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Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

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- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

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  NASA Center for AeroSpace Information
  7115 Standard Drive
  Hanover, MD 21076-1320

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Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and worldwide aerospace-related scientific and technical information (STI). Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related research and development (R&D) results.

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

STAR includes citations to R&D results reported in:

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

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

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The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

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NASA Center for AeroSpace Information (CASI)

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

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form, e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 443-757-5802. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

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

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Prog ram** to ensure access for the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal depository libraries at http://www.gpoaccess.gov/index.html.

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

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

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Subject Term Index

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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.

20090030115 National Inst. of Justice, Washington, DC USA
Helicopters in Pursuit Operations
Aug. 1999; 6 pp.; In English
Report No.(s): PB2008-107200; No Copyright; Avail.: CASI: A02, Hardcopy

While existing information on the uses, costs, and effectiveness of helicopters in police operations generally indicates that the helicopter can play a valuable role, there has been no research that examined the uses and productivity of the helicopter in pursuit operations. This research study conducted for the National Institute of Justice addressed these issues. This Research in Action presents findings and assessments from a study of helicopters used in pursuit operations for the Baltimore City and Miami-Dade County Police Departments.
NTIS
Helicopters; Police

20090030129 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Aerodynamic Shape Optimization by Means of Sequential Linear Programming Techniques
Carpentieri, G.; Van Tooren, M. J. L.; Koren, B.; Feb. 2007; 20 pp.; In English
Report No.(s): PB2008-108134; MAS-R0703; Copyright; Avail.: National Technical Information Service (NTIS)

A Sequential Linear Programming technique, known as the method of centers, is the driver of an aerodynamic shape optimization framework on unstructured meshes. The first order information required by this technique, functional values and their gradients, are computed by a median-dual flow/adjoint solver which is coupled to an analytical shape parameterization. Functional and geometric constraints are easily handled by the algorithm which appears to be very effective in obtaining efficiently near-optimal designs. Shape optimization results are presented for transonic as well as supersonic flows involving appreciable shape deformations.
NTIS
Aerodynamic Configurations; Linear Programming; Shape Optimization

20090030728 Department of Transportation, Washington, DC, USA
U.S. Department of Transportation Office of Inspector General Semiannual Report to Congress, April 1-September 30, 2007
January 2007; 85 pp.; In English
Report No.(s): PB2008-108094; No Copyright; Avail.: CASI: A05, Hardcopy

Our audit activities addressed such issues as improving airline customer service, assessing DOT preparations for granting Mexican trucks the authority to operate in the U.S., quantifying the growth in highway construction and maintenance costs, and identifying information security weaknesses. Our investigative activities involved matters as diverse as selling fraudulent aircraft parts, falsifying airman medical certificates, rigging bids and falsifying records on highway projects, using substandard construction materials, and illegally transporting hazardous materials. This semiannual period culminated with the issuance of 38 audit reports and 95 recommendations having a financial impact totaling about $38,275,000. In addition, our investigative work resulted in 64 convictions and a total of $122,311,180 in fines, restitutions and recoveries We also testified

before Congress on 14 occasions primarily on the safety of our nations transportation system, including aviation, highway, motor carrier, and railroad safety.
NTIS
Congressional Reports; Inspection; Transportation

20090030897 NASA Langley Research Center, Hampton, VA, USA
Engine Concept Study for an Advanced Single-Aisle Transport
Guynn, Mark D.; Berton, Jeffrey J.; Fisher, Kenneth L.; Haller, William J.; Tong, Michael; Thurman, Douglas R.; August 2009; 97 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07.13.04
Report No.(s): NASA/TM-2009-215784; L-19712; LF-9138; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030897

The desire for higher engine efficiency has resulted in the evolution of aircraft gas turbine engines from turbojets, to low bypass ratio, first generation turbofans, to today's high bypass ratio turbofans. Although increased bypass ratio has clear benefits in terms of propulsion system metrics such as specific fuel consumption, these benefits may not translate into aircraft system level benefits due to integration penalties. In this study, the design trade space for advanced turbofan engines applied to a single aisle transport (737/A320 class aircraft) is explored. The benefits of increased bypass ratio and associated enabling technologies such as geared fan drive are found to depend on the primary metrics of interest. For example, bypass ratios at which mission fuel consumption is minimized may not require geared fan technology. However, geared fan drive does enable higher bypass ratio designs which result in lower noise. The results of this study indicate the potential for the advanced aircraft to realize substantial improvements in fuel efficiency, emissions, and noise compared to the current vehicles in this size class.
Author
Aircraft Design; Gas Turbine Engines; Turbojet Engines; Noise Reduction; Engine Design

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.

20090029946 NASA Langley Research Center, Hampton, VA, USA
Simultaneous Multiple-Location Separation Control
Greenblatt, David, Inventor; May 26, 2009; 6 pp.; In English
Patent Info.: Filed 22 Sep. 2005; US-Patent-7537182; NASA-Case-LAR-17017-1; US-Patent-Appl-SN-11/250700; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029946

A method of controlling a shear layer for a fluid dynamic body introduces first periodic disturbances into the fluid medium at a first flow separation location. Simultaneously, second periodic disturbances are introduced into the fluid medium at a second flow separation location. A phase difference between the first and second periodic disturbances is adjusted to control flow separation of the shear layer as the fluid medium moves over the fluid dynamic body.
Author
Boundary Layer Separation; Shear Layers; Flow Distribution; Airfoils

20090029977 NASA Langley Research Center, Hampton, VA, USA
Design of Mach-4 and Mach-6 Nozzles for the NASA LaRC 8-Ft High Temperature Tunnel
Gaffney, Richard L., Jr.; August 03, 2009; 11 pp.; In English; 45th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 3-5 Aug. 2009, Denver, CO, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.03.03.01
Report No.(s): LF99-8150; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029977

The aerodynamic contours for two new nozzles have been designed for the NASA Langley Research Center 8-Foot High Temperature Tunnel. The new Mach-4 and Mach-6 contours have 54.5-inch exit-diameters allowing for testing at high dynamic pressures. The Mach-4 nozzle will extend the test capability of the facility and allow turbine-based combined-cycle

propulsion systems to be tested at conditions appropriate for the transition from the turbine to the scramjet flowpath. The Mach-6 nozzle will serve a dual purpose; to provide a Mach-6 test capability at high dynamic pressure and to be used in conjunction with an existing mixer section for testing at lower enthalpy conditions. This second use will extend the life of the existing Mach-7 nozzle which has been used for this purpose. The two new nozzles, in conjunction with existing nozzles, will allow for testing at Mach numbers of 3, 4, 5 and 6 at high dynamic pressures, and Mach 4, 5 and 7 at lower dynamic pressures but larger scales.
Author
Dynamic Pressure; High Temperature; Nozzle Design; Hypersonic Nozzles; Supersonic Combustion Ramjet Engines; Contours; Supersonic Speed; Hypersonic Speed; Supersonic Nozzles

20090030131 Federal Aviation Administration, Washington, DC USA
Aeronautical Information Manual: Official Guide to Basic Flight Information and ATC (Air Traffic Control) Procedures, February 14, 2008
Feb. 14, 2008; 670 pp.; In English
Report No.(s): PB2008-107842; No Copyright; Avail.: National Technical Information Service (NTIS)
This manual is designed to provide the aviation community with basic flight information and ATC procedures for use in the National Airspace System (NAS) of the USA. An international version called the Aeronautical Information Publication contains parallel information, as well as specific information on the international airports for use by the international community. This manual contains the fundamentals required in order to fly in the USA NAS. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms used in the ATC System, and information on safety, accident, and hazard reporting. This manual is complemented by other operational publications which are available via separate subscriptions.
NTIS
Air Traffic Control; Airspace; Information; Manuals; Air Traffic

20090030132 Federal Aviation Administration, Washington, DC USA
Aeronautical Information Publication, USA of America. Nineteenth Edition, March 15, 2007
Mar. 15, 2007; 704 pp.; In English
Report No.(s): PB2008-107843; No Copyright; Avail.: National Technical Information Service (NTIS)
The AIP is prepared in accordance with the Standards and Recommended Practices (SARP) of Annex 15 to the Convention on International Civil Aviation and the Aeronautical Information Services Manual (ICAO Doc 8126). Charts contained in the AIP are produced in accordance with Annex 4 to the Convention on International Civil Aviation and the Aeronautical Chart Manual (ICAO Doc8697). Differences from ICAO Standards, Recommended Practices and Procedures are given in subsection GEN 1.7. The AIP is made up of three Parts; General (GEN), En Route (ENR), and Aerodromes (AD); each divided into sections and subsections as applicable, containing various types of information subjects.
NTIS
Air Navigation; Airports; Civil Aviation; United States

20090030511 NASA Dryden Flight Research Center, Edwards, CA, USA
Static Aeroelastic Effects of Formation Flight for Slender Unswept Wings
Hanson, Curtis E.; August 2009; 35 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2009-214649; H-2980; DFRC-988; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030511
The static aeroelastic equilibrium equations for slender, straight wings are modified to incorporate the effects of aerodynamically-coupled formation flight. A system of equations is developed by applying trim constraints and is solved for component lift distribution, trim angle-of-attack, and trim aileron deflection. The trim values are then used to calculate the elastic twist distribution of the wing box. This system of equations is applied to a formation of two gliders in trimmed flight. Structural and aerodynamic properties are assumed for the gliders, and solutions are calculated for flexible and rigid wings in solo and formation flight. It is shown for a sample application of two gliders in formation flight, that formation disturbances produce greater twist in the wingtip immersed in the vortex than for either the opposing wingtip or the wings of a similar

airplane in solo flight. Changes in the lift distribution, resulting from wing twist, increase the performance benefits of formation flight. A flexible wing in formation flight will require greater aileron deflection to achieve roll trim than a rigid wing.
Author
Aerodynamic Characteristics; Aeroelasticity; Formation Flying; Angle of Attack; Lift; Slender Wings

20090030952 Royal Aircraft Establishment, Farnborough, UK
Longitudinal Stability and Trim Changes at Speeds Near the Speed of Sound
Smelt, R; Jan 1944; 23 pp.; In English
Report No.(s): AD-A800658; RAE-AERO-1911; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA800658

By considering a typical aircraft design at both low subsonic and high supersonic speeds, where its aerodynamic characteristics can be roughly calculated by simple theory, some indications of the nature of the changes in longitudinal stability and trim of an aircraft to be expected on passing through the speed of sound are obtained.
DTIC
Acoustic Velocity; Aerodynamic Characteristics; Longitudinal Stability

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.

20090029955 L Three Communications Government Services, Chantilly , VA, USA
Analysis of Trajectory Flexibility Preservation Impact on Traffic Complexity
Idris, Husni; El-Wakil, Tarek; Wing, David J.; August 10, 2009; 14 pp.; In English; AIAA Guidance, Navigation, and Control Conference (GNC) 2009, 10-13 Aug. 2009, Chicato, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNA07BA86C; WBS 411931.02.51.07.01
Report No.(s): LF99-8345; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029955

The growing demand for air travel is increasing the need for mitigation of air traffic congestion and complexity problems, which are already at high levels. At the same time new information and automation technologies are enabling the distribution of tasks and decisions from the service providers to the users of the air traffic system, with potential capacity and cost benefits. This distribution of tasks and decisions raises the concern that independent user actions will decrease the predictability and increase the complexity of the traffic system, hence inhibiting and possibly reversing any potential benefits. In answer to this concern, the authors proposed the introduction of decision-making metrics for preserving user trajectory flexibility. The hypothesis is that such metrics will make user actions naturally mitigate traffic complexity. In this paper, the impact of using these metrics on traffic complexity is investigated. The scenarios analyzed include aircraft in en route airspace with each aircraft meeting a required time of arrival in a one-hour time horizon while mitigating the risk of loss of separation with the other aircraft, thus preserving its trajectory flexibility. The experiments showed promising results in that the individual trajectory flexibility preservation induced self-separation and self-organization effects in the overall traffic situation. The effects were quantified using traffic complexity metrics, namely dynamic density indicators, which indicated that using the flexibility metrics reduced aircraft density and the potential of loss of separation.
Author
Air Traffic Control; Routes; Airspace; Air Transportation; Predictions; Trajectories; Decision Making; Air Traffic

20090029978 NASA Langley Research Center, Hampton, VA, USA
Methodologies for Adaptive Flight Envelope Estimation and Protection
Tang, Liang; Roemer, Michael; Ge, Jianhua; Crassidis, Agamemnon; Prasad, J. V. R.; Belcastro, Christine; August 10, 2009; 14 pp.; In English; AIAA Guidance, Navigation and Control Conference (GNC) 2009, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX09CE94P; WBS 457280.02.07.07
Report No.(s): LF99-9243; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029978

This paper reports the latest development of several techniques for adaptive flight envelope estimation and protection

system for aircraft under damage upset conditions. Through the integration of advanced fault detection algorithms, real-time system identification of the damage/faulted aircraft and flight envelop estimation, real-time decision support can be executed autonomously for improving damage tolerance and flight recoverability. Particularly, a bank of adaptive nonlinear fault detection and isolation estimators were developed for flight control actuator faults; a real-time system identification method was developed for assessing the dynamics and performance limitation of impaired aircraft; online learning neural networks were used to approximate selected aircraft dynamics which were then inverted to estimate command margins. As off-line training of network weights is not required, the method has the advantage of adapting to varying flight conditions and different vehicle configurations. The key benefit of the envelope estimation and protection system is that it allows the aircraft to fly close to its limit boundary by constantly updating the controller command limits during flight. The developed techniques were demonstrated on NASA s Generic Transport Model (GTM) simulation environments with simulated actuator faults. Simulation results and remarks on future work are presented.
Author
Flight Envelopes; Flight Control; Fault Detection; System Identification; Real Time Operation; Actuators; Damage; Flight Conditions

20090030040 Next Generation Air Transportation System, Washington, DC, USA
Business Case for the Next Generation Air Transportation System Version 1.0
24 Aug. 2007; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A496136; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030040

The Joint Planning and Development Office (JPDO) developed this Business Case for the Next Generation Air Transportation System (NextGen) to inform business strategies and investment planning. The NextGen Business Case is intended to provide a characterization of the aviation environment and the motivation to move to NextGen, present an overview of the projected cost of NextGen implementation, and offer an indication of the benefits that are likely to accrue from the successful implementation of the operational concepts that comprise NextGen. The Business Case represents an integration of data from a number of sources, including the Concept of Operations (ConOps) for the Next Generation Air Transportation System, analyses conducted by the JPDO System and Engineering Analysis Division, Federal Aviation Administration (FAA) and partner agency budget information, and aviation demand forecasts. Booz Allen Hamilton, under contract to the FAA, gathered the data and analyses referenced in the plan and integrated the information to provide a succinct overview of the NextGen system and its associated costs and benefits. This Business Case presents a case for NextGen in a manner more akin to a commercial business case than that of a traditional government cost/benefit analysis. The plan's goal is to analyze the market situation, identify compelling business opportunities, communicate the NextGen implementation goal and how it can be attained, lay out the plan for reaching the stated goals, and present expected benefits and investments required to achieve those goals. This document presents cost and benefits estimates that are based on the best data currently available. Because the path to NextGen will occur over nearly 20 years, cost data is necessarily much more precise for the near term and less so for the later time periods. Also, it is expected that in the near future, more accurate cost estimates for partner agencies other than the FAA will be available.
Author
Air Transportation; Civil Aviation; Commerce; Cost Analysis

20090030052 NASA, Washington, DC, USA
Integrated Surveillance for the Next Generation Air Transportation System. Final Report of the Integrated Surveillance Study Team
31 Oct. 2008; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A496140; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030052

Effective operation of the national air transportation system - for civil aviation, national defense, and homeland security - rests on accurate airspace situational awareness. While progress has been made by the U.S. Government in fielding surveillance capabilities to support this situational awareness, gaps remain that cause operational risks and stand as obstacles to achieving the vision for the Next Generation Air Transportation System (NextGen). Creation of a formal interagency governance mechanism for Integrated Aviation Transportation System Surveillance (also referred to as Integrated Surveillance) would provide a synergy of effort in policy development, requirements generation, technology maturation, and acquisition and operation of surveillance systems, leading to improved overall capabilities and overall cost savings. This report outlines current key deficiencies in integrated surveillance as well as national surveillance needs projected forward to 2025

for U.S. sovereign airspace, air approaches to the USA, and U.S. airport movement areas. These areas are considered critical to providing appropriate aviation security while maximizing the U.S. Government's ability to provide safe and uninterrupted airborne operations of manned and unmanned aircraft engaged in commerce, defense/security of the homeland, and other flight operations. This report was compiled by the Integrated Surveillance Study Team (ISST), consisting of members from the Joint Planning and Development Office (JPDO), Federal Aviation Administration (FAA), Department of Defense (DoD), and the Department of Homeland Security (DHS). Multiple departments and agencies have a need for Aviation Transportation System surveillance information and have existing resources and planned programs to meet their mission needs: the FAA, DHS, DoD and Department of Commerce.
Author
Air Traffic; Air Transportation; Surveillance

20090030103 Federal Aviation Administration, Washington, DC USA
FAA's Implementation of Runway Status Lights
Jan. 14, 2008; 21 pp.; In English
Report No.(s): PB2008-108162; AV-2008-021; No Copyright; Avail.: CASI: A03, Hardcopy

This report provides the results of our review of the Federal Aviation Administrations (FAA) implementation of Runway Status Lights (RWSL). We conducted this review as part of our ongoing efforts to assess FAAs actions to reduce runway incursions. The objectives of our audit were to (1) determine RWSLs viability for reducing runway incursions and (2) assess FAAs progress in implementing the system. Our review was conducted between June and January of 2008 and included site visits to Dallas/Fort Worth International Airport (DFW) and FAA Headquarters. Exhibit A details our scope and methodology.
NTIS
Runways; Runway Lights; Airports; Collision Avoidance; Airfield Surface Movements

20090030113 Committee on Government Operations (U.S. House), Washington, DC, USA
Information Security Breach at TSA (Transportation Security Administration): Traveler Redress Website
Jan. 2008; 12 pp.; In English
Report No.(s): PB2008-106926; No Copyright; Avail.: CASI: A03, Hardcopy

TSA was created on November 19, 2001, just two months after the 9/11 attacks. The agency was charged with day-to-day Federal security screening operations for passenger air transportation. One of its earliest actions was to split the Federal Aviation Administration's watchlist of persons not allowed to board commercial airlines into two separate lists: a No-Fly List and a Selectee List. Individuals on the No-Fly List are not allowed to board commercial flights, while travelers on the Selectee List are allowed to board only after additional security screening procedures. TSA does not publicly confirm the names on the lists or the criteria it uses to add names to the lists. According to press accounts, the size of these lists increased rapidly after September 11, 2001, as a variety of government agencies submitted names. One consequence of the growth of the No-Fly and Selectee Lists was the dramatic increase in false positives, cases in which travelers with names identical or similar to names of suspected terrorists were prevented from boarding flights or were singled out for additional security inspections. Well-known false positives include Senator Ted Kennedy, whose name was close to the name of a suspected terrorist, and Catherine Stevens, the wife of Senator Ted Stevens, whose name was similar to Cat Stevens, the former name of the singer Yusuf Islam. Investigations by GAO and the Department of Justice Inspector General have revealed significant inaccuracies in the two watch lists. In June 2005, the Justice Department IG reported a number of weaknesses in the completeness and accuracy of the Terrorist Screening Center (TSC) database, the central database maintained by the FBI from which names for the No-Fly Lists are extracted. A 2007 follow-up to this audit found that weaknesses persist in the management of the TSC database and that 43% of the names reported to the TSC are false positives.
NTIS
Air Transportation; Aircraft Safety; Flight Safety; Security; Transportation; Websites

20090030200 Transportation Research Board, Washington, DC USA
Deicing Practices: ACRP Fact Sheets
Jan. 2009; 145 pp.; In English
Report No.(s): PB2009-112790; No Copyright; Avail.: CASI: A07, Hardcopy

This practice considers opportunities to use alternative aircraft-deicing products that have a reduced environmental impact, primarily in terms of the biochemical oxygen demand (BOD) found in the freeze-point depressants and aquatic

toxicity associated with additives required to meet certification specifications. Product selection is typically the responsibility of aircraft operators and their contractors.
NTIS
Deicing; Management Systems

20090030262 Federal Aviation Administration, Washington, DC USA
Air Traffic Control: Potential Fatigue Factors
Jun. 29, 2009; 22 pp.; In English
Report No.(s): PB2009-113528; AV-2009-065; No Copyright; Avail.: CASI: A03, Hardcopy

Fatigue is defined as a mental weariness resulting from exertion. Fatigue can be mental or physical and can manifest as either somnolence (decreased wakefulness) or as a general decrease in attention. Fatigue can cause problems for individuals who perform tasks that require constant concentration, such as air traffic control. Additionally, the nature of air traffic control requires shift work, which can exacerbate fatigue because it often requires individuals to work at times when they would normally be sleeping or sleep at times when they would normally be awake. Since the 1980s, the National Transportation Safety Board (NTSB) has been concerned about the effects of fatigue on individuals performing critical functions in all transportation industries, including air traffic control. The NTSB has made numerous fatigue-related safety recommendations addressing topics such as rest periods between shifts, scheduling practices, and fatigue awareness training for personnel working in the transportation industry.
NTIS
Air Traffic; Air Traffic Controllers (Personnel); Human Factors Engineering

20090030517 NASA Langley Research Center, Hampton, VA, USA
Aircraft Accident Prevention: Loss-of-Control Analysis
Kwatny, Harry G.; Dongmo, Jean-Etienne T.; Chang, Bor-Chin; Bajpai, Guarav; Yasar, Murat; Belcastro, Christine M.; August 10, 2009; 14 pp.; In English; AAIA Guidance, Navigation and Control Conference, 10 - 13 Aug. 2009, Chicago, IL, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NNX09CE93P; WBS 457280.02.07.07
Report No.(s): LF99-9242; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030517

The majority of fatal aircraft accidents are associated with loss-of-control . Yet the notion of loss-of-control is not well-defined in terms suitable for rigorous control systems analysis. Loss-of-control is generally associated with flight outside of the normal flight envelope, with nonlinear influences, and with an inability of the pilot to control the aircraft. The two primary sources of nonlinearity are the intrinsic nonlinear dynamics of the aircraft and the state and control constraints within which the aircraft must operate. In this paper we examine how these nonlinearities affect the ability to control the aircraft and how they may contribute to loss-of-control. Examples are provided using NASA s Generic Transport Model.
Author
Aircraft Accident Investigation; Aircraft Accidents; Aircraft Control; Dynamic Control; Flight Envelopes

20090030602 NASA Glenn Research Center, Cleveland, OH, USA
Proceedings of the Airframe Icing Workshop
Colantonio, Ron O., Editor; July 2009; 187 pp.; In English; Airframe Icing Workshop, 9 Jun. 2009, Cleveland, OH, USA; See also 20090030603 - 20090030611; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280.02.07.03.02
Report No.(s): NASA/CP-2009-215797; E-17059; Copyright; Avail.: CASI: A09, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030602

The NASA Glenn Research Center (GRC) has a long history of working with its partners towards the understanding of ice accretion formation and its associated degradation of aerodynamic performance. The June 9, 2009, Airframe Icing Workshop held at GRC provided an opportunity to examine the current NASA airframe icing research program and to dialogue on remaining and emerging airframe icing issues and research with the external community. Some of the airframe icing gaps identified included, but are not limited to, ice accretion simulation enhancements, three-dimensional benchmark icing database development, three-dimensional iced aerodynamics modeling, and technology development for a smart icing system.
Author
Airframes; Ice Formation; Aerodynamic Characteristics; Three Dimensional Flow

20090030603 NASA Glenn Research Center, Cleveland, OH, USA
NASA Iced Aerodynamics and Controls Current Research
Addy, Gene; Proceedings of the Airframe Icing Workshop; July 2009, pp. 35-46; In English; See also 20090030602; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030603

This slide presentation reviews the state of current research in the area of aerodynamics and aircraft control with ice conditions by the Aviation Safety Program, part of the Integrated Resilient Aircraft Controls Project (IRAC). Included in the presentation is a overview of the modeling efforts. The objective of the modeling is to develop experimental and computational methods to model and predict aircraft response during adverse flight conditions, including icing. The Aircraft icing modeling efforts includes the Ice-Contaminated Aerodynamics Modeling, which examines the effects of ice contamination on aircraft aerodynamics, and CFD modeling of ice-contaminated aircraft aerodynamics, and Advanced Ice Accretion Process Modeling which examines the physics of ice accretion, and works on computational modeling of ice accretions. The IRAC testbed, a Generic Transport Model (GTM) and its use in the investigation of the effects of icing on its aerodynamics is also reviewed. This has led to a more thorough understanding and models, both theoretical and empirical of icing physics and ice accretion for airframes, advanced 3D ice accretion prediction codes, CFD methods for iced aerodynamics and better understanding of aircraft iced aerodynamics and its effects on control surface effectiveness.
CASI
Aerodynamics; Aircraft Icing; Aircraft Safety; Flight Conditions; Flight Safety; Aircraft Hazards

20090030604 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Academic Airframe Icing Perspective
Bragg, Mike; Rothmayer, Alric; Thompson, David; Proceedings of the Airframe Icing Workshop; July 2009, pp. 149-167; In English; See also 20090030602; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030604

2-D ice accretion and aerodynamics reasonably well understood for engineering applications To significantly improve our current capabilities we need to understand 3-D: a) Important ice accretion physics and modeling not well understood in 3-D; and b) Aerodynamics unsteady and 3-D especially near stall. Larger systems issues important and require multidisciplinary team approach
Derived from text
Aerodynamics; Airframes; Ice Formation

20090030605 NASA Glenn Research Center, Cleveland, OH, USA
Icing Simulation
Bidwell, Colin; Proceedings of the Airframe Icing Workshop; July 2009, pp. 71-86; In English; See also 20090030602; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030605

A grid block transformation scheme which allows the input of grids in arbitrary reference frames, the use of mirror planes, and grids with relative velocities has been developed. A simple ice crystal and sand particle bouncing scheme has been included.. Added an SLD splashing model based on that developed by William Wright for the LEWICE 3.2.2 software. A new area based collection efficiency algorithm will be incorporated which calculates trajectories from inflow block boundaries to outflow block boundaries. This method will be used for calculating and passing collection efficiency data between blade rows for turbo-machinery calculations.
Author
Ice Formation; Computational Grids; Simulation; Splashing

20090030606 NASA Glenn Research Center, Cleveland, OH, USA
Airframe Icing Research Gaps: NASA Perspective
Potapczuk, Mark; Proceedings of the Airframe Icing Workshop; July 2009, pp. 87-100; In English; See also 20090030602; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030606

qCurrent Airframe Icing Technology Gaps: Development of a full 3D ice accretion simulation model. Development of an improved simulation model for SLD conditions. CFD modeling of stall behavior for ice-contaminated wings/tails.

