Cosmochemistry; Mineralogy

20050061335 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Oscillatory Zoning and Aqueous Alteration of Fayalitic Olivine from the LEW 90500 CM2 Chondrite
Hua, X.; Li, J.; Sharp, T. G.; Buseck, P. R.; Meteoritics and Planetary Science Suppl.; 2002; 2 pp.; In English; 65th Ann. Mtg. Meteoritical Soc., July 2002, Los Angeles, CA, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Olivine; Fayalite; Carbonaceous Meteorites; Chondrites

20050061338 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Experimental Investigation of Fe-Si Alloy Corrosion in the Solar Nebula
Zega, T. J.; Lauretta, D. S.; Buseck, P. R.; 2001; 2 pp.; In English; Lunar Planet. Sci. Conf. XXXII, March 2001, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352
Report No.(s): Paper 2165; No Copyright; Avail: Other Sources
No abstract available
Corrosion; Solar Nebula; Iron Alloys; Silicon Alloys

20050061339 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Silicon-isotopic Abundances in Silicate Minerals from the Kaba and Mokoia CV3 Carbonaceous Chondrites
Hua, X.; Wang, J.; Buseck, P. R.; Meteoritics and Planetary Science; 2000; Vol. 35, No. A-78; 2 pp.; In English; 63rd Ann. Mtg. Meteoritical Soc., August 2000, Chicago, IL, USA
Contract(s)/Grant(s): NAG5-9352; No Copyright; Avail: Other Sources
No abstract available
Abundance; Carbonaceous Chondrites; Minerals; Silicon Isotopes; Silicates

20050061340 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Si-isotopic Franctionation in Silicate Minerals from Chondritic Meteorites: A Possible New Probe for Early Solar System Processes
Hua, X.; Wang, J.; Huss, G. R.; Sharp, T. G.; Buseck, P. R.; 2001; 2 pp.; In English; Lunar Planet. Sci. Conf. XXXII, March 2001, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352
Report No.(s): Paper 1852; No Copyright; Avail: Other Sources
No abstract available
Solar System; Silicon Isotopes; Minerals; Silicates; Fractionation

20050061344 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Opaque Minerals in the Matrix of the Bishunpur (LL3.1) Chondrite: Constraints on the Chondrule Formation Environment
Zega, T. J.; Lauretta, D. S.; Buseck, P. R.; Geochim. Cosmochim. Acta 65; 2001; Volume 65, pp. 1337-1353; In English
Contract(s)/Grant(s): NAG5-9353; Copyright; Avail: Other Sources
No abstract available
Chondrule; Meteoritic Composition; Minerals; Chondrites; Cosmochemistry

20050061346 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mercury Abundances and Isotopic Compositions in the Murchison (CM) and Allende (CV) Carbonaceous Chondrites
Lauretta, D. S.; Klaue, B.; Blum, J. D.; Buseck, P. R.; Geochim. Cosmochim. Acta 65; 2001; Volume 65, pp. 2807-2818; In English
Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources
No abstract available
Composition (Property); Murchison Meteorite; Allende Meteorite

20050070558 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fine-grained Rims in the Allan Hills 81002 and Lewis Cliff 90500 CM2 Meteorites: Their Origin and Modification
Hua, X.; Wang, J.; Buseck, P. R.; Meteoritics and Planetary Science; 2002; Volume 37, pp. 229-244; In English
Contract(s)/Grant(s): NAG5-9352; Copyright; Avail: Other Sources
No abstract available
Carbonaceous Meteorites; Granular Materials

20050070560 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sulfur-Rich Carbonaceous Nanoglobules in the Tagish Lake Meteorite
Garvie, L. A. J.; Buseck, P. R.; March 2003; 2 pp.; In English; Lunar and Planetary Sciences Conference XXXIV, March 2003, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352
Report No.(s): Paper 2014; No Copyright; Avail: Other Sources
No abstract available
Globules; Sulfur; Carbonaceous Meteorites; Planetary Geology; Meteorites