Computational methods for simulation of stability and control parameters. Analysis of thermal ice protection system performance. Quantification of 3D ice shape geometric characteristics Development of accurate ground-based simulation of SLD conditions. Development of scaling methods for SLD conditions. Development of advanced diagnostic techniques for assessment of tunnel cloud conditions. Identification of critical ice shapes for aerodynamic performance degradation. Aerodynamic scaling issues associated with testing scale model ice shape geometries. Development of altitude scaling methods for thermal ice protections systems. Development of accurate parameter identification methods. Measurement of stability and control parameters for an ice-contaminated swept wing aircraft. Creation of control law modifications to prevent loss of control during icing encounters. 3D ice shape geometries. Collection efficiency data for ice shape geometries. SLD ice shape data, in-flight and ground-based, for simulation verification. Aerodynamic performance data for 3D geometries and various icing conditions. Stability and control parameter data for iced aircraft configurations. Thermal ice protection system data for simulation validation.
Derived from text
Airframes; Ice Formation; Thermal Protection; Aerodynamic Characteristics; Computational Fluid Dynamics; Control Theory; Ice Prevention

20090030607 NASA Glenn Research Center, Cleveland, OH, USA
NASA Airframe Icing Research Overview Past and Current
Potapczuk, Mark; Proceedings of the Airframe Icing Workshop; July 2009, pp. 1-34; In English; See also 20090030602; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030607

This slide presentation reviews the past and current research that NASA has done in the area of airframe icing. Both the history experimental efforts and model development to understand the process and problem of ice formation are reviewed. This has resulted in the development of new experimental methods, advanced icing simulation software, flight dynamics and experimental databases that have an impact on design, testing, construction and certification and qualification of the aircraft and its sub-systems.
Author
Aircraft Design; Airframes; Computerized Simulation; Aircraft Icing; Experimentation

20090030608 Cessna Aircraft Co., Wichita, KS, USA
Small Airframe Manufacturer's Icing Perspective
Hoppins, Jim; Proceedings of the Airframe Icing Workshop; July 2009, pp. 119-147; In English; See also 20090030602; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030608

This viewgraph presentation describes the icing effects, risk mitigation practices, and icing certifications for various Cessna small aircraft models. NASA's role in the development of simulation tools for icing certifications is also discussed.
CASI
Cessna Aircraft; Ice Formation; Airframes; Manufacturing; Aircraft Models

20090030609 Goodrich (B. F.) Co., Akron, OH, USA
An Ice Protection and Detection Systems Manufacturer's Perspective
Sweet, Dave; Proceedings of the Airframe Icing Workshop; July 2009, pp. 169-176; In English; See also 20090030602; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030609

Accomplishments include: World Class Aircraft Icing Research Center and Facility. Primary Sponsor/Partner - Aircraft Icing Consortia/Meetings. Icing Research Tunnel. Icing Test Aircraft. Icing Codes - LEWICE/Scaling, et al. Development of New Technologies (SBIR, STTR, et al). Example: Look Ahead Ice Detection. Pilot Training Materials. Full Cooperation with Academia, Government and Industry.
Derived from text
Aircraft Icing; Ice Formation; Ice Prevention; Pilot Training; Detection; Deicing

20090030610 Federal Aviation Administration, Washington, DC, USA
FAA Perspective
Bond, Tom; Proceedings of the Airframe Icing Workshop; July 2009, pp. 101-118; In English; See also 20090030602; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030610

This viewgraph presentation describes the Federal Aviation Administration's perspective on improvements on aircraft icing. The most important areas that are discussed include: 1) Improvements in SLD engineering tools to meet concerns about means of compliance (MOC); and 2) 3-D iced aerodynamics.
CASI
Aerodynamics; Aircraft Icing; Computational Fluid Dynamics; Aeronautics; Airframes

20090030611 NASA Glenn Research Center, Cleveland, OH, USA
Icing Branch Current Research Activities in Icing Physics
Vargas, Mario; Proceedings of the Airframe Icing Workshop; July 2009, pp. 47-86; In English; See also 20090030602; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030611

Current development: A grid block transformation scheme which allows the input of grids in arbitrary reference frames, the use of mirror planes, and grids with relative velocities has been developed. A simple ice crystal and sand particle bouncing scheme has been included. Added an SLD splashing model based on that developed by William Wright for the LEWICE 3.2.2 software. A new area based collection efficiency algorithm will be incorporated which calculates trajectories from inflow block boundaries to outflow block boundaries. This method will be used for calculating and passing collection efficiency data between blade rows for turbo-machinery calculations.
Author
Computational Grids; Ice Formation; Trajectories; Algorithms; Crystals

20090030643 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 74, Number 2, February 1931
Giffin, Stewart S; Crouch, Edwin H; Feb. 1931; 85 pp.; In English
Report No.(s): AD-A502670; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: The Effect of the Development of Aviation Upon the Missions and Responsibilities of the C.A.C., by Colonel P. P. Bishop, C.A.C.; New Developments in Warfare, by General C. P. Summerall; The British Army Exercises of 1930, by Captain B. H. Liddell Hart; Industry and National Defense (Part 2), by Major General George Van Horn Moseley, U.S.A.; Hawaii Nei, by Lieutenant G. A. Hadsell, C.A.C.; Practical Peace-Time Leadership: The 'Case Method' Applied to an All-Important Phase of Military Education, by Major O. W. Griswold, Infantry; What's the Matter with the Reserve? by Major F. J. Baum, 605th C.A. (Ry); Tables of Organization for the Antiaircraft Regiment; Comments on the Article 'The Case of Tracers vs. Sights' by Machine Gunner; Radio in the Philippine Islands, by 1st Lieutenant A. D. Whittaker, Jr., C.A.C.; Cooperation, by Captain Harry R. Pierce, C.A.C. The remainder of the issue contains the following features: Current Events Overseas; Coast Artillery Association Notes; Coast Artillery Activities; Coast Artillery Board Notes; Professional Notes on Air Corps Division Maneuvers, Device for Training Spotters, The Radio Telephone, and the War Department General Council; Coast Artillery Orders; You Tell Em; and book reviews.
DTIC
Artillery; Coasts; Military Operations; United Kingdom

20090030754 Waterloo Univ., Ontario, Canada; Applied Pavement Technology, Inc., Urbana, IL, USA
Implementation of an Airport Pavement Management System
Tighe, S.; Covalt, M.; Feb. 2008; 26 pp.; In English
Report No.(s): PB2008-109272; TRANSPORTATION RESEARCH CIR-E-C127; No Copyright; Avail.: CASI: A03, Hardcopy

This circular discusses the implementation of an Airport Pavement Management System (APMS). The role of an APMS, as well as the data requirements for the implementation and update of an APMS, are explained. It also reviews the benefits and costs associated with the implementation of an APMS, as well as the challenges commonly faced by those agencies implementing an APMS. The primary steps involved in implementing an APMS include identifying the APMS users and their

needs, conducting a pavement inventory, evaluating pavement condition, customizing APMS software as needed, analyzing data, generating reports and other outputs, and obtaining training on the APMS process and software. After an APMS has been implemented, continued support and update of it is critical.
NTIS
Airports; Maintenance; Management Systems; Pavements; Runways

20090030989 Massachusetts Inst. of Tech., Cambridge, MA, USA
Variations Among Pilots from Different Flight Operations in Party Line Information Requirements for Situation Awareness
Pritchett, Amy; Hansman, John; Air Traffic Control Quarterly; 1997; Volume 4, No. 1, pp. 29-50; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG2-716; Copyright; Avail.: Other Sources

Current air traffic control communications use shared VHF voice frequencies from which pilots can obtain 'party line' information (PLI) by overhearing communications addressed to other aircraft. Previous studies have shown that pilots perceive PLI to be important. There is concern that some critical PLI may be lost in the proposed data link environment, where communications will be discretely addressed. Different types of flight operations will be equipped with data link equipment at different times, generating a mixed environment in which some pilots will rely on PLI, while others will receive their information by data link. To research the importance, availability, and accuracy of PLI and to query pilots on the information they feel is necessary for global situation awareness, a survey was distributed to pilots. The pilots were selected from four flight operation groups to study the variations in PLI requirements in the mixed data link environment. Pilots perceived PLI to be important overall, with specific traffic and weather information elements identified as critical. Most PLI elements followed a pattern of higher perceived importance during terminal area operations, final approach, and landing. Pilots from the different flight operation groups identified some elements as particularly important. In a free-response question designed to identify the information requirements for global situation awareness, pilots frequently indicated a need for traffic and weather information. The results of this survey reveal specific concerns to be addressed when implementing data link communications.
Author
Situational Awareness; Flight Operations; Very High Frequencies; User Requirements; Air Traffic Control; Approach

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.

20090030498 Idaho National Lab., Idaho Falls, ID, USA
Time-Slotted On-Demand Routing Protocol for Mobile Ad Hoc Unmanned Vehicle Systems. SPIE Defense and Security Symposium, Unmanned Systems Technology
Forsmann, J. H.; Hiromoto, R. E.; Svoboda, J.; Apr. 2007; 4 pp.; In English
Report No.(s): DE2008-923478; INL/CON-06-11083; No Copyright; Avail.: National Technical Information Service (NTIS)

The popularity of UAVs has increased dramatically because of their successful deployment in military operations, their ability to preserve human life, and the continual improvements in wireless communication that serves to increase their capabilities. We believe the usefulness of UAVs would be dramatically increased if formation flight were added to the list of capabilities. Currently, sustained formation flight with a cluster of UAVs has only been achieved with two nodes by the Multi-UAV Testbed at the Massachusetts Institute of Technology. Formation flight is a complex operation requiring the ability to adjust the flight patterns on the fly and correct for wind gusts, terrain, and differences in node equipment. All of which increases the amount of inner node communication. Since one of the problems with MANET communication is network congestion, we believe a first step towards formation flight can be made through improved inner node communication. We have investigated current communication routing protocols and developed an altered hybrid routing protocol in order to provide communication with less network congestion.
NTIS
Command and Control; Wireless Communication; Formation Flying; Flight Control; Air Navigation; Aircraft Maneuvers; Pilotless Aircraft; Unmanned Aircraft Systems

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.

20090030001 NASA Langley Research Center, Hampton, VA, USA
Remotely Piloted Vehicles for Experimental Flight Control Testing
Motter, Mark A.; High, James W.; August 10, 2009; 14 pp.; In English; AUVSI's Unmanned Systems North America 2009, 10-13 Aug. 2009, Washington, DC, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07.11.04
Report No.(s): LF99-8230; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030001

A successful flight test and training campaign of the NASA Flying Controls Testbed was conducted at Naval Outlying Field, Webster Field, MD during 2008. Both the prop and jet-powered versions of the subscale, remotely piloted testbeds were used to test representative experimental flight controllers. These testbeds were developed by the Subsonic Fixed Wing Project s emphasis on new flight test techniques. The Subsonic Fixed Wing Project is under the Fundamental Aeronautics Program of NASA's Aeronautics Research Mission Directorate (ARMD). The purpose of these testbeds is to quickly and inexpensively evaluate advanced concepts and experimental flight controls, with applications to adaptive control, system identification, novel control effectors, correlation of subscale flight tests with wind tunnel results, and autonomous operations. Flight tests and operator training were conducted during four separate series of tests during April, May, June and August 2008. Experimental controllers were engaged and disengaged during fully autonomous flight in the designated test area. Flaps and landing gear were deployed by commands from the ground control station as unanticipated disturbances. The flight tests were performed NASA personnel with support from the Maritime Unmanned Development and Operations (MUDO) team of the Naval Air Warfare Center, Aircraft Division
Author
Autonomy; Flight Control; Flight Tests; Remotely Piloted Vehicles; Unmanned Aircraft Systems

20090030164 International Trade Commission, Washington, DC, USA
China's Growing Market for Large Civil Aircraft
Anderson, P.; Feb. 2008; 66 pp.; In English
Report No.(s): PB2009-113515; USITC-ID-18; No Copyright; Avail.: National Technical Information Service (NTIS)

China will likely become the largest market in the world for new large civil aircraft (LCA), with global LCA manufacturers expecting to sell 100 LCA per year in the Chinese market for the next twenty years, or one every three to four days, at a total value ranging up to $350 billion. The challenge for western LCA producers in meeting this demand comes less from each other than from the regulation of Chinas market by its government, the lack of adequate air transport infrastructure to serve its population, and Chinas nascent attempt at building its own LCA. Should China continue to aggressively address governmental and infrastructure restraints, it will benefit through increased trade and tourism, both of which will spur LCA sales to satisfy air transport demand. This paper describes Chinas growing market for LCA and the challenges for LCA producers in realizing Chinas potential market. It further discusses Chinas trade in LCA and parts, U.S. exports and imports with China, key infrastructure and regulatory challenges in China, and Chinas ambitions of building a domestic LCA by 2020.
NTIS
China; Civil Aviation; Air Transportation

20090030256 Northwestern Univ., Evanston, IL USA
Effects of Manufacturing Defects and Scaling on Glass Fiber Composite Sandwich Panels in General Aviation Aircraft Structures
Bayldon, J.; Daniel, I. M.; Bazant, Z.; May 2009; 70 pp.; In English
Report No.(s): PB2009-113251; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents the collaborative effort between the USA and Canada to investigate the impact of process-induced defects on strength and stiffness under static and fatigue loading and for low-cost composite aircraft structures, in particular, general aviation aircraft. The emphasis was on safety, reliability, and certification. The research involved manufacturing sandwich panels with process-induced defects (porosity) and used destructive and nondestructive analyses to characterize the defects. The sandwich panels were also tested under compressive loading to measure the severity of the defect for strength

and stiffness assessment. The test results on monolithic and sandwich beams indicated that the failure mode under compression load of the sandwich, in most realistic cases, will be dictated by the longitudinal stiffness of the sandwich facesheets, the shear modulus of the core, and the geometry of the sandwich. Although the porosity acts to reduce the static strength of the facesheets (20% at 4% porosity), it had no significant effect on the factors that affect the static strength of the sandwich, such as longitudinal stiffness. For the scaling/size effect study, sandwich specimens of various sizes (geometrically scaled in the ratio 1:2:4:8) were subjected to eccentric axial compression and tested to failure. The sandwich core consisted of a closed-cell polyvinyl chloride foam, and the facesheets were woven glass/epoxy laminates, scaled by increasing the number of plies. The test results revealed a size effect on the mean nominal strength, which was strong enough to require consideration in design. The observed size effect was fitted with the size effect law of the energetic (deterministic) size effect theory. However, because of inevitable scatter and limited testing range, the precise form of the energetic size effect law to describe the test results was not unambiguous. The Weibull-type statistical size effect on the mean strength was ruled out because the specimens had small notches that caused the failure to occur in only one place in the specimen. The observed failure mode was shear band propagation, previously shown to cause energetic size effect.
NTIS
Composite Structures; Defects; Fiber Composites; General Aviation Aircraft; Glass Fibers; Manufacturing; Sandwich Structures

20090030353 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Airfoil Optimization by Using the Manifold Mapping Method
Van der Jagt, M.; Jun. 2007; 64 pp.; In English
Report No.(s): PB2008-108714; MAS-E0709; Copyright; Avail.: National Technical Information Service (NTIS)
In this report it is investigated if the Manifold Mapping method can be used in airfoil optimization. Before the method can be implemented, a suitable airfoil parametrization must be chosen. Furthermore a coarse and fine model must be assigned. These models are the key to success for the Manifold Mapping method. If two models are chosen that are completely different from each other, the Manifold Mapping will not work properly. Furthermore, if two models are chosen that are very similar to each other, the benefit in reducing computational cost will be only marginal. In this report the Manifold Mapping method will be explained in detail and applied to airfoil design. The approach is validated by using a test case, which will also be explained in detail. Furthermore recommendations and extensions will be given in the last chapter.
NTIS
Airfoils; Defects; Correction; Optimization

20090030361 Joint Aircraft Survivability Program Office (JASPO), Arlington, VA USA
Aircraft Survivability. Spring 2009
Lindell, Dennis; Jan 2009; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A501555; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501555
Articles in this issue: Reducing Aircraft Combat Casualties; The JASPO Casualty Assessment Initiative; Full Spectrum Crashworthiness Criteria; Crashworthiness--An Army Science and Technology Perspective; DESCENT's Contribution to Rotorcraft Vulnerability Analysis; Excellence in Survivability--Charles E. Frankenberger III; Methodology for Assessing Tri-Service Personnel Casualties; Surviving an Aircraft Crash with Airbag Restraints; Pioneer in Survivability--Walter S. Thompson III
DTIC
Aircraft; Vulnerability

20090030386 Air Force Research Lab., Wright-Patterson AFB, OH USA
Aero-Optics Code Development Experimental Databases and AVUS Code Improvements
Sherer, Scott E.; Mar. 2009; 72 pp.; In English
Contract(s)/Grant(s): Proj-A08A; 62764
Report No.(s): AD-A501509; AFRL-RB-WP-TR-2009-3076; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501509
Work has been performed in and coordinated by the Computational Sciences Branch to develop an in-house aero-optics predictive capability. This interim report summarizes the first two years of this effort. The work during this period has focused

on acquiring high-quality experimental databases consisting of both aerodynamic and aero-optical measurements for future code validation, and the evaluation and improvement of the unstructured flow solver AVUS to solve representative flow fields.
DTIC
Coding; Computational Fluid Dynamics; Data Bases; Shear Flow

20090030617 Stresswave, Inc., Kent, WA USA
Evaluation of the StressWave Cold Working (SWCW) Process on High-Strength Aluminum Alloys for Aerospace
Easterbrook, Eric T; Landy, Michael A; Feb. 2009; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-06-C-5606; Proj-3005
Report No.(s): AD-A502693; TR-AL20-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This report was developed under a SBIR contract. A new and innovative cold working process called StressWave Cold Working (SWCW) was investigated and compared to the conventional split sleeve cold working method that is used to enhance the fatigue life of fastener holes in high strength aluminum alloys used on USAF aircraft structures. StressWave cold working was found to be superior in enhancing fatigue lives compared to split sleeve cold working in both constant amplitude and spectrum fatigue loading environments, when used in its preferred embodiment, upstream cold working. The investigation also included extensive finite element analysis, in the post-yield regime which revealed the presence of deep compressive stresses throughout the thickness of specimens examined. This study also evaluated the fatigue and crack growth performance of over 300 specimens, which demonstrated the superior performance of Upstream StressWave cold working as compared to the split sleeve method. The new method was also shown to be significantly less expensive than the split sleeve method for a USAF fighter aircraft program currently under development. Various production implementation methods were investigated and proof-of-concept physical and hardware models were produced.
DTIC
Aerospace Vehicles; Airframes; Aluminum Alloys; Cold Working; Evaluation; High Strength Alloys; System Effectiveness

20090030625 Royal Aircraft Establishment, Farnborough, UK
Design of a Pilotless Target Aircraft
Smith, F.; Nov. 1945; 19 pp.; In English
Report No.(s): AD-A800663; RAE-TN-AERO-1716; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Drone Vehicles; Pilotless Aircraft; Targets

20090030635 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 72, Number 3, March 1930
Giffin, Stewart S.; Miller, Charles R.; Mar 1930; 96 pp.; In English
Report No.(s): AD-A502667; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of The Coast Artillery Journal contains the following articles: Comments on the Revision of T.R. 435-55, Coast Artillery Target Practice (Parts I and II), by the Coast Artillery Board; Communications to and from Airplanes in Flight, by Captain Fred G. Borden, Signal Corps; The Value of Training a National Guard Unit in Association with a Regular Unit, by Major Joseph D. Eisenbrown, 213th C.A. (AA); The Robot Brothers -- Gunners, by Lieutenant Arthur Willink, O.D.; Constructive Economy, by Captain George H. Rarey, Infantry (Tanks); and The Tortoise-Boat and the Flying Thunderbolt, by 1st Lieutenant E. Carl Engelhart, C.A.C. The remainder of this issue contains the following features: Coast Artillery Activities; Professional Notes on The New Formula for the B Component of the Seacoast Artillery score, An Antiaircraft Training Target, Projectile Cleaning Machine, and Change in Training Regulations for 155-G.P.F.; Coast Artillery Board Notes; You Tell Em; Coast Artillery Orders; Extracts from Foreign Periodicals; and book reviews.
DTIC
Armed Forces (United States); Artillery; Coasts; Education; Radio Equipment; Regulations; Scoring; Targets; Telecommunication

20090030657 Ohio State Univ., Columbus, OH USA

Robust Data Alignment and its Application in an Integrated Multi-Sensor Surveillance System Consisting of UAVs and Fixed Platforms. The Current and Future Phase of the RASER Project

Ozguner, U.; Jwa, S.; Martin, J.; Redmill, K.; Jan 2009; 91 pp.; In English

Contract(s)/Grant(s): FA8650-05-1-1854; Proj-6095

Report No.(s): AD-A502286; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502286

This report introduces a new algorithm called Robust Data Alignment (RDA) for persistent sensing in multi-layered sensor network. Invariant features collected from a set of images are used for image registration. Information-theoretic cost models a functional structure where an optimal transformation can be recovered from feature representations of different but related images. By using a cooperative search strategy, we believe that RDA can help to understand and deal with many situations in persistent sensor networks by solving problems such as Layered sensing, Multi-modal data fusion, Multi-UAV sensing. In addition, we provide Georegistration for CLIF 2007 dataset. SIFT algorithm after georeferencing recovers a correspondence for data registration.

DTIC

Algorithms; Alignment; Drone Vehicles; Masers; Multisensor Applications; Pilotless Aircraft; Surveillance; Systems Integration; Target Recognition

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.

20090030497 Idaho National Lab., Idaho Falls, ID, USA

High Performance Piezoelectric Actuated Gimbal (HIERAX).49th Annual Conference of the Idaho Academy of Sciences

Tschaggeny, C.; Jones, W.; Bamberg, E.; Apr. 2007; 12 pp.; In English

Report No.(s): DE2008-923493; INL/CON-07-12887; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents a 3-axis gimbal whose three rotational axes are actuated by a novel drive system: linear piezoelectric motors whose linear output is converted to rotation by using drive disks. Advantages of this technology are: fast response, high accelerations, dither-free actuation and backlash-free positioning. The gimbal was developed to house a laser range finder for the purpose of tracking and guiding unmanned aerial vehicles during landing maneuvers. The tilt axis was built and the test results indicate excellent performance that meets design specifications.

NTIS

Gimbals; Piezoelectricity; Pilotless Aircraft; Piezoelectric Motors

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.

20090030135 California Univ., Riverside, CA USA

Measurement Allowance Project On-Road Validation

Miller, J. W.; Jan. 2008; 106 pp.; In English

Contract(s)/Grant(s): CARBRA-03-345

Report No.(s): PB2008-107904; No Copyright; Avail.: CASI: A06, Hardcopy

Regulations were promulgated requiring the measurement of emissions from diesel engines while operating within the No-To-Exceed (NTE) control area of the engine map. These measurements require the use of portable emissions measurement systems (PEMS) rather than traditional laboratory methods. To provide input into the determination of a measurement 'allowance' that would account for differences between a laboratory measurement and PEMS, a comprehensive Measurement

Allowance testing project was set-up and governed by the Measurement Allowance Steering Committee (MASC). In the first phase of the project emissions measured with PEMS and federal reference were compared for an engine on a dynamometer while the environmental conditions were changed for the PEMS unit. These data were fitted to a Monte Carlo model. In a second phase, the goal was to compare the measurements from PEMS with federal reference methods during actual in-use driving using the University of California, Riverside (UCR) Bourns College of Engineering-Center for Environmental Research and Technology's (CE-CERT) Mobile Emissions Laboratory (MEL). Prior to the on-road testing portion, MEL underwent an audit following 40CFR Par 1065 and a side-by-side comparison with emissions measured at the SwRI laboratory. Results were viewed to be comparable. This report focuses on the on-road comparison of the PEMS measuring in the raw exhaust with gaseous instruments measuring flow and concentrations from a full dilution tunnel according to the Code of Federal Regulations (CFR).
NTIS
Air Pollution; Diesel Engines; Pollution Control; Roads

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.

20090030026 NASA Langley Research Center, Hampton, VA, USA
A Direct Adaptive Control Approach in the Presence of Model Mismatch
Joshi, Suresh M.; Tao, Gang; Khong, Thuan; August 10, 2009; 17 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 736466
Report No.(s): LF99-8350; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030026

This paper considers the problem of direct model reference adaptive control when the plant-model matching conditions are violated due to abnormal changes in the plant or incorrect knowledge of the plant's mathematical structure. The approach consists of direct adaptation of state feedback gains for state tracking, and simultaneous estimation of the plant-model mismatch. Because of the mismatch, the plant can no longer track the state of the original reference model, but may be able to track a new reference model that still provides satisfactory performance. The reference model is updated if the estimated plant-model mismatch exceeds a bound that is determined via robust stability and/or performance criteria. The resulting controller is a hybrid direct-indirect adaptive controller that offers asymptotic state tracking in the presence of plant-model mismatch as well as parameter deviations.
Author
Adaptive Control; Model Reference Adaptive Control; Controllers; Control Theory

20090030053 Next Generation Air Transportation System, Washington, DC, USA
Concept of Operations for the Next Generation Air Transportation System, Version 2.0
Jun 13, 2007; 220 pp.; In English; Original contains color illustrations
Report No.(s): AD-A496134; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030053

The Joint Planning and Development Office (JPDO) is developing a Concept of Operations (ConOps) for the Next Generation Air Transportation System (NextGen). The final version of the ConOps will provide an overall, integrated view of NextGen operations in the 2025 timeframe, including key transformations from today's operations. The development of the ConOps is an iterative and evolutionary process that will encompass the input and feedback of the aviation community. This is Version 2.0 of the document, which includes accepted comments resulting from an internal review and an expanded breadth of the NextGen concepts. The purpose of this document is to provide all aviation stakeholders with an iterative version of the NextGen ConOps in order to gain further consensus from their comments for incremental improvement. Details of the JPDO comment and review process can be found at www.jpdo.gov. This document identifies key research and policy issues that need resolution to achieve national goals for air transportation. In many cases, this document presents 'aggressive' concepts that have not been validated, but are envisioned to maximize benefits and flexibility for NextGen users. Many potential futures are possible, and much will depend on the insights gained by the evolution of the ConOps. The research and policy issues referenced throughout the text appear in detail in Appendices D and E, respectively. They are referenced within each chapter

as [R-#] or [P-#]. Comments directed at refining these research and policy issues are requested. The following page outlines the expected development chronology of the ConOps.
Author
Air Transportation; Civil Aviation; Policies

20090030482 NASA Langley Research Center, Hampton, VA, USA
An Indirect Adaptive Control Scheme in the Presence of Actuator and Sensor Failures
Sun, Joy Z.; Josh, Suresh M.; August 10, 2009; 19 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 736466
Report No.(s): LF99-8359; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030482

The problem of controlling a system in the presence of unknown actuator and sensor faults is addressed. The system is assumed to have groups of actuators, and groups of sensors, with each group consisting of multiple redundant similar actuators or sensors. The types of actuator faults considered consist of unknown actuators stuck in unknown positions, as well as reduced actuator effectiveness. The sensor faults considered include unknown biases and outages. The approach employed for fault detection and estimation consists of a bank of Kalman filters based on multiple models, and subsequent control reconfiguration to mitigate the effect of biases caused by failed components as well as to obtain stability and satisfactory performance using the remaining actuators and sensors. Conditions for fault identifiability are presented, and the adaptive scheme is applied to an aircraft flight control example in the presence of actuator failures. Simulation results demonstrate that the method can rapidly and accurately detect faults and estimate the fault values, thus enabling safe operation and acceptable performance in spite of failures.
Author
Actuators; Adaptive Control; Aircraft Control; Failure; Flight Control; Sensors

20090030626 Royal Aircraft Establishment, Farnborough, UK
The Use of Rocket-Propelled Flying Models for Experiments at Transonic Speeds
Jun. 1946; 15 pp.; In English
Report No.(s): AD-A800662; RAE-TN-GAS-26; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A proposal is made to investigate the transonic speed range by means of a liquid-rocket-propelled guided missile. This guided missile is launched from an airplane at high altitude and is observed by radio and radar. A brief description of the guided missile is given. The future development of this experimenting method is discussed. A drawing illustrates a longitudinal projection of the transonic guided missile and curves illustrate its estimated performance during flight.
DTIC
Missiles; Transonic Speed

20090030986 NASA Langley Research Center, Hampton, VA, USA
Aircraft Flight Envelope Determination using Upset Detection and Physical Modeling Methods
Keller, Jeffrey D.; McKillip, Robert M. Jr.; Kim, Singwan; August 10, 2009; 21 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX09CE91P; NNL07AA63P; WBS 736466.11.01.07.43.17.01
Report No.(s): LF99-9220; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030986

The development of flight control systems to enhance aircraft safety during periods of vehicle impairment or degraded operations has been the focus of extensive work in recent years. Conditions adversely affecting aircraft flight operations and safety may result from a number of causes, including environmental disturbances, degraded flight operations, and aerodynamic upsets. To enhance the effectiveness of adaptive and envelope limiting controls systems, it is desirable to examine methods for identifying the occurrence of anomalous conditions and for assessing the impact of these conditions on the aircraft operational limits. This paper describes initial work performed toward this end, examining the use of fault detection methods applied to the aircraft for aerodynamic performance degradation identification and model-based methods for envelope prediction. Results are presented in which a model-based fault detection filter is applied to the identification of aircraft control surface and stall departure failures/upsets. This application is supported by a distributed loading aerodynamics formulation for

the flight dynamics system reference model. Extensions for estimating the flight envelope due to generalized aerodynamic performance degradation are also described.
Author
Adaptive Control; Aircraft Control; Flight Control; Degradation; Control Systems Design; Aerodynamic Characteristics

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)*.

20090030054 Next Generation Air Transportation System, Washington, DC, USA
Security Annex Concept of Operations for the Next Generation Air Transportation System Version 2.0
13 Jun. 2007; 52 pp.; In English; Original contains color illustrations
Report No.(s): AD-A496137; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030054; http://hdl.handle.net/100.2/ADA496137

The Joint Planning and Development Office (JPDO) is developing a concept of operations (ConOps) for the Next Generation Air Transportation System (NextGen). The final version of the ConOps will provide an overall and integrated view of NextGen operations in the 2025 timeframe, including key transformations from today's operations. The overall document also identifies key research and policy issues that need resolution to achieve national goals for air transportation. The development of the ConOps is an iterative and evolutionary process that will progress using input and feedback from the aviation community. This document provides the aviation community with a preview of the NextGen ConOps and receive their comments for improvements. Details of the JPDO comment and review process can be found at the Tech Hanger at www.jpdo.aero. The full version of this document will include accepted comments for the NextGen concepts related to the following; * Airport operations and mission support * Air traffic management planning and mission support services * Flight operations planning and mission support services * Layered adaptive security services * Network-enabled infrastructure services * Shared situational awareness services * Safety management services * Environmental management services * Compliance, regulation, and harmonization services. Often, this document presents 'aggressive' concepts that have not been validated but are envisioned as attainable goals to maximize benefits and flexibility for NextGen users of 2025 and beyond. Many potential futures are possible, and much will depend on the insights gained by the evolution and increasing specificity of the ConOps.
Author
Air Transportation; Civil Aviation; Risk; Security

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*.

20090029988 NASA Johnson Space Center, Houston, TX, USA
Apollo: Learning From the Past, For the Future
Grabois, Michael R.; [2009]; 21 pp.; In English; 60th International Astronomical Congress, 12-16 Oct. 2009, Daejeon, Korea, Republic of; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNJ06VA01C
Report No.(s): JSC-CN-18726; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029988

This paper shares an interesting and unique case study of knowledge capture by the National Aeronautics and Space Administration (NASA), an ongoing project to recapture and make available the lessons learned from the Apollo lunar landing project so that those working on future projects do not have to 'reinvent the wheel'. NASA's new Constellation program, the successor to the Space Shuttle program, proposes a return to the Moon using a new generation of vehicles. The Orion Crew Vehicle and the Altair Lunar Lander will use hardware, practices, and techniques descended and derived from Apollo, Shuttle

and the International Space Station. However, the new generation of engineers and managers who will be working with Orion and Altair are largely from the decades following Apollo, and are likely not well aware of what was developed in the 1960s. In 2006 a project at NASA's Johnson Space Center was begun to find pertinent Apollo-era documentation and gather it, format it, and present it using modern tools for today's engineers and managers. This 'Apollo Mission Familiarization for Constellation Personnel' project is accessible via the web from any NASA center for those interested in learning 'how did we do this during Apollo?'
Author
Apollo Project; Constellation Program; Lessons Learned; Manned Space Flight; Documentation; Mission Planning

20090030355 Deal Corp., Yellow Springs, OH USA
Embedding Cognitive Systems into Systems Engineering Practice
Deal, Steven V; Dec 2008; 117 pp.; In English
Contract(s)/Grant(s): FA8650-06-C-6638; Proj-3005
Report No.(s): AD-A501511; AF05071.2-F-2009; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501511

Research and Development of the Acquisition Practitioner Support Environment (APSE) is described. Product is a web-enabled guide to in-engineers, human systems engineers/integrators and cognitive engineers. Deliverables were selected for value in incorporating human abilities, limitations, preferences and costs in development, operations and sustainment activities. APSE instantiates a model process, the goal of which is to provide improved mission performance and reduced total ownership costs. Also described are efforts to create market for the product. These activities involved creating awareness of human systems integration and cognitive engineering value in systems engineering and project/program management communities.
DTIC
Aerospace Systems; Cognition; Embedding; Human Factors Engineering; Man Machine Systems; Systems Engineering

20090030685 Idaho National Engineering and Environmental Lab., Idaho Falls, ID, USA
Safety Analysis for a Radioisotope Stirling Generator
Novascone, S. R.; Dolphin, B. H.; Lacy, J. M.; Richins, W. D.; Jun. 01, 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727
Report No.(s): DE2008-912897; INL/CON-07-12211; No Copyright; Avail.: National Technical Information Service (NTIS)

The Idaho National Laboratory (INL) is conducting safety analyses of various lowpower Radioisotope Stirling Generator (RSG) design concepts for the U. S. Department of Energy. These systems are electrical power generators converting thermal energy from plutonium (238Pu) decay to electrical energy via a Stirling cycle generator. The design and function are similar to the RTG (Radioisotope Thermoelectric Generator) used in space missions since the early 1960s, with a more efficient Stirling cycle generator replacing the proven thermoelectric converter. This paper discusses the methods the INL is employing in the safety analysis effort, along with the software tools, lessons learned, and results. The overall goal of our safety analyses is to determine the probability of an accidental plutonium release over the life of the generator. Historical accident rates for various transportation modes were investigated using event tree methods. Source terms were developed for these accidents including primarily impact, fire, and creep rupture. A negative result was defined as rupture of the tantalum alloy containment vessel surrounding the encapsulated plutonia pellet. Damage due to identified impact accidents was evaluated using non-linear finite element software tools. Material models, gathered from a wide variety of sources, included strain-rate and temperature dependencies on yield strength, strain hardening, and rupture. Both individual component and overall system simulation results will be validated by impact testing to be conducted by Los Alamos National Laboratory. Results from deterministic impact, fire, and creep rupture analyses were integrated into the probabilistic (Monte Carlo) risk assessment by correlation functions relating accident parameters to component damage. This approach presented challenges, which are addressed.
NTIS
Electric Generators; Radioisotope Heat Sources; Safety; Stirling Cycle

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)*.

20090030891 NASA Johnson Space Center, Houston, TX, USA
Internet Protocol Display Sharing Solution for Mission Control Center Video System
Brown, Michael A.; [2009]; 2 pp.; In English; SpaceOps 2010, 25-30 Apr. 2010, Huntsville, AL, USA
Report No.(s): JSC-CN-18588; Copyright; Avail.: Other Sources; Abstract Only

With the advent of broadcast television as a constant source of information throughout the NASA manned space flight Mission Control Center (MCC) at the Johnson Space Center (JSC), the current Video Transport System (VTS) characteristics provides the ability to visually enhance real-time applications as a broadcast channel that decision making flight controllers come to rely on, but can be difficult to maintain and costly. The Operations Technology Facility (OTF) of the Mission Operations Facility Division (MOFD) has been tasked to provide insight to new innovative technological solutions for the MCC environment focusing on alternative architectures for a VTS. New technology will be provided to enable sharing of all imagery from one specific computer display, better known as Display Sharing (DS), to other computer displays and display systems such as; large projector systems, flight control rooms, and back supporting rooms throughout the facilities and other offsite centers using IP networks. It has been stated that Internet Protocol (IP) applications are easily readied to substitute for the current visual architecture, but quality and speed may need to be forfeited for reducing cost and maintainability. Although the IP infrastructure can support many technologies, the simple task of sharing ones computer display can be rather clumsy and difficult to configure and manage to the many operators and products. The DS process shall invest in collectively automating the sharing of images while focusing on such characteristics as; managing bandwidth, encrypting security measures, synchronizing disconnections from loss of signal / loss of acquisitions, performance latency, and provide functions like, scalability, multi-sharing, ease of initial integration / sustained configuration, integration with video adjustments packages, collaborative tools, host / recipient controllability, and the utmost paramount priority, an enterprise solution that provides ownership to the whole process, while maintaining the integrity of the latest technological displayed image devices. This study will provide insights to the many possibilities that can be filtered down to a harmoniously responsive product that can be used in today's MCC environment.
Author
Protocol (Computers); Video Communication; Ground Stations; Internets; Internet Resources; Web Services

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

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

20090029968 NASA Ames Research Center, Moffett Field, CA, USA
Science Missions Enabled by the Ares V
Worden, Simon Peter; Weiler, Edward J.; September 29, 2008; 10 pp.; In English; 59th International Astronautical Congress, 29 Sept. 2008, Glasgow, UK
Report No.(s): IAC-08-D2.8.9; ARC-E-DAA-TN-185; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029968

NASA's planned heavy-lift Ares V rocket is a centerpiece of U.S. Space Exploration Policy. With approximately 30% more capacity to Trans-Lunar Injection (TLI) than the Saturn V, Ares V could also enable additional science and exploration missions currently unachievable or extremely unworkable under current launch vehicle architectures. During the spring and summer of 2008, NASA held two workshops dedicated to the discussion of these new mission concepts for the Ares V rocket. The first workshop dealt with astronomy and astrophysics, and the second dealt primarily with planetary science and exploration, but did touch on Earth science and heliophysics. We present here the summary results and outcomes of these meetings, including a discussion of specific mission concepts and ideas, as well as suggestions on design for the Ares V fairing and flight configurations that improve science return.
Author
Ares 5 Cargo Launch Vehicle; Earth Sciences; Space Exploration; Saturn 5 Launch Vehicles; Injection; Astrophysics; Mission Planning

20090030013 NASA Johnson Space Center, Houston, TX, USA
Occupant Protection Project for the Orion Crew Vehicle
Gernhardt, Michael L.; Jones, Jeff; August 11, 2009; In English; Advances in Injury Biomechanics, 11 Aug. 2009, Washington, DC, USA; Original contains color illustrations
Report No.(s): JSC-CN-18663; Copyright; Avail.: CASI: C01, CD-ROM

This powerpoint presentation describes the occupant protection project for the Orion Crew Vehicle. Background information on the Orion Crew Vehicle along with comparisons of the Space Shuttle, Ares I, Ares V, Saturn V and Soyuz-FG are also described. The contents include: 1) Background and Overview; 2) Crew health and safety overview; 3) Occupant Protection project overview; and 4) Suit Element injury risk.
CASI
Crew Exploration Vehicle; Astronauts; Space Shuttles; Space Suits; Ares 1 Launch Vehicle; Aerospace Medicine; Biodynamics

20090030707 CH2M/Hill Hanford Group, Inc., Richland, WA, USA
Double-Shell Tank Integrity Project High Level Waste Chemistry Optimization
Jan. 2007; 17 pp.; In English
Report No.(s): DE2008-922696; CH2M-36344-FP; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Department of Energy's Office (DOE) of River Protection (ORP) has a continuing program for chemical optimization to better characterize corrosion behavior of High-Level Waste (HLW). The DOE controls the chemistry in its HLW to minimize the propensity of localized corrosion, such as pitting, and stress corrosion cracking (SCC) in nitrate-containing solutions. By improving the control of localized corrosion and SCC, the ORP can increase the life of the Double-Shell Tank (DST) carbon steel structural components and reduce overall mission costs. The carbon steel tanks at the Hanford Site are critical to the mission of safely managing stored HLW until it can be treated for disposal. The DOE has historically used additions of sodium hydroxide to retard corrosion processes in HLW tanks. This also increases the amount of waste to be treated. The reactions with carbon dioxide from the air and solid chemical species in the tank continually deplete the hydroxide ion concentration, which then requires continued additions. The DOE can reduce overall costs for caustic addition and treatment of waste, and more effectively utilize waste storage capacity by minimizing these chemical additions. Hydroxide addition is a means to control localized and stress corrosion cracking in carbon steel by providing a passive environment. The exact mechanism that causes nitrate to drive the corrosion process is not yet clear. The SCC is less of a concern in the newer stress relieved double shell tanks due to reduced residual stress. The optimization of waste chemistry will further reduce the propensity for SCC. The corrosion testing performed to optimize waste chemistry included cyclic potentiodynamic volarization studies, slow strain rate tests, and stress intensity factor/crack growth rate determinations. Laboratory experimental evidence suggests that nitrite is a highly effective:inhibitor for pitting and SCC in alkaline nitrate environments. Revision of the corrosion control strategies to a nitrite-based control, where there is no constant depletion mechanism as with hydroxide, should greatly enhance tank lifetime, tank space availability, and reduce downstream reprocessing costs by reducing chemical addition to the tanks.
NTIS
Carbon Steels; Radioactive Wastes

20090030881 NASA Dryden Flight Research Center, Edwards, CA, USA
Genesis of the Lunar Landing Vehicle
Gelzer, Christian; July 16, 2009; In English; The Eagle Has Landed at Auburn 40th Anniversary of Apollo 11, 16 Jul. 2009, Auburn, AL, USA; Original contains color and black and white illustrations
Report No.(s): DFRC-1037; No Copyright; Avail.: CASI: C01, CD-ROM

The author examines early research regarding return flight from a Moon landing made prior to President Kennedy's 1961 challenge to put men on the Moon before the end of the decade. Organizations involved in early research include NACA, the Flight Research Center (now Dryden) Bell Aircraft Corporation. The discussion focuses on development of a flight simulator to model the Moon's reduced gravity and development of the Lunar Landing Research Vehicle.
CASI
Lunar Landing; Flight Simulators; Lunar Landing Modules; Apollo Spacecraft; Launch Vehicles; Apollo 11 Flight

20090031057 Noblis, Inc., Decorah, IA USA

The National Polar-orbiting Operational Environmental Satellite System - Restructured Capabilities for Operational Ocean Remote Sensing

Mineart, Gary M.; Grano, Vincent; Proceedings of Oceans 2008 - Oceans, Poles and Climate: Technological Challenges; Sep. 2008; 9 pp.; In English; Oceans 2008 - Oceans, Poles and Climate: Technological Challenges, 15 - 18 Sep. 2008, Quebec City, Canada; Original contains color illustrations

Report No.(s): AD-A502487; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The tri-agency Integrated Program Office (IPO) continues to manage the development, acquisition, and execution of the National Polar-orbiting Operational Environmental Satellite System (NPOESS). As directed by its acquisition decision authority in 2006, the NPOESS Program restructured its acquisition baseline with an emphasis on reducing complexity and ensuring continuity of observations presently delivered by the two operational systems NPOESS will replace - the Polarorbiting Operational Environmental Satellite (POES) and the Defense Meteorological Satellite Program (DMSP). Ocean observations continue to comprise nearly one-fourth of the 38 user-validated data requirements levied on the system and are drivers of the design and implementation strategy for two principal sensors: the Visible Infrared Imager Radiometer Suite (VIIRS) and the Microwave Imager-Sounder (MIS). The NPOESS Preparatory Project (NPP) will deliver a subset of these NPOESS ocean observations for demonstration and risk reduction after its planned launch in 2010. Recent performance assessments indicate that the restructured NPOESS will continue to deliver improved operational capabilities and satisfy the critical civil and national security needs for space-based ocean observations.

DTIC

Meteorological Parameters; NPOESS; Oceanographic Parameters; Oceans; Polar Orbits; Remote Sensing; Research Management; Scientific Satellites; Trajectories

20090031777 National Academy of Sciences - National Research Council, Washington, DC, USA

Ensuring the Climate Record from the NPOESS and GOES-R Spacecraft: Elements of a Strategy to Recover Measurement Capabilities Lost in Program Restructuring

[2008]; 191 pp.; In English

Contract(s)/Grant(s): NNH06CE15B; DG133R07SE1940

Report No.(s): PB2009-100247; Copyright; Avail.: CASI: A09, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090031777; http://www.nap.edu/catalog/12254.html

In June 2007, the National Research Council (NRC) held a 3-day workshop, Options to Ensure the Climate Record from the NPOESS and GOES-R Spacecraft, in Washington, D.C., to discuss options to recover measurement capabilities, especially those related to climate research, that were lost following a congressionally mandated review completed in June 2006 (Nunn-McCurdy certification) of the NPOESS program and the September 2006 cancellation of the HES sensor on GOES-R. Some 100 scientists and engineers from academia, government, and industry attended the workshop, which gave participants a chance to consider and comment on a mitigation plan developed by NASA-NOAA as well as to explore options that were not included in the NASA-NOAA study. An NRC report on the workshop proceedings was released in prepublication form in September 2007. By design, that report did not present findings or recommendations.

Author

Climate; GOES Satellites; Polar Orbits; NASA Programs

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20090030496 NASA Johnson Space Center, Houston, TX, USA

The Role of the Exploration Science Officer in Lunar Surface Operations

Osborn, John H.; [2009]; 1 pp.; In English; SpaceOps 2010, 25-30 Apr. 2010, Huntsville, AL, USA

Report No.(s): JSC-CN-18733; No Copyright; Avail.: Other Sources; Abstract Only

A review has been performed of exploration science and payload operations during the Apollo and Space Shuttle programs to extract information of potential usefulness to the Constellation program. That work has resulted in creation of the concept for a unique type of flight controller: the exploration science officer. The controller s primary responsibility is to

integrate the tasks and goals of the spacecraft flight control team and the science team in order to maximize science return while maximizing crew safety. Far from being just a mouthpiece for either team, this individual must be fluent in the knowledge and language of two communities: spacecraft operations and planetary science. Responsibilities begin during the requirements phase of vehicle and lunar surface systems development and continue through development, training, planning, mission execution, and post-flight mission phases.
Author
Flight Control; Payloads; Space Shuttles; Spacecraft Control; Controllers; Constellation Program; Safety Factors; Systems Engineering

20090030615 NASA Langley Research Center, Hampton, VA, USA
Space Transportation System (STS)-117 External Tank (ET)-124 Hail Damage Repair Assessment
Wilson, Timmy R.; Gentz, Steven J.; Barth, Timothy S.; Minute, Stephen A.; Flowers, Cody P.; Hamilton, David A.; Null, Cynthia H.; Schafer, Charles F.; August 2009; 118 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 869021.05.07.02.99
Report No.(s): NASA/TM-2009-215785; NESC-RP-07-47/07-005-E; L19733; LF99-9286; Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030615

Severe thunderstorms with associated hail and high winds struck the STS-117 stack on February 26, 2007. Peak winds were recorded at 62 knots with hail sizes ranging from 0.3 inch to 0.8 inch in diameter. As a result of the storm, the North Carolina Foam Institute (NCFI) type 24-124 Thermal Protection System (TPS) foam on the liquid oxygen (LO2) ogive acreage incurred significant impact damage. The NCFI on the ET intertank and the liquid hydrogen (LH2) acreage sustained hail damage. The Polymer Development Laboratory (PDL)-1034 foam of the LO2 ice frost ramps (IFRs) and the Super-Lightweight Ablator (SLA) of the LO2 cable tray also suffered minor damage. NASA Engineering and Safety Center (NESC) was asked to assess the technical feasibility of repairing the ET TPS, the reasonableness of conducting those repairs with the vehicle in a vertical, integrated configuration at the Kennedy Space Center (KSC) Vehicle Assemble Building (VAB), and to address attendant human factors considerations including worker fatigue and the potential for error. The outcome of the assessment is recorded in this document.
Author
External Tanks; Damage Assessment; Ablative Materials; Hail; Space Transportation System; Thermal Protection; Impact Damage

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*.

20090029945 NASA Marshall Space Flight Center, Huntsville, AL, USA
Short-range/Long-range Integrated Target (SLIT) for Video Guidance Sensor Rendezvous and Docking
Roe, Fred D., Inventor; Bryan, Thomas C., Inventor; April 07, 2009; 9 pp.; In English
Patent Info.: Filed 15 Dec. 2004; US-Patent-7515257; NASA-Case-MFS-31817-1; US-Patent-Appl-SN-11/014455; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029945

A laser target reflector assembly for mounting upon spacecraft having a long-range reflector array formed from a plurality of unfiltered light reflectors embedded in an array pattern upon a hemispherical reflector disposed upon a mounting plate. The reflector assembly also includes a short-range reflector array positioned upon the mounting body proximate to the long-range reflector array. The short-range reflector array includes three filtered light reflectors positioned upon extensions from the mounting body. The three filtered light reflectors retro-reflect substantially all incident light rays that are transmissive by their monochromatic filters and received by the three filtered light reflectors. In one embodiment the short-range reflector array is embedded within the hemispherical reflector,
Author
Guidance Sensors; Laser Targets; Orbital Rendezvous; Reflectors; Spacecraft Docking; Rendezvous Guidance

20090030880 NASA Johnson Space Center, Houston, TX, USA
Developing a Standard Method for Link-Layer Security of CCSDS Space Communications
Biggerstaff, Craig; [2009]; 1 pp.; In English; SpaceOps 2010, 25-30 Apr. 2010, Huntsville, AL, USA
Report No.(s): JSC-CN-18716; Copyright; Avail.: Other Sources; Abstract Only

Communications security for space systems has been a specialized field generally far removed from considerations of mission interoperability and cross-support in fact, these considerations often have been viewed as intrinsically opposed to security objectives. The space communications protocols defined by the Consultative Committee for Space Data Systems (CCSDS) have a twenty-five year history of successful use in over 400 missions. While the CCSDS Telemetry, Telecommand, and Advancing Orbiting Systems protocols for use at OSI Layer 2 are operationally mature, there has been no direct support within these protocols for communications security techniques. Link-layer communications security has been successfully implemented in the past using mission-unique methods, but never before with an objective of facilitating cross-support and interoperability. This paper discusses the design of a standard method for cryptographic authentication, encryption, and replay protection at the data link layer that can be integrated into existing CCSDS protocols without disruption to legacy communications services. Integrating cryptographic operations into existing data structures and processing sequences requires a careful assessment of the potential impediments within spacecraft, ground stations, and operations centers. The objective of this work is to provide a sound method for cryptographic encapsulation of frame data that also facilitates Layer 2 virtual channel switching, such that a mission may procure data transport services as needed without involving third parties in the cryptographic processing, or split independent data streams for separate cryptographic processing.
Author
Data Links; Space Communication; Data Systems; Interoperability; Computer Information Security; Aerospace Systems; Warning Systems; Data Flow Analysis; Command and Control

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*.

20090029985 NASA Johnson Space Center, Houston, TX, USA
Orion Project Crew Module Analyses Summary
Alvarez-Hernandez, Angel; August 14, 2009; 42 pp.; In English; Thermal and Fluids Analysis Conference, 11-13 Aug. 2009, Huntsville, Al, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 644423.02.36.07.10
Report No.(s): JSC-CN-18688; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029985

This slide presentation reviews the efforts at analyzing the Crew Module (CM) for the Orion Project. The Integrated Thermal Model is described, and the on-orbit analysis for the 4 different mission phases is also described. The four mission phases are: Mission phase (1) Low Earth Orbit (LEO) International Space Station (ISS) mission (2) ISS docked (3) LEO, lunar mission and (4) Low Lunar Orbit (LLO).
CASI
Crew Exploration Vehicle; Thermal Analysis; Models; Computerized Simulation; Temperature Control; Spacecraft Temperature; Spacecraft Design

20090030520 NASA Langley Research Center, Hampton, VA, USA
Aeroheating Testing and Predictions for Project Orion CEV at Turbulent Conditions
Hollis, Brian R.; Berger, Karen T.; Horvath, Thomas J.; Coblish, Joseph J.; Norris, Joseph D.; Lillard, Randolph P.; Kirk, Benjamin S.; [2009]; 39 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 52628201070405
Report No.(s): LF99-6999; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030520

An investigation of the aeroheating environment of the Project Orion Crew Exploration Vehicle was performed in the Arnold Engineering Development Center Hypervelocity Wind Tunnel No. 9 Mach 8 and Mach 10 nozzles and in the NASA

Langley Research Center 20 - Inch Mach 6 Air Tunnel. Heating data were obtained using a thermocouple-instrumented approx.0.035-scale model (0.1778-m/7-inch diameter) of the flight vehicle. Runs were performed in the Tunnel 9 Mach 10 nozzle at free stream unit Reynolds numbers of 1x10(exp 6)/ft to 20x10(exp 6)/ft, in the Tunnel 9 Mach 8 nozzle at free stream unit Reynolds numbers of 8 x 10(exp 6)/ft to 48x10(exp 6)/ft, and in the 20-Inch Mach 6 Air Tunnel at free stream unit Reynolds numbers of 1x10(exp 6)/ft to 7x10(exp 6)/ft. In both facilities, enthalpy levels were low and the test gas (N2 in Tunnel 9 and air in the 20-Inch Mach 6) behaved as a perfect-gas. These test conditions produced laminar, transitional and turbulent data in the Tunnel 9 Mach 10 nozzle, transitional and turbulent data in the Tunnel 9 Mach 8 nozzle, and laminar and transitional data in the 20- Inch Mach 6 Air Tunnel. Laminar and turbulent predictions were generated for all wind tunnel test conditions and comparisons were performed with the experimental data to help define the accuracy of computational method. In general, it was found that both laminar data and predictions, and turbulent data and predictions, agreed to within less than the estimated 12% experimental uncertainty estimate. Laminar heating distributions from all three data sets were shown to correlate well and demonstrated Reynolds numbers independence when expressed in terms of the Stanton number based on adiabatic wall-recovery enthalpy. Transition onset locations on the leeside centerline were determined from the data and correlated in terms of boundary-layer parameters. Finally turbulent heating augmentation ratios were determined for several body-point locations and correlated in terms of the boundary-layer momentum Reynolds number.
Author
Crew Exploration Vehicle; Aerodynamic Heating; Hypersonic Speed; Boundary Layers

20090030522 NASA Langley Research Center, Hampton, VA, USA
Aerothermodynamic Testing of the Crew Exploration Vehicle in the LaRC 20-Inch Mach 6 and 31-Inch Mach 10 Tunnels
Berger, Karen T.; [2009]; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 52628201070405
Report No.(s): LF99-7103; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030522

An experimental wind tunnel program is being conducted in support of a NASA wide effort to develop a Space Shuttle replacement and to support the Agency s long term objective of returning to the Moon and Mars. This article documents experimental measurements made on several scaled ceramic heat transfer models of the proposed Crew Exploration Vehicle Crew Module. The experimental data highlighted in this article are to be used to assess numerical tools that will be used to generate the flight aerothermodynamic database. Global heat transfer images and heat transfer distributions were obtained over a range of freestream Reynolds numbers and angles of attack with the phosphor thermography technique. Heat transfer data were measured on the forebody and afterbody and were used to infer the heating on the vehicle as well as the boundary layer state on the forebody surface. Several model support configurations were assessed to minimize potential support interference. In addition, the ability of the global phosphor thermography method to provide quantitative heating measurements in the low temperature environment of the capsule base region was assessed. While naturally fully developed turbulent levels were not obtained on the forebody, the use of boundary layer trips generated fully developed turbulent flow. Laminar and turbulent computational results were shown to be in good agreement with the data. Backshell testing demonstrated the ability to obtain data in the low temperature region as well as demonstrating the lack of significant model support hardware influence on heating.
Author
Aerothermodynamics; Angle of Attack; Spacecraft Modules; Moon; Space Shuttles; Hypersonic Speed

20090031833 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
On the Development of Parameterized Linear Analytical Longitudinal Airship Models
Kulczycki, Eric A.; Johnson, Joseph R.; Bayard, David S.; Elfes, Alberto; Quadrelli, Marco B.; August 18, 2008; 23 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit 2008, 18 - 21 Aug. 2009, Honolulu, HI, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41379

In order to explore Titan, a moon of Saturn, airships must be able to traverse the atmosphere autonomously. To achieve this, an accurate model and accurate control of the vehicle must be developed so that it is understood how the airship will react to specific sets of control inputs. This paper explains how longitudinal aircraft stability derivatives can be used with airship parameters to create a linear model of the airship solely by combining geometric and aerodynamic airship data. This method does not require system identification of the vehicle. All of the required data can be derived from computational fluid dynamics and wind tunnel testing. This alternate method of developing dynamic airship models will reduce time and cost. Results are

compared to other stable airship dynamic models to validate the methods. Future work will address a lateral airship model using the same methods.
Author
Airships; Dynamic Models; Dynamic Tests; Longitudinal Stability; Stability Derivatives; Aerodynamics

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 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*.