20050070561 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Electron Energy-Loss Spectroscopy (EELS) of Fe-bearing Sheet Silicates in CM Chondrites
Zega, T. J.; Garvie, L. A. J.; Buseck, P. R.; March 2003; 1 pp.; In English; Lunar and Planetary Sciences Conference XXXIV, March 2003, Houston, TX, USA
Contract(s)/Grant(s): NAG5-9352
Report No.(s): Paper 2089; No Copyright; Avail: Other Sources
No abstract available
Electron Spectroscopy; Energy Dissipation; Silicates; Carbonaceous Meteorites; Iron

20050071078 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Improved Estimate of Phobos Secular Acceleration from MOLA Observations

Bills, Bruce; Neumann, Gregory; Smith, David; Zuber, Maria; [2004]; 1 pp.; In English; Fall AGU Meeting, 13-17 Dec. 2004, San Francisco, CA, USA; Copyright; Avail: Other Sources; Abstract Only

We report on new observations of the orbital position of Phobos, and use them to obtain a new and improved estimate of the rate of secular acceleration in longitude due to tidal dissipation within Mars. Phobos is the inner-most natural satellite of Mars, and one of the few natural satellites in the solar system with orbital period shorter than the rotation period of its primary. As a result, any departure from a perfect elastic response by Mars in the tides raised on it by Phobos will cause a transfer of angular momentum from the orbit of Phobos to the spin of Mars. Since its discovery in 1877, Phobos has completed over 145,500 orbits, and has one of the best studied orbits in the solar system, with over 6000 earth-based astrometric observations, and over 300 spacecraft observations. As early as 1945, Sharpless noted that there is a secular acceleration in mean longitude, with rate (1.88 + 0.25) 10(exp -3) degrees per square year. In preparation for the 1989 Russian spacecraft mission to Phobos, considerable work was done compiling past observations, and refining the orbital model. All of the published estimates from that era are in good agreement. A typical solution (Jacobson et al., 1989) yields (1.249 + 0.018) 10(exp -3) degrees per square year. The MOLA instrument on MGS is a laser altimeter, and was designed to measure the topography of Mars. However, it has also been used to make observations of the position of Phobos. In 1998, a direct range measurement was made, which indicated that Phobos was slightly ahead of the predicted position. The MOLA detector views the surface of Mars in a narrow field of view, at 1064 nanometer wavelength, and can detect shadows cast by Phobos on the surface of Mars. We have found 15 such serendipitous shadow transit events over the interval from xx to xx, and all of them show Phobos to be ahead of schedule, and getting progressively farther ahead of the predicted position. In contrast, the cross-track positions are quite close to the predicted values. Assuming that the along-track discrepancy is small enough that we can linearize the corrections, we model the mean orbital longitude as a quadratic function of time, and solve for corrections to the constant, linear, and quadratic terms. The time span of the recent observations is insufficient to properly resolve this issue alone, but when the 127 years of prior observations are added, we find a solution which reduces misfit to the new observations considerably, and makes no significant change to the fit to earlier observations. Our estimate for the secular acceleration term is (1.367 + 0.006) degrees per square year. The corresponding rate of energy dissipation is 3.34 MW. From a geophysical perspective, a more interesting parameter than the secular acceleration itself is the tidal lag angle, or tidal quality factor Q, for Mars. Unfortunately, the limiting error source in that determination is remaining uncertainty in the tidal Love numbers at harmonic degrees 2,3, and even 4. Until those parameters are better constrained, improvement in the orbital model of Phobos will not provide corresponding benefits for understanding the interior of Mars.

Author

Astrometry; Laser Altimeters; Phobos Spacecraft; Acceleration; Mars Surface; Natural Satellites

20050071098 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Goddard Space Flight Center Spacecraft Magnetic Test Facility Restoration Project