20090031835 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Automatic Hazard Detection for Landers
Huertas, Andres; Cheng, Yang; Matthies, Larry H.; February 26, 2008; 8 pp.; In English; 9th International Symposium on Artificial Intelligence, Robotics and Automation in Space, 26 Feb. 2008, Los Angeles, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41368

Unmanned planetary landers to date have landed 'blind'; that is, without the benefit of onboard landing hazard detection and avoidance systems. This constrains landing site selection to very benign terrain,which in turn constrains the scientific agenda of missions. The state of the art Entry, Descent, and Landing (EDL) technology can land a spacecraft on Mars somewhere within a 20-100km landing ellipse.Landing ellipses are very likely to contain hazards such as craters, discontinuities, steep slopes, and large rocks, than can cause mission-fatal damage. We briefly review sensor options for landing hazard detection and identify a perception approach based on stereo vision and shadow analysis that addresses the broadest set of missions. Our approach fuses stereo vision and monocular shadow-based rock detection to maximize spacecraft safety. We summarize performance models for slope estimation and rock detection within this approach and validate those models experimentally. Instantiating our model of rock detection reliability for Mars predicts that this approach can reduce the probability of failed landing by at least a factor of 4 in any given terrain. We also describe a rock detector/mapper applied to large-high-resolution images from the Mars Reconnaissance Orbiter (MRO) for landing site characterization and selection for Mars missions.
Author
Mars Reconnaissance Orbiter; Landing Sites; Unmanned Spacecraft; Stereoscopic Vision; Hazards; Performance Prediction; Mars Missions

20090031837 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mechanical Description of the Mars Climate Sounder Instrument
Jau, Bruno M.; March 3, 2008; 8 pp.; In English; 2008 IEEE Aerospace Conference, 1 - 8 Mar. 2008, Big Sky, MT, USA; Original contains color illustrations
Report No.(s): IEEEAC paper 1670; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41384

This paper introduces the Mars Climate Sounder (MCS) Instrument of the Mars Reconnaissance Orbiter (MRO) spacecraft. The instrument scans the Martian atmosphere almost continuously to systematically acquire weather and climate observations over time. Its primary components are an optical bench that houses dual telescopes with a total of nine channels for visible and infrared sensing, and a two axis gimbal that provides pointing capabilities. Both rotating joints consist of an integrated actuator with a hybrid planetary/harmonic transmission and a twist cap section that enables the electrical wiring to pass through the rotating joint. Micro stepping is used to reduce spacecraft disturbance torques to acceptable levels while driving the stepper motors. To ensure survivability over its four year life span, suitable mechanical components, lubrication, and an active temperature control system were incorporated. Some life test results and lessons learned are provided to serve as design guidelines for actuator parts and flex cables.
Author
Mars Reconnaissance Orbiter; Infrared Detectors; Mars Environment; Reconnaissance Spacecraft; Active Control; Climate; Temperature Control; Actuators

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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*.

20090029947 NASA Marshall Space Flight Center, Huntsville, AL, USA
Boiler and Pressure Balls Monopropellant Thermal Rocket Engine
Greene, William D., Inventor; June 02, 2009; 13 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 30 Jun. 2005; US-Patent-7540143; NASA-Case-MFS-32102-1; US-Patent-Appl-SN-11/172665; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029947

The proposed technology is a rocket engine cycle utilizing as the propulsive fluid a low molecular weight, cryogenic fluid, typically liquid hydrogen, pressure driven, heated, and expelled through a nozzle to generate high velocity and high specific impulse discharge gas. The proposed technology feeds the propellant through the engine cycle without the use of a separate pressurization fluid and without the use of turbomachinery. Advantages of the proposed technology are found in those elements of state-of-the-art systems that it avoids. It does not require a separate pressurization fluid or a thick-walled primary propellant tank as is typically required for a classical pressure-fed system. Further, it does not require the acceptance of intrinsic reliability risks associated with the use of turbomachinery
Author
Monopropellants; Propellant Tanks; Rocket Engines; Spacecraft Propulsion; Rocket Engine Design

20090030304 Naval Undersea Warfare Center, Bremerton, WA, USA
Southeast Alaska Cruise Ship Underwater Acoustic Noise
Kipple, B.; Oct. 2002; 92 pp.; In English
Report No.(s): PB2008-106004; NSWCCD-71-TR-2002/574; No Copyright; Avail.: National Technical Information Service (NTIS)

Between September 2000 and June 2001, the underwater radiated noise levels for six Southeast Alaska cruise ships were measured at the U.S. Navy's Southeast Alaska Acoustic Measurement Facility near Ketchikan, Alaska. The primary objective of this project was to quantify noise levels typical of large cruise ships common to Southeast Alaska. This group of ships included diesel-electric, direct-diesel, and steam turbine propulsion plant ships ranging in size from 23 to 77 thousand gross tons and from 617 to 856 feet in length. Ten-knot overall sound levels ranged from 175 to 185 dB relative to 1 microPascal at 1 yard with the highest one-third octave band level at 182 dB. The 10-knot sound level for the steam turbine ship was the lowest among the ships tested, but no ship was clearly the loudest or quietest at all frequencies. Propulsion system type and cavitation performance were important factors in cruise ship noise character.
NTIS
Acoustic Measurement; Alaska; Noise (Sound); Noise Intensity; Noise Pollution; Ships; Underwater Acoustics

20090030507 NASA Glenn Research Center, Cleveland, OH, USA
Emittance Measurements Relevant to a 250 W(sub t) Class RTPV Generator for Space Exploration
Wolford, Dave; Chubb, Donald; Clark, Eric; Pal, Anna Maria; Scheiman, Dave; Colon, Jack; August 2009; 13 pp.; In English; 5th International Conference on Solar Concentrators for the Generation of Electricity, 16-19 Nov. 2008, Palm Desert, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 138494.04.03.01
Report No.(s): NASA/TM-2009-215619; E-16935; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030507

A proposed 250 Wt Radioisotope Thermophotovoltaic (RTPV) power system for utilization in lunar exploration and the subsequent exploration of Mars is described. Details of emitter selection are outlined for use in a maintenance free power supply that is productive over a 14-year mission life. Thorough knowledge of a material s spectral emittance is essential for

accurate modeling of the RTPV system. While sometimes treated as a surface effect, emittance involves radiation from within a material. This creates a complex thermal gradient which is a combination of conductive and radiative heat transfer mechanisms. Emittance data available in the literature is a valuable resource but it is particular to the test sample s physical characteristics and the test environment. Considerations for making spectral emittance measurements relevant to RTPV development are discussed. Measured spectral emittance data of refractory emitter materials is given. Planned measurement system modifications to improve relevance to the current project are presented.
Author
Emittance; Emission Spectra; Conductive Heat Transfer; Radiative Heat Transfer; Temperature Gradients; Refractory Materials; Lunar Exploration

20090030847 Ministry of Supply, London, UK
Monofuel Rocket Motors
Hutcheon, I C; Mar. 1946; 53 pp.; In English
Report No.(s): AD-A800656; ADD-TR-4/46; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA800656
Various motors have been made, and tested statically at rates of fuel flow up to 1 lb./sec., using chiefly nitroglycerine (desensitised) and myrol as fuels. Conclusions are drawn on the essentials for safe and efficient design, and theories relating to fuel combustion and motor design are put forward.
DTIC
Rocket Engines; Fuel Combustion

20090030903 Air Force Research Lab., Edwards AFB, CA USA; Air Force Office of Scientific Research, Arlington, VA, USA; California Univ., Los Angeles, CA, USA; Advatech Pacific, Inc., Redlands, CA, USA
On the Inner Jet Spread Angles of Coaxial Jets from Subcritical to Supercritical Conditions with Preliminary Numerical Results
Rodriguez, Juan I.; Graham, Jeffrey J.; Leyva, Ivett A.; Lyu, Hsin-Yuan; Talley, Douglas; 23 Oct. 2008; 19 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A502385; AFRL-RZ-ED-TP-2008-463; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502385
A study is performed to analyze the behavior of the inner jet spread angles in a coaxial jet flow configuration similar to those used in liquid rocket engines. These angles are measured from back-lit images. Data is presented for sub-, near-, and supercritical non-reactive N2 coaxial jets. In the subcritical regime, the effects of an externally-imposed transverse acoustic field are also analyzed. The acoustic field is generated using two piezo-sirens and driven at a frequency of 3.0 - 0.1 kHz. Pressure oscillations vary from 16 to 22 kPa, peak to peak, at the location of the jet with background pressure of 1.5 MPa. For all cases, by varying the inner and outer jet temperatures and mass flowrates, outer to inner jet velocity ratios from 0.25 to 23 and outer to inner jet momentum flux ratios (J) from 0.02 to 23 are achieved. In the case where no acoustic excitation is applied the angles for the near- and supercritical cases show more spread compared to their subcritical counterparts for 1.0J2.5, attaining values up to 18-deg. However, at higher J values, the spread angles for subcritical pressures are larger than those for near- and supercritical pressures. When acoustics are applied at subcritical pressures, the largest spread angles occur for 2J10, reaching values as high as 38-deg. Also, preliminary numerical results are presented for two supercritical cases with only one acoustic source present.
DTIC
Angles (Geometry); Jet Flow; Liquid Propellant Rocket Engines

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*.

20090030167 Environmental Protection Agency, Washington, DC USA
Toxic Substances Control Act (TSCA): ASCII Text Data, July 2009, PMN Number to EPA Accession Number Link (Raw Data on CD-ROM)
Jun. 26, 2009; In English
Report No.(s): PB2009-500035; No Copyright; Avail.: National Technical Information Service (NTIS)

The TSCA Chemical Substance Inventory provides chemical identity information for the non-confidential substances on the TSCA Master Inventory File. The datafile contains no TSCA Confidential Business Information. New versions of the TSCA Inventory are issued at approximately six month intervals. The data provided for each chemical substance include the CAS Registry Number, Preferred CA Index Name, molecular formula, and other appropriate information, such as valid chemical names reported by submitters. The entries are in ascending CAS Registry Number order. The PMN Number to EPA Accession Number Link provides a cross-reference of these numbers for commenced PMNs on the confidential portion of the TSCA Master Inventory File. Neither this cross-reference nor the additional information included is TSCA Confidential Business Information.
NTIS
CD-ROM; Inventories; Texts; Toxicity

20090030202 Geological Survey, Reston, VA USA
Global Flows of Metals and Minerals
Rogich, D. G.; Matos, G. R.; Jan. 2008; 15 pp.; In English
Report No.(s): PB2009-112798; USGS-OFR-2008-1355; No Copyright; Avail.: CASI: A03, Hardcopy

This paper provides a preliminary review of the trends in worldwide metals and industrial minerals production and consumption based on newly developed global metals and minerals Material Flow Accounts (MFA). The MFA developed encompass data on extraction and consumption for 25 metal and mineral commodities, on a country-by-country and year-by-year basis, for the period 1970 to 2004. The database, jointly developed by the authors, resides with the U.S. Geological Survey (USGS) as individual commodity Excel workbooks and within a Filemaker data management system for use in analysis. Numerous national MFA have been developed to provide information on the industrial metabolism of individual countries. These MFA include material flows associated with the four commodity categories of goods that are inputs to a country's economy, agriculture, forestry, metals and minerals, and nonrenewable organic material. In some cases, the material flows associated with the creation and maintenance of the built infrastructure (such as houses, buildings, roads, airports, dams, and so forth) were also examined. The creation of global metals and industrial minerals flows is viewed as a first step in the creation of comprehensive global MFA documenting the historical and current flows of all of the four categories of physical goods that support world economies. Metals and minerals represent a major category of nonrenewable resources that humans extract from and return to the natural ecosystem. As human populations and economies have increased, metals and industrial minerals use has increased concomitantly. This dramatic growth in metals and minerals use has serious implications for both the availability of future resources and the health of the environment, which is affected by the outputs associated with their use. This paper provides an overview of a number of the trends observed by examining the database and suggests areas for future study.
NTIS
Economics; Industries; Metals; Minerals

20090030257 International Trade Commission, Washington, DC, USA
Industry and Trade Summary: Organic Commodity Chemicals
Mar. 2003; 48 pp.; In English
Report No.(s): PB2009-113431; USTIC/PUB-3590; No Copyright; Avail.: CASI: A03, Hardcopy

This report addresses trade and industry conditions for the organic commodity chemicals, also known as petrochemicals, a category of chemicals derived from crude petroleum. These chemicals are used primarily as intermediates in the production of a wide variety of downstream goods, including plastics and apparel. The period of study is from 1997 through 2001. The U.S. organic commodity chemicals industry produced an average $18.9 billion of these goods each year during 1997-2001.

The average annual trade surplus during this period was $600 million. The largest U.S. export markets of these products were Mexico and Canada, which accounted for approximately 41 percent of all exports by value (or $3.17 billion) in 2001. Major U.S. import sources included Canada, Venezuela, and Nigeria, which together accounted for approximately 53 percent of these imports by value (or $2.49 billion) in 2001. Consumers of these chemicals typically use them as intermediates in numerous products, including plastics, adhesives, and nylon fibers. There is little or no quality differentiation between domestically-produced commodity chemicals and U.S. imports. The global market is highly competitive and large fluctuations in domestic production, imports, and exports regularly occur. These fluctuations are caused by a variety of factors that include demand for downstream goods, cost of feedstocks, transportation costs, and producer efficiency. In particular, the general economic decline in 2001 contributed to the decline in U.S. production levels for that year.
NTIS
Commodities; Industries; International Trade

20090030303 Jacobs Consultancy, Inc., Houston, TX, USA
Feasibility Study for Echem's PVC Expansion Project. Volume 3, Grassroots Project
Jul. 2006; 206 pp.; In English
Report No.(s): PB2008-105831; No Copyright; Avail.: National Technical Information Service (NTIS)

The Egyptian Petrochemicals Holding Company (Echem) retained Jacobs Consultancy Incorporated, to develop a technical and financial feasibility study for the addition of a grassroots PVC production facility. The feasibility study is to be funded by a grant received by Echem from the US Trade & Development Agency (USTDA.) The scope of work for the study has been provided by the USTDA, and this feasibility study is required to adhere to that scope. The scope of this feasibility includes expansion of existing polyvinyl chloride (PVC) capacity in two phases: Phase 1-The debottlenecking of the existing PVC Complex operated by the Egyptian Petrochemicals Company (EPC) in Alexandria, Egypt to produce approximately 120,000 MTA of PVC; and Phase 2-The installation of grassroots Chlorine, VCM and PVC plants to produce an additional 150,000 MTA of PVC.
NTIS
Feasibility; Polyvinyl Chloride; Industrial Plants; Petroleum Products

20090030339 Missouri Univ., Columbia, MO, USA
Radiolytically-Induced Novel Materials and Their Application to Waste Processing. Final Report
Tokuhiro, A. T.; Bertino, M.; January 2007; 59 pp.; In English
Contract(s)/Grant(s): DE-FG07-04ID14592
Report No.(s): DE2008-920382; No Copyright; Avail.: National Technical Information Service (NTIS)

In the present NEER project we investigated two different types of gel materials with respect to potential applications in environmental remediation, including mixed waste generated from the nuclear fuel cycles. The materials under study were: 1) silica-polymer based aerogel composites into which specific metallic cations diffuse into and remain, and 2) polymer gels made of thermo-sensitive polymer networks, whose functional groups can be tailored to have a preferred affinity for specific cations, again diffusing into and remaining in the network under a volumetrically, contractive phase-transition. The molecular, diffusion of specific cations, including those of concern in low-level waste streams, into the gel materials studied here indicates that a scaled, engineered system can be designed so that it is passive; that is, minimal (human) intervention and risk would be involved in encapsulating LLW species. In addition, the gel materials hold potential significance in environmental remediation of and recovery of metallic cations identified in respective domains and physico-chemical processes. In brief, silica gels start as aqueous/liquid solutions of base catalyzed silica hydrogels and metal ions (targeted species), such as silver. The metal ions are reduced radiolytically and migrate through the solution to form clusters. Upon post-irradiation processing, aerogel monoliths, extremely lightweight but mechanically strong, that encapsulate the metals are produced. Interestingly the radiolytic or photonic source can be gamma-rays and/or other rays from artificial sources, such as reactors, or inherent sources like those characterizing mixed waste. Polymer gels, in contrast exhibit thermally-induced volumetric contraction at 20DG-50oC by expelling water from the gels physical state. Further, some functional groups that capture di- or tri-valent cations from aqueous solutions can be incorporated into the polymer networks on synthesis, including by radiolytic means. These polymer gels retain cations after volumetric contraction and have the ability to trap solid particulates in liquid waste streams. With both silica and polymer gels, functional design of a prototypic recovery systems, such as by natural convection in a rectangular cell, appears possible. Additional and specific details are provided in the rest of this Final Report.
NTIS
Cycles; Gels; Nuclear Fuels; Radioactive Wastes

20090030432 State Univ. of New York, Albany, NY, USA
Feasibility of a Stack Integrated SOFC Optical Chemical
Carpenter, M. A.; Dec. 21, 2007; 44 pp.; In English
Contract(s)/Grant(s): DE-FG26-04NT42184
Report No.(s): DE2008-924880; No Copyright; Avail.: National Technical Information Service (NTIS)

The DOE-NETL Innovative Concepts (IC) phase II program investigated the feasibility of harsh environment compatible chemical sensors based on monitoring the surface plasmon resonance (SPR) bands of metal nanoparticle doped YSZ nano-cermets, as a function of fuel concentrations, impurities e.g. CO and temperature(500-900DGC). In particular, Au nanoparticles (AuNPs) exhibit a strong surface plasmon resonance (SPR) band whose shape and spectral position is not only highly dependent on the refractive index of the host medium but also on chemical reactions at the interface between the metal and the surrounding environment. Studies have been completed on the oxygen and temperature dependence of the SPR band of the AuNPs, CO sensing studies, oxygen/hydrogen titration experiments, ethanol sensing studies and finally NO2 sensing studies. Reversible changes in the SPR band are observed for all chemical exposure studies with the sensing mechanism being determined by the oxidative or reductive properties of the exposure gases. Reactions which remove charge from the AuNPs was observed to cause a redshift in the SPR band, while charge donation to the AuNPs causes a blue shift in the SPR band. CO, hydrogen and ethanol in air mixtures were all reductive in nature as they reacted with the YSZ bound oxygen anions forming CO2 or H2O thus ultimately inducing charge donation to the AuNPs and a blue shift in the SPR band. While NO2 and oxygen were oxidative and induced the production of YSZ bound oxygen anions, charge removal from the AuNPs and a redshift in the SPR band.
NTIS
Electrolytic Cells; Fuel Cells; Optical Materials; Optical Measuring Instruments; Solid Electrolytes

20090030577 Defence Science and Technology Organisation, Victoria, Australia
Personnel Exposure to Airborne Isocyanates and Solvents During Shipboard Painting With 2-Pack Polyurethane Paints
Kibby, J.; DeNola, G.; Hanhela, P. J.; Mazurek, W.; Dec. 2008; 27 pp.; In English
Report No.(s): AD-A502525; DSTO-TR-2228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Shipboard and laboratory trials were conducted to determine personnel exposure to airborne solvents and isocyanates during the application, by roller and brush, of 2-pack polyurethane paints. Airborne concentrations in the breathing zones of the operators were found to be 1/200th (0.1 microgram/m3) of the 8 h time-weighted average (TWA) exposure limits for isocyanates during the application of Interthane 987 LSALGP and Interthane 864 LSANSP on a RAN vessel, in the open air, on a hot day with a slight wind. Similarly, brush and roller application of the paints in a simulated enclosed space produced airborne isocyanate concentrations 3 microgram/m3. The dust produced during light sanding of the polyurethane paint, 24 h after curing, did not show quantifiable levels (0.1 microgram/m3) of isocyanates. Although it appeared that respiratory protection from airborne isocyanates was not required with brush/roller applications, personnel should be protected from dermal exposure to the liquid paints. There appeared to be a greater risk from paint solvent respiratory exposure than from airborne isocyanates.
DTIC
Exposure; Isocyanates; Paints; Personnel; Polyurethane Resins; Solvents

20090030714 California Univ., Berkeley, CA, USA; Illinois Univ., Urbana-Champaign, IL, USA
Dislocation-Radiation Obstacle Interactions: Developing Improved Mechanical Property Constitutive Models, Final
WIrth, B. D.; Robertson, I. M.; Nov. 29, 2007; 23 pp.; In English
Contract(s)/Grant(s): FG07-04ID14594
Report No.(s): DE2008-920995; DOE/ID/14594; No Copyright; Avail.: National Technical Information Service (NTIS)

Radiation damage to structural and cladding materials, including austenitic stainless steels, ferritic steels, and zirconium alloys, in nuclear reactor environments results in significant mechanical property degradation, including yield strength increases, severe ductility losses and flow localization, which impacts reliability and performance. Generation IV and advanced fuel cycle concepts under consideration will require the development of advanced structural materials, which will operate in increasingly hostile environments. The development of predictive models is required to assess the performance and response of materials in extreme Gen IV reactor operating conditions (temperature, stress, and pressure), to decrease the time to rapidly assess the properties of new materials and insert them into technological applications (Gen IV and Advanced Fuel Cycle Operations).
NTIS
Mathematical Models; Mechanical Properties; Nuclear Reactors; Radiation Damage

20090030793 Nexant, Inc., White Plains, NY, USA
Feasibility Study for the Epichlorohydrin/Allyl Chloride Derivatives Project - Volume 2 - Technical (Public Version)
Jan. 2004; 96 pp.; In English
Report No.(s): PB2004-106982; No Copyright; Avail.: CASI: A05, Hardcopy

The U.S. Trade and Development Agency (USTDA) have provided a grant to ZACHEM to perform the required feasibility study on the selected new capacity for epichlorhydrin and allyl chloride derivatives. Accordingly, CACHEM is soliciting technical proposals from qualified US firms to provide expert consulting services to carry out the feasibility study. The study, in order to meet the needs of financial institutions, requires a number of broad tasks leading to the development of a cash flow feasibility model and Final Report including marketing, technical, and financial.
NTIS
Chemical Engineering; Chlorides; Derivation; Feasibility; Industries; International Trade

20090030839 Congressional Research Service, Washington, DC, USA
U.S. Trade Deficit and the Impact of Rising Oil Prices. Updated January 15, 2008
Jackson, J. K.; Jan. 15, 2008; 6 pp.; In English
Report No.(s): PB2008-108118; No Copyright; Avail.: CASI: A02, Hardcopy

Petroleum prices have risen sharply since early 2005. At the same time the average monthly volume of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energyrelated petroleum products translates into an escalating cost for those imports. This rising cost added an estimated $70 billion to the nations trade deficit in 2005 and $50 billion in 2006. Imported energy prices moderated in early 2007, before rising again through the summer and more sharply in the fall, following a pattern of rising energy import prices in the spring and summer. This report provides an estimate of the initial impact of the rising oil prices on the nations merchandise trade deficit. This report will be updated as warranted by events.
NTIS
Costs; Oils; Petroleum Products

20090030899 Food and Drug Administration, Rockville, MD USA
Nanotechnology: A Report of the U.S. Food and Drug Administration Nanotechnology Task Force, July 25, 2007
Jul. 25, 2007; 38 pp.; In English
Report No.(s): PB2008-108823; No Copyright; Avail.: CASI: A03, Hardcopy

As other emerging technologies have in the past, nanotechnology poses questions regarding the adequacy and application of regulatory authorities. The then Acting Commissioner of the Food and Drug Administration (FDA) initiated the Nanotechnology Task Force (Task Force) in 2006 to help assess these questions with respect to FDA's regulatory authorities, in light of the current state of the science for nanotechnology. This report offers the Task Force's initial findings and recommendations to the Commissioner. The report includes: A synopsis of the state of the science for biological interactions of nanoscale materials; Analysis and recommendations for science issues; and Analysis and recommendations for regulatory policy issues. The report addresses scientific issues as distinct from regulatory policy issues in recognition of the important role of the science in developing regulatory policies in this area, rapid growth of the field of nanotechnology, and the evolving state of scientific knowledge relating to this field. Rapid developments in the field mean that attention to the emerging science is needed to enable the agency to predict and prepare for the types of products FDA may see in the near future.
NTIS
Drugs; Nanotechnology

20090030908 National Inst. of Standards and Technology, Gaithersburg, MD USA
NCMC (NIST Combinatorial Methods Center) Workshop Report NCMC-10: Persistent Challenges in Combinatorial Materials Science. Held in Gaithersburg, MD. on October 5-6, 2006
Fasolka, M. J.; Laumeier, C. E.; Beers, K. L.; Stafford, C. M.; Feb. 2007; 18 pp.; In English; NCMC (NIST Combinatorial Methods Center) Workshop Report NCMC-10: Persistent Challenges in Combinatorial Materials Science., October 5 - 6, 2006, Gaithersburg, MD.
Report No.(s): PB2008-108826; NISTIR-7409; No Copyright; Avail.: CASI: A03, Hardcopy

Tremendous advances in the development and application of combinatorial and high-throughput methods for materials research have been accomplished over the past 15 years. Despite these accomplishments, todays combinatorial materials science is met by some of the same challenges that faced early implementers. NCMC-10: Persistent Challenges in

Combinatorial Materials Science, was a forum to examine these persistent measurement needs. The Workshop addressed library fabrication, which continually emerges as a problem when Combi is applied to new materials targets; and informatics/system integration, which has always been a central barrier to workflow development. Over the course of two days, the Workshop brought together 29 industry representatives from the 21 NCMC member institutions, along with academic researchers and more than 30 NIST staff (see Appendix C: NCMC-10 Attendee List). The Workshop included: Technical symposia focused on the persistent challenges of Combi workflow integration and library fabrication. Experts from BASF Aktiengesellschaft, Cornell University, Dow Chemical, North Dakota State University, Building and Fire Research Laboratory (BFRL), and Materials Science and Engineering Laboratory (MSEL) gave plenary lectures on these subjects; 10 lectures detailing MSEL Combi methods for polymer formulations, nanostructured materials, organic electronics, and inorganic electronic devices; NCMC-led discussion sessions aimed at identifying key technologies, commercial instruments, and topics at national conferences needed to address persistent challenges to Combi implementation; Tours and method demonstrations in NCMC and BFRL laboratory facilities.
NTIS
Materials Science; Composite Materials

20090030940 Southwest Region Univ. Transportation Center, College Station, TX, USA; Texas A&M Univ., College Station, TX USA
Evaluation and Optimization of Durable Pervious Concrete for Use in Urban Areas
Joung, Y.; Grasley, Z. C.; Dec. 2007; 82 pp.; In English
Report No.(s): PB2008-109362; SWUTC-08-167163-1; No Copyright; Avail.: National Technical Information Service (NTIS)

Although pervious concrete was first used in the nineteenth century, it has only recently begun to increase in popularity. As urban areas expand, the problems associated with runoff management have become more challenging. The focus on the negative environmental effects associated with pavement runoff has also increased. These two issues have spurred the recent interest in pervious concrete pavements; pervious concrete, however, has deficiencies which limit its application as pavements. These limitations include low compressive strength, flexural strength, clogging, and other durability issues. The overall purpose of this project was to provide tools to evaluate and improve the durability and strength of pervious concrete such that it may be more confidently employed in urban roadways. The specific objectives of this project were to (a) investigate the effect of mixture design on strength of pervious concrete (including the effect of fibers), (b) evaluate effect of clogging materials on coefficient of permeability, (c) and investigate the use of the dynamic pressurization test to evaluate the durability of pervious concrete. This report documents the results of the laboratory testing, and presents recommendations for mixture proportioning. In addition, recommendations are provided for optimizing the balance between compressive strength and permeability.
NTIS
Cities; Concretes; Durability; Pavements; Flexural Strength; Compressive Strength

20090031154 Department of Energy, Washington, DC, USA
National Energy Technology Laboratory SOFC Interconnect Work at NETL
Jablonski, P.; Alman, D. E.; Jan. 2008; 22 pp.; In English
Report No.(s): DE2008-926170; DOE/NETL/IR-2006/213; No Copyright; Avail.: National Technical Information Service (NTIS)

An interconnect for an SOFC stack is used to connect fuel cells into a stack. SOFC stacks are expected to run for 40,000 hours and 10 thermal cycles for the stationary application and 10,000 hours and 7000 thermal cycles for the transportation application. The interconnect of a stack must be economical and robust enough to survive the SOFC stack operation temperature of 750 degrees C and must maintain the electrical connection to the fuel cells throughout the lifetime and under thermal cycling conditions. Ferritic and austenitic stainless steels, and nickel-based superalloys were investigated as possible interconnect materials for solid oxide fuel cell (SOFC) stacks.The alloys were thermally cycled in air and in a wet nitrogen-argon-hydrogen atmosphere. Thermogravimetry was used to determine the parabolic oxidation rate constants of the alloys in both atmospheres. The area-specific resistance of the oxide scale and metal substrates were measured using a two-probe technique with platinum contacts.
NTIS
Energy Technology; Solid Oxide Fuel Cells

20090031641 Air Force Research Lab., Edwards AFB, CA USA

Effect of Polyhedral Oligomeric Silsesquioxane (POSS) Substituents on the Rheological Behavior in Butyl Methacrylate/POSS Copolymers

McGrath, Laura M.; Weber, Sarah A.; Yandek, Gregory R.; Mabry, Joseph M.; 27 Oct. 2008; 4 pp.; In English; 237th ACS National Meeting and Exposition, 22 - 26 Mar. 2009, Salt Lake City, UT, USA

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A502446; AFRL-RZ-ED-TP-2008-485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Polyhedral oligomeric silsesquioxane (POSS) has generated much interest in the development of novel nanomaterials. The organic groups attached to the silicon atoms in the POSS cage can serve many different functions. It has been shown that POSS copolymers exhibit different rheological properties when the organic group is changed in a copolymer. In this work, we examine the effects of varying the organic groups (R = c-C5H9: denoted as Cp, i-C4H9: i-Bu, C3H4F3: FPr) on propylmethacryl POSS molecule copolymerized with n-butyl methacrylate. i-Bu groups increase the free volume in the copolymer whereas the Cp and FPr groups appear to interact thereby reinforcing the soft polymer.

DTIC

Acrylates; Copolymers; Oligomers; Radicals; Rheology; Siloxanes

20090031670 Air Force Research Lab., Wright-Patterson AFB, OH USA

Coarse-Grained Molecular Dynamics Simulation of Ionic Polymer Networks

Dirama, T. E.; Varshney, V.; Anderson, K. L.; Shumaker, J. A.; Johnson, J. A.; Jul 2008; 19 pp.; In English

Contract(s)/Grant(s): FA8650-05-D-5807-0052; Proj-4347

Report No.(s): AD-A502438; AFRL-RX-WP-TP-2009-4198; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The stress-strain behavior of cross-linked polymeric networks was investigated using molecular dynamics simulations with a coarse-grained representation of the repeating units. The network structure was formed by dynamically crosslinking the reactants placed between two rigid layers comprised of particles of the same type. We studied two types of networks which differ only by one containing ionic pairs that amount to 7% of the total number of bonds present. The stress-strain curves were obtained after imposing deformation in tensile and shear modes to the networks and measuring their stress response. Under both forms of deformations there was improvement in the level of stress that the material could bear. Moreover, the time dependent behavior of the improvement in mechanical properties signed a self-healing mechanism.

DTIC

Coarseness; Crosslinking; Grain Size; Ionic Crystals; Molecular Dynamics; Polymers; Simulation

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COMPOSITE MATERIALS

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

20090029973 NASA Langley Research Center, Hampton, VA, USA

Method of Making an Electroactive Sensing/Actuating Material for Carbon Nanotube Polymer Composite

Ounaies, Zoubeida, Inventor; Park, Cheol, Inventor; Harrison, Joycelyn S., Inventor; Holloway, Nancy M., Inventor; Draughon, Gregory K., Inventor; May 05, 2009; 6 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 25 Apr. 2008; US-Patent-7527751; NASA-Case-LAR-16867-2; US-Patent-Appl-SN-12/109490; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090029973

An electroactive sensing or actuating material comprises a composite made from a polymer with polarizable moieties and an effective amount of carbon nanotubes incorporated in the polymer for a predetermined electromechanical operation of the composite when such composite is affected by an external stimulus. In another embodiment, the composite comprises a, third component of micro -sized to nano-sized particles of an electroactive ceramic that is also incorporated in the polymer matrix. The method for making the three-phase composite comprises either incorporating the carbon nanotubes in the polymer matrix before incorporation of the particles of ceramic or mixing the carbon nanotubes and particles of ceramic together in a solution before incorporation in the polymer matrix.

Author

Carbon Nanotubes; Composite Materials; Electroactive Polymers; Ceramics

20090030407 Savannah River National Lab., Aiken, SC, USA
Radiation Effects on Epoxy/Carbon-Fiber Composite
Hoffman, E.; Jan. 11, 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2008-921970; WSRC-STI-2008-00014; No Copyright; Avail.: Department of Energy Information Bridge

Piping in the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS) must withstand the stresses involved during an unlikely but potential deflagration event. One method proposed for protection and reinforcement of piping during such an event is the use of a carbon fiber-reinforced epoxy composite (Diamond-Wrap). In the DWPF, this reinforcement composite product would be required to maintain its safety function for a 20-year service life. This product has been ASME-approved (nuclear code case 589) for post-construction maintenance and is DOT-compliant per 49CFR 192 and 195. However, its radiation resistance properties have not been evaluated. This report documents initial radiation resistance testing of the product and microstructural effects. Additional testing is recommended to evaluate radiation effects on specific properties such as burst strength, chemical resistance/weeping and for service life prediction in critical applications.
NTIS
Carbon Fibers; Epoxy Resins; Fiber Composites; Grasslands; Radiation Effects; Radiation Tolerance; Rivers

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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*.

20090030318 Applied Research Associates, Inc., Tyndall AFB, FL USA
Effect of Chlorine Substitution on Sulfide Reactivity with OH Radicals
Hearn, John D; Henley, Michael V; Cory, Marshall G; Vasey, Joseph L; Burns, Douglas S; Sep 2008; 6 pp.; In English
Contract(s)/Grant(s): FA4819-06-C-0009; Proj-4915
Report No.(s): AD-A501523; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501523

Predicting plume migration and evolution of hazardous chemical species (toxic industrial compounds, chemical warfare agents, pesticides, etc.) is challenging because current models cannot accurately predict reaction rate constants with atmospheric oxidants. Predictive models based on structure activity relationships have not been developed to calculate rate constants for phosphorous or halogen containing compounds (elements that are often present in hazardous chemicals). In order to have a comprehensive approach for modeling plume migration and evolution of hazardous chemicals, rate constants need to be accurately predicted so that chemical degradation can be included. We have studied the effects that chlorine substitution has on the reaction between OH radicals and sulfides to determine the effect halogen substitution has on reactivity. The results show appreciable reduction in the rate constant and a dramatic decrease in the activation energy of the chlorine-substituted organics relative to their unmodified analogs. This implies that the chlorine decreases the stability of the intermediate complex that is formed with the sulfur during the reaction. Atmospheric implications are discussed.
DTIC
Chemical Warfare; Chlorine; Hydroxyl Radicals; Methyl Compounds; Radicals; Reactivity; Substitutes; Sulfides

20090030338 Army Research Lab., Adelphi, MD USA
Test and Characterization of Some Zeolite Supported Gas Phase Desulfurization Sorbents
Rong, Charles; Chu, Deryn; Hopkins, John; Jun. 2009; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502628; ARL-TR-4859; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the results of sulfidation and regeneration of mixed metal oxide supported on zeolite-Y for hydrogen sulfide (H2S) at 650 and 800 deg C, along with results for unsupported mixed metal oxide. The capacity for the unsupported oxide was higher than that for the supported oxide, but the unsupported mixed metal oxide showed evidence of sintering at higher temperatures, which resulted in a decreased desulfurization capacity. The sulfidation capacity of the zeolite supported mixed metal oxide, although it started with a lower capacity, was found to be independent of temperature at both 650 and 800

deg C, suggesting the mixed metal ions supported on zeolite are resistant to sintering at higher temperature, and they appear to have only surface interaction with H2S.
DTIC
Desulfurizing; Metal Oxides; Oxides; Sorbents; Sulfidation; Vapor Phases; Zeolites

20090030349 Savannah River National Lab., Aiken, SC, USA
Transient Accident Analysis of the Glovebox System in a Large Process Room
Lee, S.; Jan. 11, 2008; 10 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2008-921971; WSRC-STI-2007-00615; No Copyright; Avail.: National Technical Information Service (NTIS)

Local transient hydrogen concentrations were evaluated inside a large process room when the hydrogen gas was released by three postulated accident scenarios associated with the process tank leakage and fire leading to a loss of gas confinement. The three cases considered in this work were fire in a room, loss of confinement from a process tank, and loss of confinement coupled with fire event. Based on these accident scenarios in a large and unventilated process room, the modeling calculations of the hydrogen migration were performed to estimate local transient concentrations of hydrogen due to the sudden leakage and release from a glovebox system associated with the process tank. The modeling domain represented the major features of the process room including the principal release or leakage source of gas storage system. The model was benchmarked against the literature results for key phenomena such as natural convection, turbulent behavior, gas mixing due to jet entrainment, and radiation cooling because these phenomena are closely related to the gas driving mechanisms within a large air space of the process room. The modeling results showed that at the corner of the process room, the gas concentrations migrated by the Case 2 and Case 3 scenarios reached the set-point value of high activity alarm in about 13 seconds, while the Case 1 scenario takes about 90 seconds to reach the concentration. The modeling results were used to estimate transient radioactive gas migrations in an enclosed process room installed with high activity alarm monitor when the postulated leakage scenarios are initiated without room ventilation.
NTIS
Accident Investigation; Gloveboxes; Hydrogen; Radioactive Materials

20090030352 Air Force Research Lab., Wright-Patterson AFB, OH USA; Dayton Univ. Research Inst., OH, USA; Texas Univ., Austin, TX, USA
Influence of Residual Stresses on Fretting Fatigue Life Prediction in Ti-6Al-4V
Golden, Patrick J.; Buchanan, Dennis; Naboulsi, Sam; Jan. 2008; 28 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502624; AFRL-RX-WP-TP-2009-4162; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this work was to evaluate life prediction methodologies involving fretting fatigue of turbine engine materials with advanced surface treatments. Fretting fatigue tests were performed on Ti-6Al-4V dovetail specimens with and without advanced surface treatments. These tests were representative of the conditions found in a turbine engine blade to disk attachment. Laser shock processing and low plasticity burnishing have been shown to produce deep compressive residual stresses with relatively little cold work. Testing showed these advanced surface treatments improved fretting fatigue strength by approximately 50%. In addition to advanced surface treatments, several specimens were also coated with diamond like carbon applied through a non-line-of-sight process capable of coating small dovetail slots in an engine disk. Testing with this coating alone and combined with advanced surface treatments also significantly improved fretting fatigue strength due to a decreased coefficient of friction along with the compressive residual stresses.
DTIC
Aluminum Alloys; Fatigue Life; Fretting; Predictions; Residual Stress; Titanium Alloys; Titanium Aluminides; Vanadium Alloys

20090030360 Missouri Water Resources Research Center, Rolla, MO USA
Oxidation of ZrB2 and ZrB2-SiC Ceramics With Tungsten Additions
Zhang, S. C.; Fahrenholtz, W. G.; Hilmas, G. E.; Proceedings of the 241th Electrochemical Society Meeting; Feb. 2009; 11 pp.; In English; Electrochemical Society Meeting, 12 - 17 Oct. 2008, Honolulu, HI, USA
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A502611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effect of tungsten additions on the oxidation behavior of zirconium diboride-based ceramics was studied. Four mole

percent tungsten carbide was added to ZrB2. The oxidation behavior was studied using thermal gravimetric analysis and isothermal testing in flowing air. Upon heating to 1500 degrees C, the mass gain decreased from approx. 14 milligrams/(square centimeter) for nominally pure ZrB2 to approx. 4.5 milligrams/(square centimeter) for tungsten containing ZrB2. After heating to 1500 degrees C for three hours, the scale thickness on nominally pure ZrB2 was approx. 500 micrometers compared to approx. 100 micrometers for tungsten containing ZrB2. Tungsten additions improved the oxidation resistance of ZrB2 by modifying the morphology of the ZrO2 scale by liquid phase sintering, making it a better barrier to oxygen diffusion.
DTIC
Boron Compounds; Ceramics; Oxidation; Silicon Carbides; Tungsten; Tungsten Carbides; Zirconium Compounds

20090030403 Phoenix Chemical Lab., Inc., Chicago, IL USA
Thermochemical and Physical Properties of Fluids, Lubricants and Related Materials. Delivery Order 0001: Improved Methods Development for Determining Thermophysical and Thermochemical Properties of Fluids, Lubricants and Related Materials
Krawetz, Arthur A.; Jul. 2008; 154 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): F33615-03-D-5049-0001; Proj-4347; 62102F
Report No.(s): AD-A501623; AFRL-RX-WP-TM-2008-4368; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501623
A new method is described that determines the corrosion protection of fluids, lubricants and related materials and automatic equipment for the measurement thereof. Chemical and physical properties of experimental hydraulic fluids, dielectric coolants, grease and related materials are reported.
DTIC
Coolants; Hydraulic Fluids; Lubricants; Stability; Thermochemical Properties; Thermochemistry; Thermophysical Properties

20090030411 Idaho National Lab., Idaho Falls, ID, USA
Carbon Neutral Production of Syngas Via High Temperature Electrolytic Reduction of Steam and CO(sub2)
Stoots, C.; O'Brien, J.; Hartvigsen, J.; Nov. 2007; 11 pp.; In English
Report No.(s): DE2008-923498; INL/CON-07-12820; No Copyright; Avail.: National Technical Information Service (NTIS)
This paper presents the most recent results of experiments conducted at the Idaho National Laboratory (INL) studying coelectrolysis of steam and carbon dioxide in solid-oxide electrolysis stacks. Two 10-cell planar stacks were tested under various gas compositions, operating voltages, and operating temperatures. The tests were heavily instrumented, and outlet gas compositions were monitored with a gas chromatograph. Measured outlet compositions, open cell potentials, and coelectrolysis thermal neutral voltages compared reasonably well with a coelectrolysis computer model developed at the INL. Stack ASRs did not change significantly when switching from electrolysis to coelectrolysis operation.
NTIS
Carbon; Carbon Dioxide; High Temperature; Hydrogen Production; Steam; Synthesis Gas

20090030438 Idaho National Lab., Idaho Falls, ID, USA
Results of Recent High Temperature Co-Electrolysis Studies at the Idaho National Laboratory. 2007 AIChE Annual Meeting
Stoots, C.; O'Brien, J.; Hartvigsen, J.; Nov. 2007; 10 pp.; In English
Report No.(s): DE2008-923494; INL/CON-07-12821; No Copyright; Avail.: National Technical Information Service (NTIS)
For the past several years, the Idaho National Laboratory and Ceramatec, Inc. have been studying the feasibility of high temperature solid oxide electrolysis for large-scale, nuclear-powered hydrogen production. Parallel to this effort, the INL and Ceramatec have been researching high temperature solid oxide co-electrolysis of steam/CO2 mixtures to produce syngas, the raw material for synthetic fuels production. When powered by nuclear energy, high temperature co-electrolysis offers a carbon-neutral means of syngas production while consuming CO2. The INL has been conducting experiments to characterize the electrochemical performance of co-electrolysis, as well as validate INL-developed computer models. An inline methanation reactor has also been tested to study direct methane production from co-electrolysis products. Testing to date indicate that high temperature steam electrolysis cells perform equally well under co-electrolysis conditions. Process model

predictions compare well with measurements for outlet product compositions. The process appears to be a promising technique for large-scale syngas production.
NTIS
Electrolysis; High Temperature; Hydrogen Production; Carbon Dioxide; Synthesis Gas; Synthetic Fuels

20090030556 Air Force Research Lab., Edwards AFB, CA USA
Non-Porous Organic Solids Capable of Dynamically Resolving Mixtures of Diiodoperfluoroalkanes
Metrangolo, Pierangelo; Carcenac, Yvan; Lahtinen, Manu; Pilati, Tullio; Rissanen, Kari; Vij, Ashwani; Resnati, Giuseppe; 11 Dec. 2008; 63 pp.; In English
Contract(s)/Grant(s): Proj-5026
Report No.(s): AD-A502506; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A well-known class of organic non-porous compounds, polymethylene bismethonium iodides, undergoes selective capture and release of a,w-diiodoperfluoroalkanes in a dynamic and controlled manner, in solution and from the gas phase. Despite a lack of porosity of the starting materials, guest transport through the solid occurs readily until a thermodynamically stable porous structure is achieved, which is highly selective only to the convenient diiodoperfluoroalkane. The size matching between the intercharge distance in the cation and the charge separation in the halogen-bonded I-...I(CF2)mI...I- superanion drives the selectivity of the process, which identifies the target diiodoperfluoroalkane even from complex industrial mixtures. The full reversibility of the process where diiodoperfluoroalkanes can first be selectively complexed and then quantitatively evacuated, yields pure fluorinated telomers and reusable decamethonium congeners.
DTIC
Organic Solids; Porosity; Resolution

20090030614 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Ground Source Heat Pumps vs. Conventional HVAC: A Comparison of Economic and Environmental Costs
Fredin, Paul W; Mar. 26, 2009; 163 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502785; AFIT/ENV/GEM/09-M05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The world is undergoing a dramatic transformation with regard to how it produces and consumes energy due to increasing demand from developing nations and diminishing new resource discoveries. In addition, there has been increased concern over the effect of carbon dioxide emissions on the environment. All of these issues have created a combined pressure to force the world to begin to redefine how energy is utilized. Geothermal or ground source heat pumps (GSHPs) may provide one potential solution to these problems. This research investigated vertical borehole closed-loop GSHP systems in direct comparison to natural gas furnaces combined with traditional air-conditioning (NGAC) for 51 locations in the USA. The study utilized Trane Trace 700, Geothermal Loop Design, and Building Life-Cycle Cost 5 software packages for analysis. Although the installation costs for GSHP systems were 257% higher than NGAC systems, the operating costs were 33% lower. The mean simple and discounted payback periods for the GSHP system were 10 and 15 years, respectively. Carbon dioxide emissions were found to be 2.2% higher for the GSHP systems due to their use of coal-fired electricity in most locations. The overall life-cycle cost was 19.0% lower when selecting the GSHP system over the NGAC system.
DTIC
Carbon Dioxide; Costs; Economic Analysis; Economics; Emission; Heat Pumps; Life Cycle Costs

20090030632 Air Force Research Lab., Edwards AFB, CA USA
Design of Energetic Ionic Liquids
Boatz, Jerry A.; Voth, Gregory A.; Gordon, Mark S.; Hammes-Schiffer, Sharon; May 12, 2009; 9 pp.; In English; DOD User's Group Conference, 15-19 Jun. 2009, San Diego, CA, USA
Report No.(s): AD-A502680; AFRL-RZ-ED-TP-2009-95; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An essential need of the US Air Force is the discovery, development, and fielding of new, energetic materials for advanced chemical propulsion in space and missile applications. Some of the key factors driving the requirement for new chemical propellants include: (a) improved performance in terms of increased specific impulse and density, (b) reduced sensitivity to external stimuli such as impact, friction, shock, and electrostatic discharge, and (c) mitigation of environmental and toxicological hazards (and the resulting costs) associated with currently used propellants. The overall objective of the Design of Energetic Ionic Liquids challenge project is to address several key technical issues and challenges associated with the

characterization, design, and development of ILs as new monopropellants. Among these, for example, are a fundamental understanding of the (in)stability of ILs, the intrinsic nature of the short- and long-range structure and interactions between the component ions, and identification of the key steps in the initial stages of decomposition and combustion. A hierarchy of computational approaches is employed, including atomistic, high-level quantum chemical methods applied to individual ions and ion clusters, condensed phase atomistic molecular dynamics simulations utilizing polarizable force fields, and mesoscale-level simulations of bulk ionic liquids based upon multiscale coarse graining techniques.
DTIC
Combustion; Liquids; Missiles; Molecular Dynamics; Monopropellants; Quantum Chemistry; Specific Impulse; Toxic Hazards

20090030681 National Renewable Energy Lab., Golden, CO USA
Hydrogen from Water in a Novel Recombinant Oxygen-Tolerant Cyanobacterial System (Presentation)
Xu, Q.; Smith, H. O.; Maness, P. C.; May 01, 2007; 19 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-912960; NREL/PR-270-41783; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this report is to develop an O(sub 2)-tolerant cyanobacterial system for continuous light-driven H(sub 2) production from water. The overall goal is to produce a cyanobacterial recombinant to produce H(sub 2) continuously.
NTIS
Bacteria; Hydrogen; Hydrogen Production; Oxygen Supply Equipment; Water

20090030682 National Renewable Energy Lab., Golden, CO USA
Purdue Hydrogen Systems Laboratory (Presentation)
Gore, J.; Peterson, J.; Ting, B.; Pelter, L.; Basu, S.; May 01, 2007; 33 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-912947; NREL/PR-270-41782; No Copyright; Avail.: National Technical Information Service (NTIS)
Objectives of this report are: Improve the extent, rate and control of hydrogen release from ammonia borane(AB) by hydrolysis reactions; Characterize the dehydrogenation products and develop new methods for AB regeneration; and Investigate a new method for hydrogen generation from water and ammonia borane using self-sustained combustion reactions.
NTIS
Hydrogen; Boranes; Ammonia

20090030686 Idaho National Lab., Idaho Falls, ID, USA
Catalyst Activity and Post-operation Analyses of Pt/TiO2 (Rutile) Catalysts Used in the Sulfuric Acid Decomposition Reaction
Farrell, H. H.; Pinhero, P. J.; Burch, K. C.; Rollins, H. W.; Ginosar, D. M.; Jun. 01, 2007; 2 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727
Report No.(s): DE2008-912893; INL/CON-06-11998; No Copyright; Avail.: Department of Energy Information Bridge
Production of hydrogen by splitting of water at lower temperatures than by direct thermal decomposition can be achieved by a series of particular chemical reactions that establish a thermochemical cycle (1). Among the high number of thermochemical water-splitting cycles proposed in the literature (2), the sulfur-based group is of considerable interest. All the sulfur-based cycles employ the catalytic decomposition of sulfuric acid into SO2 and O2. The produced O2 corresponds to the O2 generated from water in the overall cycle. Research performed at the Idaho National Laboratory (3) has found that even one of the most stables catalysts, Pt supported on low surface area titania, deactivates with time on stream (TOS). To develop an understanding of the factors that cause catalyst deactivation, samples of 1% Pt supported on titania (rutile) catalyst were submitted to flowing concentrated sulfuric acid at 1123 K and atmospheric pressure for different TOSs between 0 and 548 h and a number of chemical and spectroscopic analyses applied to the spent samples.
NTIS
Catalysts; Decomposition; Rutile; Sulfuric Acid; Titanium Oxides

20090030697 Geological Survey, Reston, VA USA

Association of Arsenic with Redox Conditions, Depth, and Ground-Water Age in the Glacial Aquifer System of the Northern USA

Thomas, M. A.; Jan. 2007; 36 pp.; In English

Report No.(s): PB2008-109244; USGS/SIR-2007-5036; No Copyright; Avail.: National Technical Information Service (NTIS)

More than 800 wells in the glacial aquifer system of the Northern USA were sampled for arsenic as part of U.S. Geological Survey National Water-Quality Assessment (NAWQA) studies during 1991-2003. Elevated arsenic concentrations (greater than or equal to 10 micrograms per liter) were detected in 9 percent of samples. Elevated arsenic concentrations were associated with strongly reducing conditions. Of the samples classified as iron reducing or sulfate reducing, arsenic concentrations were elevated in 19 percent. Of the methanogenic samples, arsenic concentrations were elevated in 45 percent. In contrast, concentrations of arsenic were elevated in only 1 percent of oxic samples.

NTIS

Aquifers; Glaciers; Ground Water; Oxidation-Reduction Reactions; Water Quality

20090030823 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Cavity Coupled Aeroramp Injector Combustion Study

Olmstead, Dell T; Jun. 2009; 76 pp.; In English; Original contains color illustrations

Report No.(s): AD-A502108; AFIT/GAE/ENY/09-J03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502108

The difficulties with fueling of supersonic combustion ramjet engines with hydrocarbon based fuels presents many challenges that are currently being tackled by the Air Force Research Lab Propulsion Directorate Aerospace Propulsion Division. As the scramjet engine designs are scaled up, the need for a better solution to supersonic mixing has led to the development of many different styles of fuel injection. An aerodynamic ramp injector has been shown to have a quantitative improvement over a physical ramp while still achieving desirable mixing characteristics. The objectives for this research was quantifying the performance and operability implications of replacing four 15 degree round injectors with four arrays of improved aeroramp injectors. Ignition limits and pre-combustion shock position were used to define the operability differences while combustion efficiency was the primary metric used for performance comparisons. Performance and operability data was derived from data taken determining the ignition limits, the wall static pressures, temperature measurements, and thrust stand loading. It was determined that the operability reduces significantly for the aeroramp injector, but the performance is virtually identical to the round injectors. The aeroramp injector indicated improved near-field combustion indicating the potential for better performance in higher Mach number flow to include full scramjet mode.

DTIC

Cavities; Combustion; Fuels; Hydrocarbons; Injectors; Supersonic Combustion Ramjet Engines

20090030836 Air Force Research Lab., Wright-Patterson AFB, OH USA

Application of a Ternary Phase-Field Model to Precipitation Behavior in Ni-Al-Cr Alloys

Simmons, J P; Woodward, C; Wen, Y H; Apr. 2009; 22 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A502103; AFRL-RX-WP-TP-2009-4094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502103

A recently developed ternary phase-field model is applied to study the precipitation behavior in Ni-Al-Cr alloys. The effect of diffusivity and initial compositional/ordering profiles on the growth process of precipitates are examined. Specifically, the composition evolution with time in the precipitates is simulated and compared with experimental observations by Sudbrack et al. The simulation work reveals that the CR- trapping phenomenon can only be reproduced with no significant partitioning of Cr at the nucleation stage. By looking into the composition dependent diffusivity and thermodynamic driving force for both Al and Cr, it is found that the key difference resides in the much stronger composition dependence of the diffusivity of Al.

DTIC

Aluminum Alloys; Chromium Alloys; Diffusivity; Mathematical Models; Nickel Alloys; Nucleation

20090030901 Rensselaer Polytechnic Inst., Troy, NY USA
Eigendeformation-Based Homogenization of Concrete
Wu, Wei; Yuan, Zheng; Fish, Jacob; 26 Mar. 2009; 31 pp.; In English
Contract(s)/Grant(s): FA8651-05-1-0007; Proj-2502; 62602F
Report No.(s): AD-A502402; AFRL-RW-EG-TR-2009-7066; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502402

A two-scale approach based on eigendeformation-based homogenization is explored to predict the behavior of concrete targets subjected to impact loading by high speed projectiles. The method allows accounting for micromechanical features of concrete at a computational cost comparable to single scale phenomenological models of concrete. The inelastic behavior of concrete is modeled using three types of eigenstrains. The eigenstrains in the mortar phase include pore compaction (or lock-in), rate-dependent damage and plasticity eigenstrains, whereas the inelastic behavior of aggregates is assumed to be governed by plasticity only. Material parameters were identified using inverse methods against unconfined compression and uniaxial compression tests. A unit cell was constructed from a 3D digital image of concrete. The eigendeformation-based homogenization approach was validated for the projectile penetration into concrete target. The simulation results were found to be in reasonable agreement with the experimental data. Attention is restricted to non-reinforced concrete.
DTIC
Concretes; Elastic Properties; Homogeneity; Homogenizing

20090030923 Sandia Labs., Livermore, CA, USA
Erbium Hydride Thermal Desorption: Controlling Kinetics
Ferrizz, R. M.; Aug. 01, 2007; 18 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-920769; SAND2007-2659; No Copyright; Avail.: Department of Energy Information Bridge

Thermal desorption spectroscopy (TDS) is used to study the decomposition kinetics of erbium hydride thin films. The TDS results presented in this report show that hydride film processing parameters directly impact thermal stability. Issues to be addressed include desorption kinetics for dihydrides and trihydrides, and the effect of film growth parameters, loading parameters, and substrate selection on desorption kinetics.
NTIS
Decomposition; Desorption; Erbium; Hydrides; Kinetics; Spectroscopy; Thin Films

20090031746 Open Univ., Kaoshiung, Taiwan, Province of China
Solar Photocatalytic Disinfection of Water in the Presence of Kaolinite Catalyst
Wu, Ming-Ching; Liao, Chiu-Jung; Kuo, Shu-Lung; Chang, Chang-Tang; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 299-302; In English; See also 20090031741; Copyright; Avail.: Other Sources

In this study a kaolinite-Ag catalyst and a kaolinite-Zn catalyst are prepared for use in photocatalysis which uses irradiation by sodium light to damage the cell structures of bacteria in water for disinfection. The experimental results indicated that kaolinite-Ag catalyst and kaolinite-Zn catalyst have the best disinfection efficiency when 0.06 wt% are added and reached 90% and 85% disinfection efficiency when they were exposed to sodium light for 200 minutes. Among the individual catalysts, kaolinite-Zn catalyst releases more intermediates at the latter stage of photocatalysis (proved by the concentration level of total organic carbon, (TOC)); it is easy for the intermediates to compete with the catalyst. The activation rate of target objects on the surface of the Zn catalyst, thus, slows down and results in slower spread of disinfection in the latter part of the reaction curve.
Author
Catalysts; Kaolinite; Water; Sunlight; Water Treatment

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METALS AND METALLIC MATERIALS

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

20090030203 International Trade Commission, Washington, DC USA
Certain Steel Wire Rod: Evaluation of the Effectiveness of Import Relief
Aug. 2003; 73 pp.; In English
Report No.(s): PB2009-113043; USITC/PUB-3629; No Copyright; Avail.: CASI: A04, Hardcopy

Contents: Introduction; The U.S. market; Condition of the U.S. industry; Domestic industry adjustment efforts; Pricing and related information and Appendixes.