Vernier, Robert; Bonalksy, Todd; Slavin, James; [2004]; 11 pp.; In English; 23rd Space Simulation Conference Proceedings; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The Goddard Space Flight Center Spacecraft Magnetic Test Facility (SMTF) was constructed in the 1960's for the purpose of simulating geomagnetic and interplanetary magnetic field environments. The facility includes a three axis Braunbek coil system consisting of 12 loops, 4 loops on each of the three orthogonal axes; a remote Earth field sensing magnetometer and servo controller; and a remote power control and instrumentation building. The inner coils of the Braunbek system are 42-foot in diameter with a 10-foot by 10-foot opening through the outer coils to accommodate spacecraft access into the test volume. The physical size and precision of the facility are matched by only two other such facilities in the world. The facility was used extensively from the late 1960's until the early 1990's when the requirement for spacecraft level testing diminished. New NASA missions planned under the Living with a Star, Solar Terrestrial Probes, Explorer, and New Millennium Programs include precision, high-resolution magnetometers to obtain magnetic field data that is critical to fulfilling their scientific mission. It is highly likely that future Lunar and Martian exploration missions will also use precision magnetometers to conduct geophysical magnetic surveys. To ensure the success of these missions, ground-testing using a magnetic test facility such as the GSFC SMTF will be required. This paper describes the history of the facility, the future mission requirements that have renewed the need for spacecraft level magnetic testing, and the plans for restoring the facility to be capable of performing to its original design specifications.

Author

Geomagnetism; Interplanetary Magnetic Fields; Restoration; Test Facilities; Spacecraft Design; NASA Space Programs

20050071536 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical System Design and Integration of the Mercury Laser Altimeter
Ramos-Izquierdo, Luis; Scott, V. Stanley, III; Schmidt, Stephen; Britt, Jamie; Mamakos, William; Trunzo, Raymond; Cavanaugh, John; Miller, Roger; January 05, 2005; 38 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The Mercury Laser Altimeter (MLA). developed for the 2004 MESSENGER mission to Mercury, is designed to measure the planet's topography via laser ranging. A description of the MLA optical system and its measured optical performance during instrument-level and spacecraft-level integration and testing are presented.
Author
Laser Altimeters; Optical Equipment; Systems Engineering; Mercury (Planet); NASA Space Programs; Systems Integration

20050071554 Stanford Linear Accelerator Center, CA, USA
Inflation Induced Planck-Size Black Hole Remnants As Dark Matter
Chen, P.; 2003; 16 pp.; In English
Report No.(s): DE2004-827299; SLAC-PUB-10538; No Copyright; Avail: Department of Energy Information Bridge

While there exist various candidates, the identification of dark matter remains unresolved. Recently it was argued that the generalized uncertainty principle (GUP) may prevent a black hole from evaporating completely, and as a result there should exist a Planck-size BHR at the end of its evaporation. We speculate that the stability of BHR may be further protected by supersymmetry in the form of extremal black hole. If this is indeed the case and if a sufficient amount of small black holes can be produced in the early universe, then the resultant BHRs can be an interesting candidate for DM. We demonstrate that this is the case in the hybrid inflation model. By assuming BHR as DM, our notion imposes a constraint on the hybrid inflation potential. We show that such a constraint is not fine-tuned. Possible observational signatures are briefly discussed.
NTIS
Black Holes (Astronomy); Dark Matter

92
SOLAR PHYSICS

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

20050070873 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The 'Approximate 150 Day Quasi-Periodicity' in Interplanetary and Solar Phenomena During Cycle 23
Richardson, I. G.; Cane, H. V.; [2004]; 5 pp.; In English
Contract(s)/Grant(s): NCC5-180; Copyright; Avail: CASI; A01, Hardcopy

A'quasi-periodicity' of approx. 150 days in various solar and interplanetary phenomena has been reported in earlier solar cycles. We suggest that variations in the occurrence of solar energetic particle events, inter-planetary coronal mass ejections, and geomagnetic storm sudden commenceents during solar cycle 23 show evidence of this quasi-periodicity, which is also present in the sunspot number, in particular in the northern solar hemisphere. It is not, however, prominent in the interplanetary magnetic field strength.
Author
Coronal Mass Ejection; Solar Storms; Solar Cosmic Rays

20050070874 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The October-November, 2003 Solar Activity and its Relationship to the 'approximately 155 day' Solar Periodicity
Richardson, I. G.; Cane, H. V.; [2005]; ISSN 0094-8276; 4 pp.; In English
Contract(s)/Grant(s): NCC5-180; No Copyright; Avail: CASI; A01, Hardcopy