NTIS
Rods; Steels; Wire

20090030206 International Trade Commission, Washington, DC, USA
Partial Equilibrium Approach of Modeling Vertical Linkages in the U.S. Flat Rolled Steel Market
Fetzer, J. J.; Jan. 11, 2005; 26 pp.; In English
Report No.(s): PB2009-113047; USITC-2005-01-A; No Copyright; Avail.: CASI: A03, Hardcopy

This paper models linkages between upstream and downstream goods in the U.S. market for flat-rolled steel. These vertical linkages are important to account for when estimating the impact of trade restrictions on imports of flat rolled steel because some types of flat rolled steel are predominately used to produce other types of flat rolled steel and in some cases also make up a large share of their production costs. Previous research has modeled the linkages between upstream and downstream goods with CGE models and vertically linked partial equilibrium models. Drawing upon this literature, this paper builds a vertically linked version of the CES COMPAS model that incorporates vertical linkages as constant cross price elasticities in both downstream supply functions and upstream factor demand functions. Compared to estimates from the CES COMPAS without vertical linkages, introduction of a trade restriction increases demand for upstream goods and decreases supply of downstream goods, increasing prices of both upstream and downstream goods, while increasing shipments of upstream goods and decreasing shipments of downstream goods. In estimating the impact of the safeguard measures imposed on the flat rolled steel market, accounting for the vertical linkages is most important when estimating the impact on domestically produced slab since all downstream products produced from slab were subject to the safeguard tariffs.

NTIS
International Trade; Linkages; Steels

20090030344 Air Force Research Lab., Wright-Patterson AFB, OH USA; Commissariat a l'Energie Atomique, France; Ecole Nationale Superieure des Mines, Sainte-Etienne, France
A Model of Discontinuous Dynamic Recrystallization and its Application for Nickel Alloys
Semiatin, S. L.; Damamme, Gilles; Piot, David; Montheillet, Frank; Apr. 2009; 8 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502625; AFRL-RX-WP-TP-2009-4117; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A simple mesoscale model was developed for discontinuous dynamic recrystallization. The material is described on a grain scale as a set of (variable) spherical grains. Each grain is characterized by two internal variables: its diameter and dislocation density (assumed homogeneous within the grain). Each grain is then considered in turn as an inclusion, embedded in a homogeneous equivalent matrix, the properties of which are obtained by averaging over all the grains. The model includes: (1) a grain boundary migration equation driving the evolution of grain size via the mobility of grain boundaries, which is coupled with (2) a dislocation-density evolution equation, such as the Yoshie-Laasraoui-Jonas or Kocks-Mecking relationship, involving strain hardening and dynamic recovery, and (3) an equation governing the total number of grains in the system due to the nucleation of new grains. The model can be used to predict transient and steady-state flow stresses, recrystallized fractions, and grain-size distributions. A method to fit the model coefficients is also described. The application of the model to pure Ni is presented.

DTIC
Discontinuity; Nickel Alloys; Recrystallization

20090030387 Universal Energy Systems, Inc., Dayton, OH USA
Particle Size Distributions During Diffusion Controlled Growth and Coarsening (Preprint)
Senkov, Oleg N; Feb 2008; 11 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-2311
Report No.(s): AD-A501504; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501504

The chemical partitioning of alloying elements between the disordered y and ordered y-prime phases in the nickel base superalloy Rene 88DT, has been characterized in detail using three dimensional atom probe tomography (3DAP) coupled with energy-filtered transmission electron microscopy studies. After a homogenization treatment followed by a water quench, it is observed that the morphology of the y-prime precipitates remains near-spherical even after long aging times. Compositional variation, observed between small (less than 5 nanometers) and larger y-prime precipitates, reduces with increasing aging time, while the compositional gradient across the y/y-prime interface decreases. The process of growth of y-prime precipitates seems to occur through coalescence of adjacent y-prime precipitates, facilitated through the formation of necks between adjacent precipitates. These necks are observed to have intermediate elemental concentration values, between the matrix and the y-prime precipitate compositions.
DTIC
Diffusion; Heat Resistant Alloys; Nickel Alloys; Size Distribution

20090030418 National Energy Technology Lab., Albany, OR, USA
Quantitative X-ray Microanalysis of Submicron Carbide Formation in Chromium (III) Oxide Rich Scale
Collins, W. K.; Ziomek-Moroz, M.; Holcomb, G. R.; Danielson, P.; Hunt, A.; Jan. 2007; 25 pp.; In English
Report No.(s): DE2008-923630; DOE/NETL-IR-2007-183; No Copyright; Avail.: Department of Energy Information Bridge

This paper discusses the chemical microanalysis techniques adapted to identify the precipitates that form on the surface of, or within, the oxide scale of a Fe-22Cr ferritic steel during exposure to a carbon-monoxide rich environment at 750C for 800 hours. Examination of oxidized test coupons revealed the presence of a fiber like structure at the surface. Other studies have reported that these structures are carbon precipitates.
NTIS
Carbides; Chromium Carbides; Chromium Oxides; Microanalysis; X Rays

20090030439 Bettis Atomic Power Lab., West Mifflin, PA, USA
Stress Corrosion Cracking Response of 304 Stainless Steel in Aerated and Dearated Water
Mills, W. J.; Apr. 2007; 81 pp.; In English
Report No.(s): DE2008-923319; B-T-3697; No Copyright; Avail.: National Technical Information Service (NTIS)

Scoping stress corrosion cracking (SCC) tests of 304 stainless steel (SS) were performed in 75 C and 250 C aerated pressurized water (APW) and 250 C deaerated pressurized water (DPW). The 250 C APW environment was used to initiate intergranular stress corrosion cracking (IGSCC) and then the water was deaerated and hydrogenated to see if IGSCC continued in 250 C DPW. Tests were performed with and without 200 ppb SO(sub 4)(sup =). The 304 SS test materials were evaluated in either the as-received, heavily sensitized (649 C for 1 h), fully sensitized (1099 C for 1 h/water quench/621 C for 17 h) or 20% cold rolled condition. At the beginning of each test sequence, specimens were subjected to continuous cycling with a 500s rise/500s fall or a 5000s rise/500s fall to promote the transition from a transgranular (TG) precrack to an IG crack. After generating a uniform crack under continuous cycling conditions, a trapezoidal waveform with 500s rise/9000s hold/500s fall was used to characterize the SCC behavior. Crack growth rates (CGRs) were monitored continuously with the electric potential drop (EPD) method and were corrected based on physical crack length measurements obtained when specimens were destructively evaluated. Continuous cycling with a 500s or 5000s rise time was found to produce both TG faceting and IGSCC in fully sensitized 304 SS tested in 75 C APW with 7 ppm O(sub 2) and 200 ppb SO(sub 4)(sup =).
NTIS
Aeration; Crack Propagation; Stainless Steels; Water; Stress Corrosion Cracking; Corrosion Tests

20090030440 Bettis Atomic Power Lab., West Mifflin, PA, USA; Southwest Research Inst., San Antonio, TX USA
In-Situ Fracture Studies and Modeling of the Toughening Mechanism Present in Wrought LCAC, TZM and ODS Molybdenum Flat Products
Cockeram, B. V.; Chan, K. S.; Aug. 2007; 50 pp.; In English
Report No.(s): DE2008-923317; B-T-3613; No Copyright; Avail.: National Technical Information Service (NTIS)

In-situ testing, ultrasonic C-scans, and metallography were used to show that a crack-divider delamination form of

thin-sheet toughening occurs in wrought Low Carbon Arc Cast (LCAC) unalloyed molybdenum, Oxide Dispersion Strengthened (ODS) molybdenum, and TZM molybdenum at temperatures (ge) the Ductile to Brittle Transition Temperature (DBTT). Cracking along boundaries relieves mechanical constraint to free ligaments that may plastically stretch to produce toughening. Anisotropy in fracture toughness with lower values in the short-transverse direction is shown to produce the crack divider delaminations at the crack tip in the LT and TL orientations. The delamination zone increases with increasing stress-intensity to sizes significantly larger than the plastic zone, which leads to large increases in fracture toughness by the thin sheet toughening mechanism. Fracture in ODS Mo-alloys proceeds mainly along grain boundaries to produce small ligaments that exhibit ductility for both LT and TL orientations resulting in a lower DBTT and higher toughness values at lower temperatures than observed in LCAC and TZM. A combination of grain boundary fracture and cleavage is prevalent in LCAC molybdenum and TZM.
NTIS
Fracturing; Molybdenum; Molybdenum Alloys; Wrought Alloys

20090030587 Air Force Research Lab., Wright-Patterson AFB, OH USA
Stress Ratio Effects on Small Fatigue Crack Growth in Ti-6Al-4V
Caton, M. J.; John, R.; Porter, W. J.; Burba, M. E.; Nov. 2008; 28 pp.; In English
Contract(s)/Grant(s): FA8650-O4-C-5200; Proj-4347
Report No.(s): AD-A502789; AFRL-RX-WP-TP-2009-4133; No Copyright; Avail.: Defense Technical Information Center (DTIC)
A systematic study of the effects of stress ratio on small fatigue crack growth in Ti-6Al-4V was conducted. Cylindrical fatigue specimens were tested axially at room temperature under a maximum stress of 690 MPa and with stress ratios (R) of 0.5, 0.1, and -1. Tests were periodically interrupted and a standard replication technique was used to monitor the growth of cracks artificially initiated from 30 to 40 micrometer micro-notches, which were milled into the specimen surface with a focused ion beam (FIB). Measurement of striation spacing from fracture surfaces was evaluated for determining small crack growth rates and showed good agreement with replication data, but is only possible for relatively high stress intensity factor ranges, delta-K, on the order of 10 MPa(square root m) or greater. A significant small crack effect is observed in this alloy, consistent with previous observations, where small cracks grew at stress intensity factor ranges below the long crack threshold and at higher rates than long cracks for equivalent delta-K levels.
DTIC
Aluminum Alloys; Crack Propagation; Fatigue (Materials); Stress Intensity Factors; Titanium Alloys; Vanadium Alloys

20090030620 University of North Texas, Denton, TX USA
Development of Methods for the Quantification of Microstructural Features in Alpha+Beta Processed Alpha/Beta Titanium Alloys
Collins, P C; Welk, B; Searles, T; Tiley, J; Russ, J C; Fraser, H L; Mar. 2009; 22 pp.; In English
Contract(s)/Grant(s): FA8650-08-C-5226; Proj-4349
Report No.(s): AD-A502691; No Copyright; Avail.: Defense Technical Information Center (DTIC)
A set of stereological procedures has been developed for the rigorous quantification of microstructural features resolvable using scanning electron microscopy in alpha+beta processed alpha/beta titanium alloys. This paper identifies the four microstructural features that most likely influence the mechanical properties in alpha+beta processed titanium alloy, including: the size of the equiaxed alpha, the volume fraction of the equiaxed alpha, the volume fraction of total alpha, and the thickness of the Widmanstaetten alpha laths. The details regarding the quantification methodologies are provided, as are the origins of the associated uncertainties.
DTIC
Microstructure; Numerical Analysis; Stereochemistry; Titanium Alloys

20090030622 University of North Texas, Denton, TX USA
Evolution of the gamma/gamma' Interface Width in a Commercial Nickel Base Superalloy Studied by 3D Atom Probe
Hwang, J Y; Nag, S; Singh, A R; Srinivasan, R; Tiley, J; Fraser, H L; Banerjee, R; Mar. 2009; 15 pp.; In English
Contract(s)/Grant(s): FA8650-08-C-5226; Proj-4349
Report No.(s): AD-A502690; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The compositional width of the gamma/gamma-prime interface for primary and secondary gamma-prime precipitates in the commercial nickel base superalloy, Rene 88 DT, has been characterized at sub-nanometer resolution using local electrode

atom probe (LEAP) tomography. On formation during continuous cooling, the primary gamma-prime precipitates exhibit a very sharp interface while the secondary gamma-prime precipitates exhibit a substantially more diffuse interface. Interestingly, on subsequent isothermal aging at 760 degrees C, the interface width increases for the primary gamma-prime precipitates while it decreases for the secondary gamma-prime precipitates, reaching a near equilibrium composition width for both types of interfaces after aging for 200 hours. These results imply the gamma/gamma-prime interface width is strongly dependent on temperature in these alloys.
DTIC
Electrodes; Heat Resistant Alloys; Nanostructures (Devices); Nickel Alloys

20090030623 Air Force Research Lab., Wright-Patterson AFB, OH USA
Microstructure-Sensitive Extreme Value Probabilities for High Cycle Fatigue of Ni-Base Superalloy IN100 (Preprint)
Przybyla, Craig P.; McDowell, David L.; Mar 2009; 48 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502689; AFRL-RX-WP-TP-2009-4123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To quantify the effects of interactions between various microstructure attributes on fatigue life in the high cycle fatigue (HCF) regime, we have proposed a new microstructure-sensitive extreme value statistical framework. This framework couples the extreme value distributions of certain fatigue indicator parameters (FIPs) or response functions to the correlated microstructure attributes that exist at the extreme value locations of these FIPs. We demonstrate the application of this statistical framework to investigate the microstructure-sensitive fatigue response of the PM Ni-base superalloy IN100. To accomplish this task, we construct statistical volume elements (SVEs) used to compute the local response for 200 instantiations of IN100. These SVEs are constructed and simulated via the finite element method with state-of-the-art crystal plasticity constitutive relations. The results of the simulations are used to explore various extreme value statistics of the FIPs for these microstructures.
DTIC
Fatigue Life; Heat Resistant Alloys; Metal Fatigue; Microstructure; Nickel Alloys; Probability Theory; Sensitivity; Statistical Analysis

20090030627 Universal Energy Systems, Inc., Dayton, OH USA
NbTiSiMo-X Alloys-Composition, Microstructure Refinement and Properties (Preprint)
Kim, Y-W; Menon, S.; Woodward, C.; Mar 2009; 15 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-4347
Report No.(s): AD-A502688; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Advanced NbTiSi-X alloys have demonstrated very high RT strength levels (compressive yield strength approaching 1,800 MPa) and excellent high-temperature strength retention (approx. 1,200 MPa at 1,000 degrees C and over 500 MPa at 1,200 degrees C). Unfortunately, these alloys have an inhomogeneous size and spatial distribution of silicides, low fracture strength under tension (300 MPa) at all temperatures, and low oxidation resistance. The high volume fraction and non-uniform size distribution of silicides were considered to be responsible for the poor fracture resistance. In this work we attempt to refine the microstructure of cast alloys and to increase oxidation resistance by introducing Mo and adjusting other alloying additions. In focused efforts, we explored highly refined near-eutectic alloys, NbTiSiMo-Y, that showed excellent compression flow behavior. Further chemistry adjustments were made for balanced improvements, and cast alloys in homogenized material forms were evaluated for fracture to find that increases in fracture resistance without major chemistry modification are limited in the current alloy system.
DTIC
Cast Alloys; Chemical Composition; Fracture Strength; Microstructure; Molybdenum Alloys; Niobium Alloys; Silicides; Silicon Alloys; Titanium Alloys

20090030630 University of North Texas, Denton, TX USA
Elemental Partitioning Associated with Different Generations of Gamma Prime Precipitates in Rene 88DT Nickel Base Superalloy (Preprint)
Hwang, J Y; Nag, S.; Srinivasan, R.; Tiley, J.; Viswanathan, G. B.; Fraser, H. L.; Banerjee, R.; Mar 2009; 28 pp.; In English
Contract(s)/Grant(s): FA8650-08-C-5226; Proj-4349
Report No.(s): AD-A502687; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The compositional and microstructural evolution of different generations of precipitates of the ordered gamma-prime

phase during the continuous cooling, followed by isothermal aging, of a commercial nickel base superalloy, Rene 88DT, has been characterized by three dimensional atom probe tomography (3DAP) coupled with energy-filtered transmission electron microscopy studies. After solutionizing in the single gamma phase field, during continuous cooling at a relatively slow rate (approx. 24 degrees C/min), the first generation primary gamma-prime precipitates, forming at relatively higher temperatures, exhibit nearequilibrium compositions, while the smaller scale secondary gamma-prime precipitates, forming at lower temperatures, exhibit nonequilibrium compositions often consisting of excess Co and Cr, while being depleted in Al and Ti content. The compositions of the gamma matrix near these precipitates also exhibit similar trends with the composition being closer to equilibrium near the primary precipitates as compared to the secondary precipitates.
DTIC
Chemical Analysis; Heat Resistant Alloys; Nickel Alloys; Precipitates; Precipitation (Chemistry)

20090030631 Air Force Research Lab., Wright-Patterson AFB, OH USA
Dislocation Micromechanisms and Scale-Free Flow in Microcrystals
Dimiduk, D. M.; Woodward, C.; Uchic, M. D.; Rao, S. I.; Nadgorny, E.; Shade, P.; Mar. 2009; 26 pp.; In English; The Minerals, Metals and Materials Society Annual Meeting and Exhibition, 15 - 19 Feb. 2009, San Francisco, CA, USA
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502793; AFRL-RX-WP-TP-2009-4137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A frontier topic in computational materials science and mechanics is the development of a plasticity-modeling framework that naturally and accurately represents evolving length-scale effects and the consequences of the dislocation structure. Current studies show that important intrinsic size effects exist separately from an evolving excess dislocation density at mesoscopic scales. Understanding those effects forms an essential foundation for representing microstructural effects within predictive computational frameworks. Our studies focused on simulation, analysis and measurements of the plastic phenomena occurring in microcrystals having dimensions at the lower end of the mesoscopic domain, wherein the discrete and stochastic nature of the dislocation ensemble is visible. In prior work, we reported on selected experimental results for Ni crystals. The present studies examined the athermal flow response of micron-scale single crystals using large-scale discrete dislocation simulations (DDS) in 3d, under conditions closely related to our experimental methods.
DTIC
Crystal Structure; Free Flow; Microcrystals; Micromechanics; Microstructure; Plastic Flow; Plastic Properties; Simulation

20090030649 Air Force Research Lab., Wright-Patterson AFB, OH USA
Microstructure-Sensitive Modeling of High Cycle Fatigue
Przybyla, Craig; Prasannavenkatesan, Rajesh; Salajegheh, Nima; McDowell, David L.; Mar. 2009; 43 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502791; AFRL-RX-WP-TP-2009-4138; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Strategies are described for microstructure-sensitive computational methods for estimating variability of high cycle fatigue (HCF) crack formation and early growth in metallic polycrystals to support design of fatigue resistant alloys. We outline a philosophy of employing computational simulation to establish relations between remote loading conditions and microstructure-scale slip behavior in terms of Fatigue Indicator Parameters (FIPs) as a function of stress amplitude, stress state and microstructure, featuring calibration of mean experimental responses for known microstructures. Effects of process history (carburization and shot peening) and resulting residual stresses are considered in the case of subsurface crack formation at primary inclusions in martensitic steel. The need to characterize extreme value correlations of microstructure attributes coupled to the local driving force (i.e., features) for HCF crack formation is outlined, along with a strategy involving a set of FIPs relevant to different mechanisms of crack formation.
DTIC
Martensite; Microstructure; Models; Sensitivity; Steels

20090030665 Air Force Research Lab., Wright-Patterson AFB, OH USA; Ohio State Univ., Columbus, OH, USA; UES, Inc., Dayton, OH, USA

A Combined Experimental and Computational Study to Examine Lateral Constraint Effects on Single-Slip Oriented Microcompression Experiments

Shade, P. A.; Wheeler, R.; Choi, Y. S.; Uchic, M. D.; Dimiduk, D. M.; Fraser, H. L.; Apr. 2009; 18 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A502100; AFRL-RX-WP-TP-2009-4096; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502100

A custom in-situ SEM mechanical testing system has been used to study the compressive deformation behavior of single-slip oriented Rene N5 microcrystals. Two different compression platens were used to explore the effect of lateral stiffness on the resultant mechanical response, which approximated either a full-frictional or zero-friction case. The change in the lateral constraint of the test system had a demonstrable effect on many aspects or attributes of plastic flow: the measured modulus, yield stress and strain hardening behavior, the intermittency of strain bursts, the spatial distribution of slip bands, and the development of internal lattice rotations. Finite element modeling of the microcompression experiments using a crystal plasticity framework enabled insight regarding changes in the internal stress field and resultant slip system activity. The experimental tests findings are rationalized based on these simulation results.

DTIC

Compressibility; Experiment Design; Microcrystals

20090030671 Texas Univ., San Antonio, TX USA

Probabilistic Sensitivity Analysis of Fretting Fatigue

Golden, Patrick J.; Millwater, Harry R.; Yang, Xiaobin; Apr. 2009; 14 pp.; In English

Contract(s)/Grant(s): FA8650-06-C-5060; Proj-4347; 62102F

Report No.(s): AD-A502099; AFRL-RX-WP-TP-2009-4091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502099

A probabilistic analysis of the fatigue life of specimens subject to fretting fatigue was carried out. A mechanics based fretting life analysis was applied that accounted for the local stress gradient at the edge of contact. The random variables in the analysis included the initial crack size, coefficient of friction, crack growth rate law, and the contact pad profile. The variation in pad profiles was determined through statistical analysis of seventy-seven machined pads. A probabilistic fatigue analysis was applied using Monte Carlo sampling to determine the statistics (mean and standard deviation) of the fatigue life prediction and the probabilistic sensitivities (partial derivatives of the fatigue statistics with respect to the input probability density function parameters).

DTIC

Fretting; Probability Theory; Sensitivity; Sensitivity Analysis; Statistical Analysis

20090030684 Idaho National Engineering and Environmental Lab., Idaho Falls, ID, USA

Overview of a Welding Development Program for a Ni-Cr-Mo-Gd Alloy

Hurt, W. L.; Mizia, R. E.; Clark, D. E.; Jun. 01, 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2008-912909; INL/CON-07-12834; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Spent Nuclear Fuel Program (NSNFP), located at the Idaho National Laboratory, coordinates and integrates management and disposal of U.S. Department of Energy-owned spent nuclear fuel. These management functions include using the DOE standardized canister for packaging, storage, treatment, transport, and long-term disposal in the Yucca Mountain Repository. Nuclear criticality must be prevented in the postulated event where a waste package is breached and water (neutron moderator) is introduced into the waste package. Criticality control will be implemented by using a new, weldable, corrosion-resistant, neutron-absorbing material to fabricate the welded structural inserts (fuel baskets) that will be placed in the standardized canister. The new alloy is based on the Ni-Cr-Mo alloy system with a gadolinium addition. Gadolinium was chosen as the neutron absorption alloying element because of its high thermal neutron absorption cross section. This paper describes a weld development program to qualify this new material for American Society of Mechanical Engineers (ASME)

welding procedures, develop data to extend the present ASME Code Case (unwelded) for welded construction, and understand the weldability and microstructural factors inherent to this alloy.
NTIS
Neutron Absorbers; Spent Fuels; Welding

20090030833 Air Force Research Lab., Wright-Patterson AFB, OH USA
Anisotropy of the Hot Plastic Deformation of Ti-6Al-4V Single-Colony Samples
Salem, A A; Semiatin, S L; Apr. 2009; 26 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502104; AFRL-RX-WP-TP-2009-4093; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502104

The critical resolved shear stresses and flow curves for the seven possible slip systems in Ti-6Al-4V with a lamellar microstructure were determined via high temperature uniaxial compression testing. For this purpose, samples with a rectangular cross section were cut from single colonies grown using a float-zone technique and then tested at 815 degrees C. Each sample was oriented for single slip along one of seven different slip systems in the alpha phase; i.e., one of the three 1120{1010} (prism a), the three 1120{0001} (basal a), or the c+a (pyramidal) systems was activated by orienting specific samples to have the highest Schmid factor on that particular system. Measurements of the critical resolved shear stress (CRSS) at yielding and the subsequent flow behavior revealed a strong dependence of mechanical behavior on colony orientation/activated slip system. The anisotropy in the CRSS and the tendency for flow softening at large strains was rationalized on the basis of the Burgers orientation relationship between the alpha (hcp) lamellae and the beta (bcc) matrix and hence the orientation of alpha slip directions relative to those in the beta phase.
DTIC
Aluminum Alloys; Anisotropy; Colonies; Plastic Deformation; Titanium Alloys; Vanadium Alloys

20090030841 Air Force Research Lab., Wright-Patterson AFB, OH USA
Modeling Grain Boundary Mobility During Dynamic Recrystallization of Metallic Alloys
Semiatin, S L; Montheillet, F; Damamme, G; Piot, D; Apr. 2009; 8 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502302; AFRL-RX-WP-TP-2009-4118; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502302

A simple analytical model is proposed for estimating grain boundary mobility during dynamic recrystallization in metallic alloys. The combined effects of solutes (solute drag) and second phase particles (Zener pinning) on mobility are considered. The approach is based on (and is consistent with) a recently published mesoscale model of discontinuous dynamic recrystallization. The dependence of grain boundary mobility on solute concentration and particle size is summarized in the form of two-dimensional maps.
DTIC
Boundaries; Grain Boundaries; Mathematical Models; Metalloids; Mobility; Pinning; Recrystallization

20090030900 Air Force Research Lab., Wright-Patterson AFB, OH USA
Modeling and Simulation of Cavitation During Hot Working
Nicolaou, P. D.; Ghosh, A. K.; Semiatin, S. L.; Apr. 2009; 66 pp.; In English
Contract(s)/Grant(s): Proj-4347; 62102F
Report No.(s): AD-A502413; AFRL-RX-WP-TP-2009-4098; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502413

Many metallic materials develop internal cavities when subjected to large uniaxial or multiaxial tensile strains at elevated temperatures. These materials include conventional alloys of aluminum, titanium, copper, lead, and iron as well as emerging intermetallic materials such as titanium aluminide alloys. For a given material, with a given microstructure, the extent of cavitation depends on the specific deformation conditions (e.g., strain rate, temperature, and stress state). In most cases, cavitation may lead to premature failure at levels of deformation far less than those at which flow-localization-controlled failure would occur. Cavitation is a very important phenomenon in hot working of materials because it may yield inferior

properties in the final part let alone lead to premature failure during forming. Cavity formation usually comprises three distinct but simultaneously occurring stages, i.e. nucleation, growth, and coalescence. An important requirement for cavitation during deformation under either conventional hot-working (high-strain-rate) conditions or superplastic forming is the presence of a tensile stress.
DTIC
Cavitation Flow; Hot Working; Simulation