Periodicities of - 155 days in various solar and interplanetary phenomena were first discovered during solar cycle 21 and have been shown t o be intermittently present in other solar cycles. In the current solar cycle (23), they have been reported in solar energetic particle events and interplanetary coronal maSS ejections. We assess whether the 'unexpected' October - November 2003 burst of solar activity during the late declining phase of the cycle may have been a manifestation of such a periodic behavior, and hence might have been to =me extent 'predictable'. If the pattern were to continue, episodes of

enhanced activity might be expected around April - May and October, 2004. There was a mod- est increase activity increase in mid-April, 2004 which may conform to this pattern.
Author
Solar Cycles; Coronal Mass Ejection; Solar Corpuscular Radiation

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20050061201 NASA Langley Research Center, Hampton, VA, USA
A Simple Model for Straggling Evaluation
Wilson, J. W.; Tweed, J.; Tai, H.; Tripathi, R. K.; Nuclear Instruments and Methods in Physics Research B; 2002; ISSN 0168-583X; Volume 194, pp. 389-392; In English
Contract(s)/Grant(s): NCC1-396; Copyright; Avail: Other Sources

Simple straggling models had largely been abandoned in favor of Monte Carlo simulations of straggling which are accurate but time consuming, limiting their application in practice. The difficulty of simple analytic models is the failure to give accurate values past 85% of the particle range. A simple model is derived herein based on a second order approximation upon which rapid analysis tools are developed for improved understanding of material charged particle transmission properties.
Author
Mathematical Models; Charged Particles; Penetration; Extraterrestrial Radiation

20050061202 NASA Langley Research Center, Hampton, VA, USA
An Improved Green's Function for Ion Beam Transport
Tweed, J.; Wilson, J. W.; Tripathi, R. K.; [2003]; 8 pp.; In English
Contract(s)/Grant(s): NCC1-396; No Copyright; Avail: CASI; A02, Hardcopy

Ion beam transport theory allows testing of material transmission properties in the laboratory environment generated by particle accelerators. This is a necessary step in materials development and evaluation for space use. The approximations used in solving the Boltzmann transport equation for the space setting are often not sufficient for laboratory work and those issues are the main emphasis of the present work. In consequence, an analytic solution of the linear Boltzmann equation is pursued in the form of a Green's function allowing flexibility in application to a broad range of boundary value problems. It has been established that simple solutions can be found for the high charge and energy (HZE) by ignoring nuclear energy downshifts and dispersion. Such solutions were found to be supported by experimental evidence with HZE ion beams when multiple scattering was added. Lacking from the prior solutions were range and energy straggling and energy downshift with dispersion associated with nuclear events. Recently, we have found global solutions including these effects providing a broader class of HZE ion solutions.
Author
Boltzmann Transport Equation; Ion Beams; Extraterrestrial Radiation; Transport Theory

20050061206 NASA Langley Research Center, Hampton, VA, USA
Towards a 3D Space Radiation Transport Code
Wilson, J. W.; Tripathl, R. K.; Cicomptta, F. A.; Heinbockel, J. H.; Tweed, J.; [2002]; 8 pp.; In English
Contract(s)/Grant(s): NCC1-396
Report No.(s): Rept-2002-01-2333; Copyright; Avail: CASI; A02, Hardcopy

High-speed computational procedures for space radiation shielding have relied on asymptotic expansions in terms of the off-axis scatter and replacement of the general geometry problem by a collection of flat plates. This type of solution was derived for application to human rated systems in which the radius of the shielded volume is large compared to the off-axis diffusion limiting leakage at lateral boundaries. Over the decades these computational codes are relatively complete and lateral diffusion effects are now being added. The analysis for developing a practical full 3D space shielding code is presented.
Author
Extraterrestrial Radiation; Radiation Shielding; Radiation Transport

20050070875 NASA Goddard Space Flight Center, Greenbelt, MD, USA

EGRET Diffuse Gamma Ray Maps Between 30 MeV and 10 GeV

Cillis, A. N.; Hartman, R. C.; [2004]; 1 pp.; In English; Copyright; Avail: Other Sources