20090030905 Air Force Research Lab., Wright-Patterson AFB, OH USA; Illinois Univ., Urbana-Champaign, IL, USA
Novel MEMS Apparatus for In Situ Thermo-Mechanical Tensile Testing of Materials at the Micro- and Nano-Scale
Han, J.; Uchic, M. D.; Saif, T.; Apr. 2009; 6 pp.; In English; 22nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS), 25 - 29 Jan. 2009, Sorrento, Italy
Contract(s)/Grant(s): Proj-4347; 62102F
Report No.(s): AD-A502102; AFRL-RX-WP-TP-2009-4095; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502102
We present, for the first time, a MEMS-based test methodology that potentially enables elevated-temperature mechanical tensile testing of nano- and micro-scale samples within a SEM or TEM (T 500 degrees C). Importantly, the test methodology allows for the samples to be fabricated separately from the MEMS-apparatus, a significant advancement from other test devices developed by some of the present authors. Therefore the test methodology should be applicable to the study of a wide range of materials. Other advancements found in the methodology include a co-fabricated force calibration device, and a built-in thermocouple sensor to measure the stage temperature close to the sample.
DTIC
Microelectromechanical Systems; Microstructure; Nanostructures (Devices); Test Equipment; Thermodynamics

20090030921 Idaho National Engineering and Environmental Lab., Idaho Falls, ID, USA
HTIR-TC Compensating Extension Wire Evaluations
Crepeau, J. C.; Wilkins, S. C.; Knudson, D. L.; Rempe, J. L.; Daw, J. F.; Sep. 01, 2007; 36 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727
Report No.(s): DE2008-920709; INL/EXT-07-13121; No Copyright; Avail.: National Technical Information Service (NTIS)
In an effort to reduce production costs for the doped molybdenum/niobium alloy High Temperature Irradiation Resistant Thermocouples (HTIR-TCs) recently developed by the Idaho National Laboratory, a series of evaluations were completed to identify an optimum compensating extension cable. As documented in this report, results indicate that of those combinations tested, two inexpensive, commercially-available copper nickel alloy wires approximate the low temperature (0 to 500 DGC) thermoelectric output of KW-Mo (molybdenum doped with tungsten and potassium silicate) versus Nb-1%Zr in HTIR-TCs. For lower temperatures (0 to 150 DGC), which is the region where soft extension cable is most often located, results indicate that the thermocouple emf is best replicated by the Cu-3.5%Ni versus Cu-5%Ni combination (measured emfs were within 4% at 100 and 150 DGC). At higher temperatures (300 to 500 DGC), data suggest that the Cu-5%Ni versus Cu-10%Ni combination may yield data closer to that obtained with KWMo versus Nb-1%Zr wires (measured emfs were within 8%).
NTIS
Copper Alloys; High Temperature; Irradiation; Nickel Alloys; Thermocouples; Wire

20090031749 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Intermetallic Reactions in a Sn-51In Solder BGA Package with Immersion Ag Surface Finish
Jain, Chao-Chi; Wang, Shiuan-Sheng; Wu, Hui-Min; Chuang, Tung-Han; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 229-234; In English; See also 20090031741
Contract(s)/Grant(s): NSC 93-2216-E002-024; 96R-0210; Copyright; Avail.: Other Sources
Intermetallic compounds formed in Sn-51In solder ball grid array (BGA) packages with Ag/Cu pads are investigated. After reflow, the Ag thin film dissolves quickly into the solder matrix, and scallop-shaped intermetallic layers with compositions of (Cu(0.89)(Ag(0.ll))(In(0.79)Sn(0.21))2/eta-Cu6(Sn(0.54)In(0.4)) 5 at the interfaces between the Sn-51In solder balls and Cu pads. Aging at 75C and 100C caused the eta-Cu6 (Sn(0.54)1n(0.46))5 intermetallics to replace the (Cu(0.89)Ag(0.ll)(In(0.79)Sn(0.21)2 at the solder/pad interfaces. The thickness of eta-intermetallic versus the square root of reaction time (t(exp 1/2) shows a linear relation, indicating that the growth of intermetallics is diffusion-controlled. Ball shear

tests show that the strength of these Sn-51In solder joints is initially 1.9 N, decreasing to 1.7 N and 1.6 N after aging at 75 C and 100 C, respectively.
Author
Intermetallics; Solders; Electronic Packaging; Silver

20090031790 Cincinnati Univ., OH, USA
Final Report for Verification of the Metal Finishing Facility Pollution Prevention Tool (MFFPPT)
Barrett, W. M.; Yang, J.; Strunjas, S.; Apr. 2007; 85 pp.; In English
Report No.(s): PB2008-108875; EPA/600/R-07/067; No Copyright; Avail.: National Technical Information Service (NTIS)

The USA Environmental Protection Agency (USEPA) has prepared a computer process simulation package for the metal finishing industry that enables users to predict process outputs based upon process inputs and other operating conditions. This report documents the development of the process simulations package, calculations methodologies used in the simulation, verification of the model, and its ability to simulate metal finishing processes. The process simulation package has been built using Microsofts Visual C++ Version 8, also known as Microsoft Visual C++ 2005 and the C++ extensions to the Common Language Infrastructure (C++/CLI) and the Microsoft Net Framework Version 2.0. Additionally, the process simulation package supports the CAPE-OPEN computer-aided processes engineering (CAPE) open interface standards. Through the use of the CAPE-OPEN standards, the process simulator has been shown to interoperate with third-party process simulation components, and can be used as a general chemical process simulation package.
NTIS
Industrial Wastes; Metal Finishing; Pollution Control; Vitrification

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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*.

20090030130 Wisconsin Univ., Madison, WI, USA
Expanded Study on the Effects of Aggregate Coating and Films on Concrete Performance
Munoz, J. F.; Tejedor, M. I.; Anderson, M. A.; Cramer, S. M.; Oct. 2007; 83 pp.; In English
Report No.(s): PB2008-107678; WIS-SPR-0092-04-12; No Copyright; Avail.: National Technical Information Service (NTIS)

The WisDOT sponsored study entitled: Effects of Aggregate Coatings and Films on Concrete Performance, I.D: 0092-00-07, found that clay coatings showed a deleterious impact in concrete compared with other microfine mineralogy such as dust or carbonates. The principal aim of this research was to complement the previous project by identifying the primary variables that govern the effects of clay microfine coatings on concrete pavements and to use this knowledge to improve the present aggregate monitoring situation in Wisconsin. The materials selected for this research were a two naturally-coated igneous aggregates located near Eau Claire and an igneous clean coarse aggregate from Black River Falls which was lab-coated with four different clay suspensions (kaolin, illite, sodium montmorillonite and calcium montmorillonite). A total of ten batches: a control, two containing natural coatings and 4 containing each one of the select clays as coarse aggregate coatings at a 0.45 w/c ratio were prepared along with 3 additional batches with extra water to maintain workability. The major findings are that the effects of microfines in concrete are not only dependent on the amount of microfines but also on their nature. The methylene blue test together with P200 to calculate the modified methylene blue value is the best predictor of the influence of coatings on concrete performance, but the methylene blue test presents practical difficulties for WisDOT implementation and a new test is needed.
NTIS
Aggregates; Coating; Concretes

20090030149 Mountain-Plains Consortium, Fargo, ND, USA; Wyoming Univ., Laramie, WY, USA
Recycled Glass Utilization in Highway Construction
Finkle, I.; Ksaibati, K.; Dec. 2007; 34 pp.; In English
Report No.(s): PB2008-105778; MPC-07-192; No Copyright; Avail.: CASI: A03, Hardcopy

The utilization of recycled glass in highway applications has been occurring over the past couple of decades. In recent years, the discovery of several economic and environmental benefits could increase the use of recycled glass in highway

construction, making the evaluation of the engineering properties of glass and aggregate mixes necessary. The uses of recycled glass have varied widely, depending on the specific application. Crushed recycled glass, or cullet, has been used independently, and has also been blended with natural stone construction aggregate at different replacement rates. This research provides an evaluation of the potential use of glass cullet when used in combination with natural base course aggregate for roadway construction. This research studied the strength and moisture/density characteristics of different glass and aggregate blends to examine the effects of blending glass cullet into base course aggregate. Two sources of natural aggregate were tested: one being crusher run and very angular in nature; and the other being pit-run and rounded in nature.
NTIS
Construction; Glass; Highways; Recycling; Pavements; Composite Materials

20090030163 Rutgers - The State Univ., Piscataway, NJ, USA; Willets Point Asphalt, Flushing, NY, USA
NYSDOT Waterproof HMA Mix Verification
Bennert, T.; Apr. 2009; 8 pp.; In English
Report No.(s): PB2009-113505; WILLET-RU9247; No Copyright; Avail.: National Technical Information Service (NTIS)

The New York State Department of Transportation (NYSDOT) is currently using Waterproofing Hot Mix Asphalt (HMA) to overlay their concrete bridge deck systems. The waterproofing characteristics of the mix provide a protective coating on the concrete bridge deck to protect it from future exposure to environmental conditions, along with de-icing chemicals. However, due to the movements associated with the bridge deck, this thin layer is highly susceptible to fatigue cracking. In an effort to ensure the NYSDOT is getting what they are paying for, the NYSDOTs Waterproof HMA specification includes performance testing to verify the HMA mixture is indeed fatigue cracking resistant and waterproof. To verify for fatigue cracking, the mixture is evaluated using the Flexural Beam Fatigue test (AASHTO T321). Meanwhile, waterproof verification is done by testing compacted samples in the flexible-wall permeameter (ASTM D5084).
NTIS
Asphalt; Concretes; Transportation; Waterproofing

20090030222 Pacific Northwest National Lab., Richland, WA, USA
Caustic Recycle from Hanford Tank Waste Using NaSICON Ceramic Membrane Salt Splitting Process
Fountain, M. S.; Kurath, D. E.; Sevigny, G. J.; Poloski, A. P.; Pendleton, J.; Feb. 2009; 48 pp.; In English
Report No.(s): DE2009-951865; PNNL-18216; No Copyright; Avail.: National Technical Information Service (NTIS)

A family of inorganic ceramic materials, called sodium (Na) Super Ion Conductors (NaSICON), has been studied at Pacific Northwest National Laboratory (PNNL) to investigate their ability to separate sodium from radioactively contaminated sodium salt solutions for treating U.S. Department of Energy (DOE) tank wastes. Ceramatec Inc. developed and fabricated a membrane containing a proprietary NAS-GY material formulation that was electrochemically tested in a bench-scale apparatus with both a simulant and a radioactive tank-waste solution to determine the membrane performance when removing sodium from DOE tank wastes. Implementing this sodium separation process can result in significant cost savings by reducing the disposal volume of low-activity wastes and by producing a NaOH feedstock product for recycle into waste treatment processes such as sludge leaching, regenerating ion exchange resins, inhibiting corrosion in carbon-steel tanks, or retrieving tank wastes.
NTIS
Alkalies; Ceramics; Membranes; Radioactive Wastes

20090030231 Oak Ridge National Lab., TN USA; Wisconsin Univ., Platteville, WI, USA
Effective Size Analysis of the Diametral Compression (Brazil) Test Specimen
Jadaan, O. M.; Wereszsak, A. A.; Apr. 2009; 45 pp.; In English
Report No.(s): DE2009-951944; ORNL-TM-2009/100; No Copyright; Avail.: National Technical Information Service (NTIS)

This study considers the finite element analysis (FEA) simulation and Weibull effective size analysis for the diametral compression (DC) or Brazil specimen loaded with three different push-rod geometries. Those geometries are a flat push-rod, a push-rod whose radius of curvature is larger than that for the DC specimen, and a push-rod whose radius of curvature matches that of the DC specimen. Such established effective size analysis recognizes that the tensile strength of structural ceramics is typically one to two orders of magnitude less than its compressive strength. Therefore, because fracture is much more apt to result from a tensile stress than a compressive one, this traditional analysis only considers the first principal tensile stress field in the mechanically loaded ceramic component for the effective size analysis. The effective areas and effective

volumes were computed as function of Weibull modulus using the CARES/Life code. Particular attention was devoted to the effect of mesh sensitivity and localized stress concentration. The effect of specimen width on the stress state was also investigated. The effects of push-rod geometry, the use of steel versus WC push-rods, and considering a frictionless versus no-slip interface between push-rod and specimen on the maximum stresses, where those stresses are located, and the effective area and effective volume results are described.
NTIS
Ceramics; Compression Tests; Finite Element Method

20090030251 Lawrence Livermore National Lab., Livermore, CA USA
Mechanical Testing of TR-55 Rubber Thermally Aged Under Tensile Strain
Small, W.; Alviso, C. T.; Wilson, T. S.; Chinn, S. C.; Maxwell, R. S.; Mar. 10, 2009; 17 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2009-952426; LLNL-TR-412681; No Copyright; Avail.: National Technical Information Service (NTIS)

TR-55 rubber specimens were previously subjected to an aging process consisting of the application of a tensile strain of approximately 67%, 100%, 133%, or 167% elongation for 4, 8, 12, or 16 h at either 250 DGC or room temperature. Control specimens at the same temperatures/durations were not subjected to tensile strain. The specimens were allowed to recover at room temperature without external stimuli for over 100 days before tensile testing. A single dog bone was cut from each specimen and a stress-strain curve was obtained. The elastic modulus of each specimen was calculated. Specimens aged under tensile strain exhibited rubber-like behavior dependent on the aging elongation and duration.
NTIS
Elastomers; Rubber

20090030287 Department of Energy, Washington, DC USA
Response Predicing LTCC Firing Shrinkage: A Response Surface Analysis Study
Girardi, M.; Barner, G.; Lopez, C.; Buncan, B.; Zawicki, L.; Jan. 2009; 6 pp.; In English
Report No.(s): DE2009-952622; No Copyright; Avail.: National Technical Information Service (NTIS)

The Low Temperature Cofired Ceramic (LTCC) technology is used in a variety of applications including military/space electronics, wireless communication, MEMS, medical and automotive electronics. The use of LTCC is growing due to the low cost of investment, short development time, good electrical and mechanical properties, high reliability, and flexibility in design integration (3 dimensional (3D) microstructures with cavities are possible). The dimensional accuracy of the resulting x/y shrinkage of LTCC substrates is responsible for component assembly problems with the tolerance effect that increases in relation to the substrate size. Response Surface Analysis was used to predict product shrinkage based on specific process inputs (metal loading, layer count, lamination pressure, and tape thickness) with the ultimate goal to optimize manufacturing outputs (NC files, stencils, and screens) in achieving the final product design the first time. Three (3) regression models were developed for the DuPont 951 tape system with DuPont 5734 gold metallization based on green tape thickness.
NTIS
Ceramics; Low Temperature; Shrinkage

20090030391 Pratt and Whitney Aircraft, East Hartford, CT USA
Tensile Creep and Fatigue of Sylramic-iBN Melt-Infiltrated SiC Matrix Composites: Retained Properties, Damage Development, and Failure Mechanisms (Preprint)
Morscher, Gregory N; Ojard, Greg; Miller, Robert; Gowayed, Yasser; Santhosh, Unni; Ahmed, Jalees; John, Reji; Oct 2007; 32 pp.; In English
Contract(s)/Grant(s): F33615-03-D-2354-D004; F33615-01-C-5234; Proj-4347
Report No.(s): AD-A501502; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501502

The elevated temperature creep, fatigue, rupture, and retained properties of ceramic matrix composites envisioned for use in gas turbine engine applications are essential properties to understand and model for the purposes of component design and life-prediction. In order to quantify the effect of stress, time, temperature, and oxidation for a state-of-the-art composite system: the Sylramic-iBN woven fiberreinforced, BN interphase, melt-infiltrated SiC matrix composite, a wide variety of tensile creep, dwell fatigue, and cyclic fatigue experiments were performed in air at 1204 degrees Celsius. Tests were either taken to failure or interrupted. Interrupted tests were then tested at room temperature to determine the residual mechanical

properties. The retained properties of most of the composites subjected to tensile creep or fatigue was usually within 20% of the as-produced strength and 10% of the as-produced elastic modulus.
DTIC
Ceramic Matrix Composites; Creep Tests; Damage; Degradation; Failure; Matrix Materials; Mechanical Properties; Silicon Carbides; Tensile Creep; Tensile Properties; Thermal Fatigue; Tolerances (Mechanics)

20090030444 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Santa Barbara, CA, USA
Examination of the Platinum Effect on the Oxidation Behavior of Nickel-Aluminide Coatings
Hou, P. Y.; Tolpygo, V. K.; Jan. 2007; 17 pp.; In English
Report No.(s): DE2008-923207; LBNL-62479; No Copyright; Avail.: Department of Energy Information Bridge
Oxidation resistant nickel-aluminide coatings are designed to develop a protective alumina scale during high temperature exposure. It is well established that platinum additions, typically about 6-8 at%, provide substantial improvements in oxidation resistance of such coatings, yet the nature of the platinum effect is still not fully understood. In this work, the oxidation behavior of two commercial NiAl and NiPtAl coatings deposited on the same Ni-base single crystal alloy CMSX-4 was analyzed. Cyclic and isothermal oxidation tests were conducted at 1150 degrees C in air. Microstructure development and alumina/coating interface chemistry were studied as a function of oxidation time. Numerous voids developed at the Al(sub 2)O(sub 3)/NiAl interface, and sulfur was found to segregate at the void surfaces and at the contact interface, leading to spallation of the scale over the convex areas along ridges on the coating surface. The presence of platinum prevented sulfur segregation and void formation at the Al(sub 2)O(sub 3)/NiPtAl interface. As a result, the Al(sub 2)O(sub 3) scale on the NiPtAl coating remained adherent and virtually no spallation was observed even after prolonged cyclic oxidation.
NTIS
Aluminum Alloys; Nickel Alloys; Nickel Aluminides; Oxidation; Platinum; Oxidation Resistance

20090030613 Universal Energy Systems, Inc., Dayton, OH USA
Description of the Fragile Behavior of Glass Forming Liquids with the Use of Experimentally Accessible Parameters
Senkov, Oleg N; Miracle, Daniel B; Mar. 2009; 30 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5235; Proj-2511
Report No.(s): AD-A502788; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The three-fitting-parameter viscosity equations, i.e. Vogel-Fulcher-Tamman (VFT) and Avramov's equations, which are used to describe the temperature dependence of viscosity are modified into one-fitting parameter equations. Both modified equations contain the glass transition temperature Tg and fragility index m as material constants, allowing a direct comparison of the modified equations. Base on analysis of 12 glass-forming liquids, it is concluded that the modified Avramov's equation describes the experimental data slightly better than the modified VFT equation. Experimental data must be collected over a wide temperature range before the three-fitting-parameters of the VFT and Avramov equations can be determined and the equations can be applies. However, the modified equations developed here provide a convenient method of estimating the temperature dependence of viscosity by using the experimentally accessible parameters Tg and m, which can be determined by differential scanning calorimetry measurements conducted in a narrow temperature range near the glass transition temperature.
DTIC
Fitting; Glass; Glass Transition Temperature; Heat Measurement; Independent Variables; Liquids; Viscosity

20090030660 Universal Energy Systems, Inc., Dayton, OH USA; Air Force Research Lab., Wright-Patterson AFB, OH, USA
Relaxation Behavior of Ca-Based Bulk Metallic Glasses
Senkov, Oleg N.; Miracle, Daniel B.; Apr. 2009; 29 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5235; Proj-2511; 62102F
Report No.(s): AD-A502101; AFRL-RX-WP-TP-2009-4087; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502101
Relaxation behavior of Ca60Mg20Zn20, Ca60Mg20Cu20, Ca65Mg15Zn20, Ca50Mg20Cu30, and Ca55Mg18Zn11Cu16 bulk metallic glasses was determined in the glass transition region using DSC with the heating rates from 1 to 160 K/min. The activation enthalpy of structural relaxation and the fragility index m were found to be smaller in the glassy state (onset of the

glass transition) than in the supercooled liquid state (end of glass transition). The Ca-based glass-forming liquids showed strong behavior of the relaxation time, with the fragility indexes m in the range of 33 to 40. The strong liquid behavior implies sluggish kinetics of crystallization in the supercooled liquid region and explain the very good glass forming ability of these alloys. The critical cooling rate for amorphization Rc of the Ca-based bulk metallic glasses was estimated to be in the range of 0.3 to 10 K/s, which is similar to Rc values for the best Pd and Zr based metallic glass forming alloys discovered so far.
DTIC
Calcium; Metallic Glasses

20090031020 Lehigh Univ., Bethlehem, PA USA; Applied Research Associates, Inc., Tyndall AFB, FL, USA
Precast/Prestressed Concrete Experiments - Series 1, Volume 1
Naito, Clay J.; Dinan, Robert J.; Fisher, Jeff W.; Hoemann, John M.; Nov. 2008; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): CRADA0-51-1-19ML; Proj-4915; 62102F
Report No.(s): AD-A501975; AFRL-RX-TY-TR-2008-4616; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501975

Protection against blast generated pressure loads has become a high priority for many building owners. Blast retrofits and structural hardening, much like earthquake retrofits, can prove to be costly. For this reason, it is important to understand that any structural element has an inherent capacity to absorb energy and resist some level of blast pressure. A general evaluation that allows a designer to realize the absorption capacity of a structural element may preclude the need for a blast-specific retrofit. To illustrate this concept, the blast resistances of non-load bearing precast, prestressed concrete sandwich wall panels (WP) are examined. These components are used extensively in modern construction for cladding of building systems and often provide a significant level of protection from blast events.
DTIC
Concretes; Impulses; Prestressing

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*.

20090030348 Savannah River National Lab., Aiken, SC, USA
Accelerated-Aging of Shipping Package O-Rings for PU Storage
Hoffman, E.; Jan. 10, 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2008-921969; WSRC-STI-2008-0004; No Copyright; Avail.: Department of Energy Information Bridge

The Savannah River Site (SRS) is storing surplus plutonium (Pu) materials in the K-Area Materials Storage (KAMS) facility. The Pu materials are packaged per the DOE 3013 Standard. The nested, welded 300 series stainless steel 3013 containers are transported to KAMS in Type B shipping packages and subsequently stored in the same packages. These type B shipping packages consist of double containment vessels sealed with dual Orings. The O-ring compound is Parker Seals V0835-75, based on Viton GLT fluoroelastomer. This work evaluates the performance of the V0835-75 O-rings at accelerated-aging conditions. The results will be used to develop a lifetime prediction model for O-rings in KAMS.
NTIS
Accelerated Life Tests; Aging (Materials); Grasslands; O Ring Seals; Packaging; Plutonium; Rivers

20090030553 Jackson (Henry M.) Foundation for the Advancement of Military Medicine, Wright-Patterson AFB, OH USA
A Harmonized Physiologically-Based Pharmacokinetic Model for Nonane as a Component of Jet Fuel
Robinson, Peter J.; Merrill, Elaine A.; Sep. 2007; 58 pp.; In English
Contract(s)/Grant(s): Proj-2312
Report No.(s): AD-A502508; No Copyright; Avail.: Defense Technical Information Center (DTIC)

JP-8 is a complex mixture of hundreds of components including straight and branched chain alkanes, cycloalkanes, diaromatics and naphthalenes. Inhalation and dermal are the most prevalent routes of exposure. Occupations of interest include

aircraft fuel tank and exhaust workers. To assess potential health effects of such exposures, it is useful to predict target site dosimetry of JP-8 components. A first step in this process is to develop a physiologically-based pharmacokinetic (PBPK) model for representative mixturecomponents. Single-chemical models can then be harmonized (same physiological structure) and combined into a compositemixture model. A harmonized model structure should be complex enough to take into account all important physiological processes undergone by any component in an integrated fashion; the same physiological structure must underlie each of the individual models. The initial framework for such a model is developed here on the basis of observed kinetic behavior of nonane, an aliphatic JP-8 component. Nonane is highly lipophilic and distributes preferentially in brain tissue.
DTIC
Jet Engine Fuels; Models; Nonanes; Pharmacology; Physiology; Risk; Toxicity

20090030628 Dayton Univ. Research Inst., OH USA
Evaluation and Testing of the Suitability of a Coal-Based Jet Fuel
Zabarnick, X.; Phelps, D. K.; West, Z. J.; Shafer, L. S.; Ervin, J. S.; DeWitt, M. J.; Binns, K. E.; Williams, T. F.; Dieterle, G. L.; Balster, L. M.; Harrison, W. E., III; Jun. 2008; 72 pp.; In English
Contract(s)/Grant(s): F33615-03-2-2347; Proj-3048
Report No.(s): AD-A502844; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A candidate coal-based fuel was evaluated both for use as substitute for conventional petroleum-derived JP-8 fuel and as a candidate for advanced application. Numerous properties and performance behavior were monitored through a combination of specification tests and research-type evaluations. This testing included a variety of physical and chemical property tests in the areas of high temperature thermal stability, low temperature flowability, and combustion emissions characteristics, as well as a thorough series of chemical analysis evaluations. The fuel was found to meet the vast bulk of the testing, but had some off-specification test results (for example, hydrogen content and API gravity) due to the unusual hydrocarbon constituents present in the fuel. In general, the fuel performed extremely well in thermal stability testing, but exhibited a higher viscosity than conventional fuels in low temperature evaluations. The significant oxidative and pyrolytic thermal stability benefits of the coal-based fuel could be used in the future to greatly improve the fuel heat sink and engine and aircraft technologies that are currently limited by thermal concerns.
DTIC
Aircraft Fuels; Coal; Jet Engine Fuels

20090030662 Joint Improvised Explosive Device Defeat Organization, Washington, DC USA
Joint Improvised Explosive Device Defeat Organization
Jan. 2009; 21 pp.; In English
Report No.(s): AD-A502251; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502251

In Iraq and Afghanistan, the most effective weapon employed against coalition forces during 2008 continued to be the Improvised Explosive Device (IED). Except when disrupted by U.S. or coalition operations to attack their IED networks, the enemy continued to adapt and produce IEDs with readily available, inexpensive, and evolving commercial technologies. During 2006 and 2007, our first two years of operation, the Joint Improvised Explosive Device Defeat Organization (JIEDDO) learned that we must adapt and innovate faster than a resourceful enemy who is capable of continuously leveraging the $3 trillion commercial technology investments made globally each year. In 2007, we formalized our rapid development and acquisition procedures by creating a transparent, analytically driven, rapid acquisition process called the Joint IED Defeat Capability Approval and Acquisition Management Process (JCAAMP). Through 2008, JCAAMP continued to be enabled by Congressionally directed financial agility, accommodating a necessarily high degree of technical risk and uncertainty. With the support of the Combatant Commanders, the Department of Defense (DoD) decided in May 2008 to continue JIEDDO and our unique capabilities into the future. Internally, JIEDDO initiated a bottom-up review of the organization to ensure that the staff and components were appropriately tasked and aligned to accomplish an enduring mission. The structure of the organization was fine-tuned in July 2008. DoD now possesses a mature rapid acquisition organization that delivers counter-IED (C-IED) solutions to warfighters in months, versus the years associated with the conventional acquisition system. This report summarizes JIEDDO's activities and accomplishments for FY 2008.
DTIC
Clearances; Countermeasures; Explosive Devices; Explosives Detection; Mine Detectors; Mines (Ordnance)

20090030996 National Energy Technology Lab., Pittsburgh, PA USA
Impact of Fuel Interchangeability on Dynamic Instabilities in Gas Turbine Engines
Robey, E. H.; Ferguson, D. H.; Richards, G. A.; Straub, D. L.; Mar. 01, 2007; 11 pp.; In English
Report No.(s): DE2008-913267; DOE/NETL-IR-2007-102; No Copyright; Avail.: National Technical Information Service (NTIS)

Modern, low NOx emitting gas turbines typically utilize lean pre-mixed (LPM) combustion as a means of achieving target emissions goals. As stable combustion in LPM systems is somewhat intolerant to changes in operating conditions, precise engine tuning on a prescribed range of fuel properties is commonly performed to avoid dynamic instabilities. This has raised concerns regarding the use of imported liquefied natural gas (LNG) and natural gas liquids (NGLs) to offset a reduction in the domestic natural gas supply, which when introduced into the pipeline could alter the fuel BTU content and subsequently exacerbate problems such as combustion instabilities. The intent of this study is to investigate the sensitivity of dynamically unstable test rigs to changes in fuel composition and heat content. Fuel Wobbe number was controlled by blending methane and natural gas with various amounts of ethane, propane and nitrogen. Changes in combustion instabilities were observed, in both atmospheric and pressurized test rigs, for fuels containing high concentrations of propane (> 62% by vol). However, pressure oscillations measured while operating on typical LNG like fuels did not appear to deviate significantly from natural gas and methane flame responses. Mechanisms thought to produce changes in the dynamic response are discussed.
NTIS
Stability; Liquefied Natural Gas; Gas Turbine Engines; Oscillations; Combustion Stability

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*.