This paper presents all-sky maps of diffuse gamma radiation in various energy ranges between 30 MeV and 10 GeV, based on data collected by the EGRET instrument on the Compton Gamma Ray Observatory. Although the maps can be used for a variety of applications, the immediate goal is the generation of diffuse gamma-ray maps which can be used as a diffuse background/foreground for point source analysis of the data to be obtained from new high-energy gamma-ray missions like GLAST and AGILE. To generate the diffuse gamma maps from the raw EGRET maps, the point sources in the Third EGRET Catalog were subtracted out using the appropriate point spread function for each energy range. After that, smoothing was performed to minimize the effects of photon statistical noise. A smoothing length of 1deg was used for the Galactic plane maps. For the all-sky maps, a procedure was used which resulted in a smoothing length roughly equivalent to 4deg. The result of this work is 16 maps of different energy intervals for [b]less than or equal to 20deg, and 32 all-sky maps, 16 in equatorial coordinates (J2000) and 16 in Galactic coordinates.

Author

Diffuse Radiation; Gamma Rays; Mapping; Coordinates

20050071112 Naval Sea Systems Command, Crane, IN, USA

Solar Variability and the Near-Earth Environment: Mining Enhanced Low Dose Rate Sensitivity Data From the Microelectronics and Photonics Test Bed Space Experiment

Turflinger, T.; Schmeichel, W.; Krieg, J.; Titus, J.; Campbell, A.; Reeves, M.; Marshall (P.); Hardage, Donna, Technical Monitor; August 2004; 133 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TP-2004-213339; M-1120; No Copyright; Avail: CASI; A07, Hardcopy

This effort is a detailed analysis of existing microelectronics and photonics test bed satellite data from one experiment, the bipolar test board, looking to improve our understanding of the enhanced low dose rate sensitivity (ELDRS) phenomenon. Over the past several years, extensive total dose irradiations of bipolar devices have demonstrated that many of these devices exhibited ELDRS. In sensitive bipolar transistors, ELDRS produced enhanced degradation of base current, resulting in enhanced gain degradation at dose rates \h0.1 rd(Si)/s compared to similar transistors irradiated at dose rates \g1 rd(Si)/s. This Technical Publication provides updated information about the test devices, the in-flight experiment, and both flight-and ground-based observations. Flight data are presented for the past 5 yr of the mission. These data are compared to ground-based data taken on devices from the same date code lots. Information about temperature fluctuations, power shutdowns, and other variables encountered during the space flight are documented.

Author

Data Mining; Radiation Damage; Spaceborne Experiments; Radiation Dosage; Bipolar Transistors; Extraterrestrial Environments

20050071537 Naval Research Lab., Washington, DC, USA

Displacement Damage Effects in Solar Cells: Mining Damage From the Microelectronics and Photonics Test Bed Space Experiment

Hardage, Donna, Technical Monitor; Walters, R. J.; Morton, T. L.; Messenger, S. R.; August 2004; 43 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TP-2004-213338; M-1119; No Copyright; Avail: CASI; A03, Hardcopy

The objective is to develop an improved space solar cell radiation response analysis capability and to produce a computer modeling tool which implements the analysis. This was accomplished through analysis of solar cell flight data taken on the Microelectronics and Photonics Test Bed experiment. This effort specifically addresses issues related to rapid technological change in the area of solar cells for space applications in order to enhance system performance, decrease risk, and reduce cost for future missions.

Author

Radiation Damage; Solar Cells; Extraterrestrial Radiation; Computerized Simulation

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GENERAL

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

20050061325 Weskem, LLC, Paduch, KY, USA, Weston (Roy F.), Inc., Albuquerque, NM, USA
Justification for Selecting Level a vs. Level B Personal Protective Equipment to Remediate a Room Containing Concentrated Acids, Bases and Radiological Constituents
Hylko, J. M.; Thompson, A. L.; Walter, J. F.; Deecke, T. A.; 2002; 14 pp.; In English
Report No.(s): DE2004-827908; No Copyright; Avail: Department of Energy Information Bridge

This paper summarizes the Occupational Safety and Health Administration regulations addressing Level A versus Level B, and provides justification for selecting Level B over Level A without under-protecting the employee during a particular remediation scenario. The scenario consisted of an entry team performing (1) an initial entry into a room containing concentrated acids (e.g., hydrofluoric acid), bases, and radiological constituents; (2) sampling and characterizing container contents; and (3) retrieving characterized containers. The invasive nature of the hydrofluoric acid sampling and characterization scenario created a high potential for splash, immersion, and exposure to hazardous vapors, requiring additional skin protection. The hazards associated with this scenario and the chemical nature of hydrofluoric acid provided qualitative evidence to justify Level A. Once the hydrofluoric acid was removed from the room, PPE performance was evaluated against the remaining chemical inventory.
NTIS
Hydrofluoric Acid; Containers; Protection

20050061331 Oak Ridge Y-12 Plant, TN, USA
Effective Implementation of DOE Restart Orders and Standards for Deactivation Facilities
Tindal, W. C.; Daniels, D. L.; 2002; 12 pp.; In English
Report No.(s): DE2004-827116; No Copyright; Avail: Department of Energy Information Bridge

Building 9206 at the Y-12 National Security Complex has recently completed an Operational Readiness Review (ORR). The scope of the review covered the transition from a post operation surveillance and maintenance (S&M) mode to a deactivation mode. This process has generated several lessons learned that may be valuable to other Department of Energy (DOE) nuclear facilities.
NTIS
Deactivation; Maintainability; Maintenance

20050070711 NASA, Washington, DC, USA
Taming Liquid Hydrogen: The Centaur Upper Stage Rocket
2004; In English; Original contains color illustrations
Report No.(s): NASA/SP-2004-4606; No Copyright; Avail: CASI; C01, CD-ROM

The Centaur is one of the most powerful rockets in the world. As an upper-stage rocket for the Atlas and Titan boosters it has been a reliable workhorse for NASA for over forty years and has played an essential role in many of NASA's adventures into space. In this CD-ROM you will be able to explore the Centaur's history in various rooms to this virtual museum. Visit the 'Movie Theater' to enjoy several video documentaries on the Centaur. Enter the 'Interview Booth' to hear and read interviews with scientists and engineers closely responsible for building and operating the rocket. Go to the 'Photo Gallery' to look at numerous photos of the rocket throughout its history. Wander into the 'Centaur Library' to read various primary documents of the Centaur program. Finally, stop by the 'Observation Deck' to watch a virtual Centaur in flight.
Author
Centaur Launch Vehicle; Educational Resources; Histories

20050071650 Kurchatov (I. V.) Inst. of Atomic Energy, Severodvinsk, USSR, Academy of Sciences (USSR), Svierdlovsk, USSR, Department of Energy, Germantown, MD, USA, Science Applications International Corp., Germantown, MD, USA
Russian Containers for Transportation of Solid Radioactive Waste
Petrushenko, V. G.; Baal, E. P.; Tsvetkov, D. Y.; Korb, V. R.; Nikitin, V. S.; 2002; 18 pp.; In English
Report No.(s): DE2004-827665; No Copyright; Avail: Department of Energy Information Bridge

The Russian Shipyard Zvyozdochka has designed a new container for transportation and storage of solid radioactive

wastes. The PST1A-6 container is cylindrical shaped and it can hold seven standard 200-liter (55-gallon) drums. The steel wall thickness is 6 mm, which is much greater than standard U.S. containers. These containers are fully certified to the Russian GOST requirements, which are basically identical to U.S. and IAEA standards for Type A containers. They can be transported by truck, rail, barge, ship, or aircraft and they can be stacked in 6 layers in storage facilities. The first user of the PST1A-6 containers is the Northern Fleet of the Russian Navy, under a program sponsored jointly by the U.S. DoD and DOE. This paper will describe the container design and show how the first 400 containers were fabricated and certified.
NTIS
Containers; Radioactive Wastes; Solid Wastes

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