20090030365 Geological Survey, Saint Petersburg, FL USA
Changes in Trace and Minor Constituents and Associated Micro-architecture of Montastrea Faveolata during Time of Stress
Holmes, Charles W.; Buster, Noreen A.; Sorauf, James E.; Hudson, J. H.; Kester, Cynthia; Oceans 2003 MTS/IEEE Conference Proceedings; Sep. 2003, pp. 452-455; In English; Oceans 2003, 22 - 26 Sep. 2003, San Diego, CA, USA; Original contains color illustrations
Report No.(s): AD-A502607; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As corals grow, they secrete a calcareous skeleton with the aid of photosynthetic activity of endosymbiotic dinoflagellates. The rate of this secretion varies annually which produces annual bands. Entrapped with the carbonate are trace substances that record the chemistry of the surrounding ocean. Detailing these changes in chemistry requires careful high-resolution sampling. New procedures involving laser ablation inductive couple plasma mass spectroscopy (LA-ICP/MS) provides a unique method that does not involve tedious sample preparation. The La-ICP/MS data for a series of Atlantic corals from Looe Key, U.S. Florida Keys shows an intriguing distribution trace and minor elements whose concentrations are related to reported bleaching events. SEM data from the layers exhibit a change in crystal habit concurrent with the changes in chemistry. These changes reflected the affect of the variable influence of the symbiotic algae on the development of the coral skeleton.
DTIC
Carbonates; Coral Reefs; Laser Ablation; Marine Biology; Mass Spectroscopy; Minerals; Plasmas (Physics); Trace Elements

20090030618 Pratt and Whitney Aircraft, East Hartford, CT USA
Dislocation Dynamic Modeling in High Temperature Single Crystal Viscoplasticity
Cassenti, Brice N; Staroselsky, Alexander; Mar. 2009; 5 pp.; In English
Contract(s)/Grant(s): FA8650-07-C-5252; Proj-4347
Report No.(s): AD-A502692; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed a crystallographic-based viscoplastic model for nonisothermal high temperature deformation and coupled it with damage kinetics. Several damage mechanisms, namely the multiplication of mobile dislocations, void growth and including scale effects, caused by dislocation extrusions/intrusions, have been considered. We applied two body interaction concepts from chemical kinetics to include in our constitutive relations the generation and interaction of pinned and mobile dislocations. The relative importance of each of the damage modes at different temperatures and stress levels has

been deduced by comparing strain-stress and crystallographic texture predictions calibration against test data and has shown that the dislocation density growth may be important in characterizing primary creep.
DTIC
Crystallography; Dynamic Models; High Temperature; Reaction Kinetics; Single Crystals; Viscoplasticity

20090030661 Dyn-FX Consulting, Ltd., Amherstburg, Ontario Canada
Upgrade of the DRDC Suffield Blast Tube Facility
Ritzel, Dave V.; Dec 2007; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7702-03R945
Report No.(s): AD-A502267; DRDC-SUFFIELD-CR-2009-018; CR-120701; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502267

Upgrade proposals are presented for the DRDC Suffield Blast Tube facility designed to extend its testing range and capabilities for conducting studies of structural response and injury from blast. By means of straightforward modifications, the facility's operational Pressure-Impulse (P-I) envelope can be greatly extended as well as its capacity to test full-scale responding targets. Blast conditions equivalent to those from charges of several kilograms of high-explosive to small tactical nuclear devices (O.2SKT) can be simulated. This extended capability can be achieved by the following modifications which can be implemented independently in phases if necessary.
DTIC
Shock Tubes; Explosions; Nuclear Devices

20090030828 Applied Research Associates, Inc., Tyndall AFB, FL USA
The Dry Aerosol Deposition Device (DADD): An Instrument for Depositing Microbial Aerosols onto Surfaces
Heimbuch, Brian K; Kinney, Kimberly R; Nichols, Robert K; Wander, Joseph D; Dec. 2008; 17 pp.; In English
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-DODT
Report No.(s): AD-A502105; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502105

The advent -- 60 years after the concept was first proposed -- of practical self-decontaminating materials coincides with international efforts to prepare for global viral epidemics to highlight a need for a method to rapidly and reproducibly contaminate surfaces with pathogenic bioaerosol particles and representative surrogates. Slow rotation of a single collection stage in a cascade impactor downstream of a Collison nebulizer is demonstrated to deposit by impaction a rotationally symmetric distribution of particles containing a single spore of Bacillus globigii or vegetative Staphylococcus aureus bacterium. The coefficient of variation observed for deposition on glass plates was approx. 14%, significantly less than the acceptance criterion of 20%, and deposition time is approx. 20 min. Particle size distribution can be manipulated -- by changing the nozzle in the Collison, by changing the concentration of inert organics added to the atomization mixture, or both -- suggesting a possibility of selectively depositing larger particles containing multiple organisms.
DTIC
Aerosols; Airborne Infection; Bacteria; Biological Weapons; Decontamination; Deposition; Drying; Microorganisms

20090031187 Electrotechnical Society of Slovenia, Ljubljana, Slovenia
Electrotechnical Review, Volume 76, No. 1-2
Zajc, Baldomir, Editor; 2009; ISSN 0013-5852; 88 pp.; In Slovene; In English; See also 20090031188 - 20090031200; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This issue contains these articles: A Polyphase DSP-based Electricity Measurement System a with Network Analyzer, Using Regression Techniques for Coping with the One-Sample-Size Problem of Face Recognition, Testing Data Dependency for Microprocessors with a Short SIMD Instruction Set, Optimal Permutation Routing on Hexagonal Networks, Robot Vision Accuracy Estimation, Computation of the Magnetic Field around Long Conducting Nonmagnetic Shields, Hierarchical Feature Scheme for Object Recognition in Visual Sensor Networks, Transmission Loss Forecast in the Power System Based on Impacting Power Transfer Distribution Factors, Optimization of Reactive Power Compensation in Distribution Networks, Optimization of Induction Heating using Numerical Modeling and Genetic Algorithm, Magnetic and Electric Field near Overhead Line Towers, Specificity of Power Losses in Large Rectifier Transformers and Gelcard Illumination Enhancement in Gelscope 80 by LED Distribution Optimization,
CASI
Pattern Recognition; SIMD (Computers); Networks; Robot Sensors; Induction Heating

20090031188 Ljubljana Univ., Ljubljana, Slovenia

Computation of the Magnetic Field around Long Conducting Nonmagnetic Shields.

Bulic, Edi; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 31-37; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

A numerical method for computation of the quasi-static magnetic field in the vicinity of long conducting nonmagnetic shields placed around straight wires is presented. The primary magnetic field source are time-harmonic currents in wires. The purpose of the shields is to reduce the magnetic flux density in a particular region. The shielding efficiency can be determined by a comparison of the primary and total field. The calculation of the field is based on a preceding determination of eddy-currents. This determination is accomplished by solving the integral equation and the associated equations that describe how the shields are connected. The system of coupled integral equations is solved by the moment method. The numerical results for the field are comparable with measurements and analytical estimations from literature. The method provides a good insight into the effectiveness of shielding and is a suitable tool for designing the shields. The method is based on the expression of the magnetic vector potential by the Green's function in 2D, on relation between the eddy-current density and electric field intensity in the conducting cylinders, and on preparation of the numerical results and analytical solution for a cylindrical shield surrounding a pair of wires (Figs. 2 and 3). The second one is designed for the comparison of the results of the numerical method with the analytical estimation for an exceedingly wide flat shield above the wire (Figs. 5 and 4). The third case deals with a flat shield above a pair of conductors and presents a comparison of the numerical results with the results of the measurement and with the analytical estimation by the hybrid method (Figs. 5 and 6). The last case deals with the effect of parts of a three-piece shield and intends to reveal the possibilities of an efficient shield designing (Figs. 7, 8, and 9).
Author

Conductors; Magnetic Fields; Magnetostatic Fields; Numerical Analysis; Electromagnetic Shielding

20090031189 Jozef Stefan Inst., Ljubljana, Slovenia

Optimization of Reactive Power Compensation in Distribution Networks

Volkanovski, Andrija; Cepin, Marko; Mavko, Borut; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 57-62; In English; See also 20090031187; Copyright; Avail.: Other Sources

The optimal reactive-power compensation problem solving consists of tinding the optimal combinations of the capacitors and their locations in a network in a way that technical requirements are satisfied and maximum economical effects are achieved. An approach to the optimal reactive-power compensation in distribution networks based on simulated annealing method and deterministic initialization is presented. The objective function considers the savings due to the energy losses and reduction of the peak load. The costs are divided into two categories: constant and variable depending on the capacitors size. The power summation method is used for calculation of the power flows and voltages. The method is applied on a test distribution network. By compensating the reactive power in distribution networks, several goals are achieved: voltages are increased to their nominal values, the network losses are decreased and power flows though interconnections are reduced.
Author

Optimization; Capacitors; Communication Networks; Simulated Annealing

20090031190 Ljubljana Univ., Ljubljana, Slovenia

Optimal Permutation Routing on Hexagonal Networks

Rotovnik, Maja; Silc, Jurij; Zerovnik, Janez; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 19-24; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

At the beginning of the paper we introduce communication networks and data routing in networks. Later we focus on permutation routing, where each base station is the origin of at most one package and at the same time is the destination of no more than one package. The main part of the paper represents the problem of optimal permutation routing in triangular meshes with full-duplex edges. We describe an optimal permutation routing algorithm for full duplex triangular meshes. The basic idea of the algorithm is that a saturated package should not wait any longer because it has already waited as long as it could, otherwise the algorithm becomes suboptimal. Packet p is saturated if the number of waiting steps of the packet is l(sub max) - l(sub p), where l(sub max) is the maximum length over the shortest paths of all packets and l(sub p) is the length of the shortest path of packet p. The algorithm routes every permutation in the l(sub max) routing steps and is optimal, because l(sub max) is a lower bound of every permutation routing algorithm in triangular meshes.
Author

Communication Networks; Permutations; Algorithms; Packets (Communication)

20090031191 Ljubljana Univ., Ljubljana, Slovenia

Specificity of Power Losses in Large Rectifier Transformers

Berlec, Maks; Lenasi, Konrad; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 75-78; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

Additional power losses in large rectifier transformers are caused by induced eddy currents in their windings' conductors and other conductive parts of these transformers. When designing these transformers, the calculation of additional power losses inside windings shall be paid more attention than the calculation of those of the ordinary transformer. The currents in the windings are not sinusoidal and contain a large amount of harmonics, e.g. odd harmonics (Table 1). The most troublesome are the 180 degree phase-shifted harmonics (5, 7, 17, 19 ...) for causing a lot of additional power losses inside region A (Fig. 5). As seen from Eq. 3, the magnetic field distribution inside the transformer window needs to be calculated. The method (Fig 3) appropriate for this task is the method of images. It enables a direct, simple and fast calculation of the magnetic flux density. The basic idea of the method is to remove ferromagnetic objects from the space of calculation in order to apply Eqs. 1 and 2. In that case the magnetic field can be calculated by superposition of magnetic fields of transformer windings and their images.

Author

Rectifiers; Power Loss; Transformers; Electrical Engineering; Magnetic Flux

20090031192 Ljubljana Univ., Ljubljana, Slovenia

Hierarchical Feature Scheme for Object Recognition in Visual Sensor Networks

Sulic, Vildana; Pers, Janez; Kristan, Matej; Kovacic, Stanislav; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 38-44; In English; See also 20090031187; Copyright; Avail.: Other Sources

Visual sensor networks are the meeting point of two significantly different technologies: one is image processing with high computation and storage demands, and the other is distributed sensor approach with low power, low computational and storage vision task-object recognition. The key of our approach is the principle that individual nodes in the network hold only a small amount of information about objects seen by the network. However, this information is sufficient to efficiently route network query, when a new, unknown object is encountered. A set of criteria has to be fulfilled by the object recognition method to quality for use in our framework. The paper provides examples of three widely known object recognition approaches that can be easily adapted for use in such hierarchical feature encoding scheme.

Author

Pattern Recognition; Visual Tasks; Sensors; Computer Vision; Computer Networks

20090031193 Elektro-Slovenija, d.o.o., Ljubljana, Slovenia

Transmission Loss Forecast in the Power System Based on Impacting Power Transfer Distribution Factors

Klancnik, Jurij; Rejc, matej; Pantos, Milos; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 51-56; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

The paper presents an overview of the Slovenian transmission system losses over various voltage levels and transformers measured in 2005 and the main impact factors impacting the transmission system loss forecasting. The methods, which are based on power transfer distribution factors (PTDF), take into account the impacting factors that contribute to the transmission system losses. The main factors importanily affecting the transmission system losses we described in detail: the system load, network topology and power transit. These factors are taken into account in the proposed methods for transmission loss forecasting, in which the PTDFs we introduced, too. The methods of the direct and indirect loss-forecast type. Using the PTDF approach, the impact of the injected power changes on the system transmission power flows can be determined from the PTDFs. The PTDF-based methods require at least one power-flow simulation, using the classic power-flow methods, such as the Newton Raphson are to define the base-power flows. By using the PTDFs and the base-power flows, the forecast method determines losses for different system states for the following day. To improve the accuracy of the methods, more than one power-flow simulation can be used to define different base power flows. The paper compares the accuracy of using different base-power flows in the transmission system loss forecast. The results given in Figs. 5-7 show that the indirect method with two basepower flows gives the best results, i.e. the deviation from the actual losses is minimal. By using two base-power flows, the accuracy of the method is significantly improved. By using trough the method currently employed by the Transmission System Operator does not give significantly worse results than the presented methods, it is slower and requires a greater amount of the user input. The more accurate methods, sush as the Newton Raphson method, are computationally more demanding and time consuming and thus inconvenient for an extensive analysis in the very short available period of time. To

sum up, the PTDF-based methods are much interesting for being computationally effective, interesting, for being accurate and reliable.
Author
Transmission Loss; Power Transmission; Electric Potential; Transformers; Transfer Functions

20090031194 IBE d.d., Ljubljana, Slovenia
Magnetic and Electric Field near Overhead Line Towers
Borut, Zemljaric; Sinigoj, Anton R.; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 69-74; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

Since it is hard to disconnect important overhead power lines outside the foreseen terms, the maintenance personnel have to move on environment exposed to electromagnetic fields. The applicable guidelies for safe work under operating lines define the limit distances between of the maintain and live conductors. In practice, human sensitivity of the invisible electromagnetic fields on towers is also restraint at maintenance. Certain tower types are more acceptable from standpoint of electromagnetic fields as second, although the distance measured to source is the same. As seen from literature, the issue of electromagnetic fields near overhead transmission towers has not yet been discussed. Most of the authors deal with calculations of the electromagnetic fields near overhead power line primary concentrated with conductors. The idea of field calculations discussed in this paper is basically used in high voltage substation fields. Our focus was on the magnetic and electric field calculations, for the three-dimensional structure of line towers. In both calculations the overhead tower elements and conductors was divided into an equivalent assembly of sticks of the final length. Calculations of the corresponding charges and currents on and in it were made next. By dividing the elements we define the use of the moment method, where test functions are pulses of the same width as stick elements. In the calculation model, all the tower elements, which are of a noncircular form, are translated into the equivalent form shown in figure 1. Equivalent radius covers the surface area of the original element. First, we determine equation for the vector magnetic potential of the current stick. To calculate magnetic field, all the currents in conductors and tower structure elements have to be known. The currents are determined through the model circuit of magnetically connected branches and analyses by the tools of the electric circuits (5). The land contribution to primary magnetic field is neglected. The magnetic field is calculated by using the Biot-Savart law with summarizing all the sources (6). To calculate the electric field, the scalar potential equation on the elements surface is used and the land contribution is taken into calculation (7). First, the conductor potential is known. Second, from the magnetic field analyses the scalar potential of all of the structure sticks are determined. We then join the magnetic and electric considering views, so far separated in the quasi-static approach. Here is the difference between us and other authors' who assume the potential of a grounded structure to be equal to zero. By using new approach, charges on sticks are calculated. Then electric field in an arbitrary point is calculated as a sum by using the Coulomb and Faraday law (12). All calculations were made with the Matlab tool. At first, the overhead line geometry and tower structure are made. They are obtained from determination of the sticks start and end'points, internal impedance of sticks and primary source values. In the second part we calculate the matrix coefficients regarding the magnetic and electric equations. Coefficients are expressed with double integrals, which are solved numerically. Our results show that perturbation of the magnetic field is weak and of the electric field is strong. Our numerical results, too, confirmed the maintainers observations that electric field strengths, that it is achieved near 400 kV overhead towers, the geometry of single circuit line tower in shape Y is less favorable from double circuit barrel tower, from human sensitivity standpoint. The presented electric and magnetic field calculations can be used and extended for any shape of electric structure.
Author
Electric Fields; Electromagnetic Fields; Lines (Geometry); Magnetic Fields; Power Lines; Towers

20090031195 Jozef Stefan Inst., Ljubljana, Slovenia
Robot Vision Accuracy Estimation
Torbar, Drago; Papa, Gregor; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 25-30; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

In the paper we describe a procedure for the accuracy estimation in a 2D and a 3D environment of a calibrated robot stereo vision system consisting of two identical 1 Megapixel cameras and present results of the evaluation. Within the static 2D test, the IR-LED array was moved by a linear drive perpendicular to the camera optical axes and the increments in the image were measured. The purpose was to detect the smallest linear response in the image (see Figure 2). The IR-LED centroids were determined in two ways: on binary images and on grey-level images as centers of mass. During image grabbing, the array did not move thus eliminating any dynamic effects. We averaged the movement of centroids of 10 IR-LEDs in a sequence of 16 images and calculated the standard deviation to obtain accuracy confidence intervals (Table 1 and Figure 3). The dynamic 2D test revealed the shape distorsions in the images due to fast 2D movements of linear drive. We compared a few images of the

IR-LED array taken during movement to the statically obtained ones which provided information of photocenter displacements and an estimation of the dynamic error (Table 2). The static 3D accuracy evaluation was performed with two fully calibrated cameras in a stereo setup. Using a linear drive, the array of IR-LEDs was moved along the line in a 3D space with different increments and the smallest movement producing a linear response in the reconstructed 3D space was sought (Table 3 and Figure 4). In the 3D dynamic test, we attached the IR-LED array to the wrist of an industrial robot. We dynamically guided it through some predefined points in space and simultaneously recorded the trajectory with fully calibrated stereo cameras. Then, we compared the reconstructed 3D points from images to the predefined points fed to the robot controller (Table 4). The obtained results show the accuracy 1/5 of a pixel in static 2D and 1/3 of a pixel in dynamic 2D conditions. In 3D, both the static and dynamic accuracy drop to 1/2 of a pixel.
Author
Accuracy; Robots; Stereoscopic Vision; Estimating; Calibrating

20090031196 Ljubljana Univ., Ljubljana, Slovenia
Optimization of Induction Heating using Numerical Modeling and Genetic Algorithm
Kranjc, Matej; Zupanic, Anze; Jarm, Tomaz; Miklavcic, Damijan; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 63-68; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

Induction heating is one of the most widely used methods for heat treatment of steel. However, due to the complex interplay of electromagnetic, thermal and metallurgic phenomena, it is very demanding to model it numerically. The aim of our study was to determine the optimal coil position and the optimal amplitude and frequency of the electric current to attain the desired heat profile (temperature of the outer layer of the heated steel object should reach 450 - 500 K) by using the genetic algorithm optimization method in combination with finite-element numerical modelling. The object of our study was a non-ferromagnetic steel cylinder (Fig. 1) surrounded by a copper coil consisting of four loops. We calculated the magnetic field (Eq. 4), which causes joule heating (Eq. 6), and redistribution of the temperature throughout the material. In our calculations we took into account the steels temperature-dependent material properties (Eqs. 1, 2 and 3). We considered the following optimization parameter constraints: position of the single-coil loop and amplitude and frequency of the electric current through' the coil (Fig. 2). Solutions were selected according to their fitness (Eq. 9) depending on the accuracy of heating and the amount of the used energy. We compared our optimized solution with an educated guess and the actual global optimum. The optimized solution and the global optimum had very comparable temperature profiles and almost identical fitness function values due to a better selection of the electric current parameters compared to the educated guess (Table 3). The genetic algorithm was terminated after 30 generations, when the fitness of the top solution usually converged close to the global optimum (Fig. 4). One of the advantages of our approach is the adaptability of the algorithm enabling its easy use in various heat treatment applications. Even though the optimized solution is not identical to the global optimum, it is always close to it and it can also be used as an initial approximation for other more precise deterministic optimization methods. We demonstrated that our approach assures precise heating of the steel cylinder at low-energy consumption and high time efficiency. We believe these advantages will become even more pronounced when the algorithm is used on more complex induction heating problems.
Author
Genetic Algorithms; Induction Heating; Mathematical Models; Optimization

20090031197 Ljubljana Univ., Ljubljana, Slovenia
Using Regression Techniques for Coping with the One-Sample-Size Problem of Face Recognition
Struc, Vitomir; Gajsek, Rok; Mihelic, France; Pavesic, Nikola; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 7-12; In English; See also 20090031187
Contract(s)/Grant(s): Bi-CN/07-09-019; Proj. 217762; Copyright; Avail.: Other Sources

There is a number of face recognition paradigms which ensure good recognition rates with frontal face Images. However, the majority of them require an extensive training set and degrade in their performance when an insufficient number of training images is available. This is especially true for applications where only one image per subject is at hand for training. To cope with this one-sample-size (OSS) problem, we propose to employ subspace projection based regression techniques rather than modifications of the established face recognition paradigms, such as the principal component or linear discriminant analysis, as it was done in the past. Experiments performed on the XMZVTS and ORL databases show the effectiveness of the proposed approach. Also presented ia a comparative assessment of several regression techniques and some popular face recognition methods.
Author
Regression Analysis; Pattern Recognition; Discriminant Analysis (Statistics); Electrical Engineering

20090031198 Ljubljana Univ., Ljubljana, Slovenia

Gelcard Illumination Enhancement in Gelscope 80 by LED Distribution Optimization

Meza, Marko; Kosir, Andrej; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 79-84; In English; See also 20090031187; Copyright; Avail.: Other Sources

The paper describes an uneven gel card illumination problem in the gel card image capture device Gelscope 32. The problematic illuminator of the device was analyzed and optimized in such a way, that it illuminated the gel card evenly. Since the illuminator was build using white LEDs, we were able to control the distribution of its luminance by rearranging the LEDs positions. A second order gradient algorithm, implemented in Wolfram Mathematica was used to compute the optimal positions of the LEDs. A minimized objective function was a variation of the illumination produced by a preselected number of LEDs in a general positions. Specific constraints related to the hardware realization were taken into account. The LED distribution obtained was used in the construction of the Gelscope 80 device.

Author

Gels; Illuminating; Light Emitting Diodes; Optimization

20090031199 Iskraemeco, Kranj, Slovenia

A Polyphase DSP-based Electricity Measurement System a with Network Analyzer

Marolt, Rok; Zemva, Andrej; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 1-6; In English; See also 20090031187; Copyright; Avail.: Other Sources

This paper represents a three-phase precision measurement system for the electronic electricity meter based on a digital signal processor (DSP) in combination with a multichannel analog-to-digital converter. The measurement system capabilities include all the usual assessments of the energy, power, voltage and current, but functionality of this precision measurement system is extended into the domain of power network quality analyzers. Here the measuring part of a complex device is being discussed which embeds a highly accurate electricity meter and network analyzer in the same unit. Analyzer functions are implemented in compliance with the European EN5160 Standard, and they include detection of short- and long-term voltage sags, swells and outages, harmonic analysis of current and voltage signals with calculation of total harmonic distortion (THD) as well as assessment of voltage flicker severity.

Author

Digital Systems; Electricity; Signal Processing; Communication Networks; Distortion

20090031200 Ljubljana Univ., Ljubljana, Slovenia

Testing Data Dependency for Microprocessors with a Short SIMD Instruction Set

Bulic, Patricio; Dobravec, Tomaz; Electrotechnical Review, Volume 76, No. 1-2; 2009, pp. 13-18; In Slovene; See also 20090031187; Copyright; Avail.: Other Sources

In this paper we present an algorithm for the data-dependency problem related to microprocessors with a multimedia extension (i.e., including short SIMD instructions). Actually, there is a number of data-dependency tests proposed in literature (Banerjee test [2], GCD test [11], Omega test [7], Power test [10], etc.) which are all based on solving the linear dependence system. These tests would prohibit any vectorization if dependence exists even though this dependence would not be violated after the vectorization. As an extension to the Banerjee test, the presented method checks whether the vectorization affects any existing dependence relation by checking the distance between two conflicting memory references. We assume a p-nested for loop. In short SIMD processing we can process V(sub l) data simultaneously and these data must be successively stored in the memory. All the data must be of the same bit length b and the SIMD registers must be V(sub l) (raised dot) b bits long. Thus, the problem of SIMD vectorization becomes a problem of whether we can unroll the innermost loop V(sub l) times and substitute the simultaneous statements with a single SIMD statement that performs the same operation at a time, over V(sub l) b-bits data in the (V(sub l) (raised dot) b)) -bits SIMD register. In this paper, we prove that the distance between the memory referenes in the innermost loop.

Author

Algorithms; Microprocessors; Multimedia; SIMD (Computers); Vector Processing (Computers)

20090031741 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

Journal of the Chinese Institute of Engineers, Volume 32, No. 2

Chen, Shi-Shuenn, Editor; Chu, Jinn P., Editor; Jou, Shyan-kay, Editor, et al.; March 2009; ISSN 0253-3839; 160 pp.; In English; See also 20090031742 - 20090031754; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The articles in this issue are: Word Sense Disambiguation Using Word Ontology and Concept Distribution, A Two-Stage

Committee Machine of Neural Networks, Surface Defect Inspection of Light Guided Plates with the Computer-Vision Assisted Detection Method, A NURBS Curve Interpolator with Jerk-limited Trajectory Planning, Intermetallic Reactions in a Sn-51In Solder BGA Package with Immersion Ag Surface Finish, Integrated HSEE Management Systems for Industry: A Case Study in Gas Refinery, Evaluation of the Shear Strength of Four Pile Cap Using Strut and Tie Model (STM), Hybrid Evolutionary Algorithm for PID Controller Design of AVR System, Dynamics of Personal Best Oriented Particle Swarm Optimizer, Predictive Control Using Recurrent neural Networks for Industrial Processes, A Fuzzy-Neural Approach for Output Projection in a Semiconductor Fabrication Factory, Design and Implementation of Single-Phase Three-Arm Rectifier-Inverter with one Diode-Arm and Solar Photocatalytic Disinfection of Water in the Presence of Kaolinite Catalyst.
CASI
Engineers; Intermetallics; Neural Nets; Semiconductors (Materials); Trajectory Planning

20090031743 Feng Chia Univ., Taichung, Taiwan, Province of China
A Fuzzy-Neural Approach for Output Projection in a Semiconductor Fabrication Factory
Chen, Toly; Wu, Hsin-Chieh; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 285-291; In English; See also 20090031741; Copyright; Avail.: Other Sources

Output projection is a critical task for a semiconductor fabrication factory. There are two steps in output projection: predicting the output time for every job in the factory, and projecting the outputs into each period. For enhancing the effectiveness of output projection, a fuzzy-neural approach is proposed in this study. Firstly, a fuzzy back propagation network (FBPN) is applied to generate fuzzy-valued output time forecasts. Then, the fuzzy output projection function is proposed to project the outputs into each period. To evaluate the effectiveness of the proposed methodology and to make comparison with some traditional approaches, production simulation is also applied in this study to generate test data.
Author
Fuzzy Systems; Neural Nets; Predictions

20090031754 Tehran Univ., Tehran, Iran (Islamic Republic of)
Integrated HSEE Management Systems for Industry: A Case Study in Gas Refinery
Azadeh, Ali; Fam, Mohammad; Azadeh, Azam; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 235-241; In English; See also 20090031741; Copyright; Avail.: Other Sources

The aim of this study was to depict a framework for development of integrated intelligent human engineering environment in complex critical systems. Conventional health, safety and environment (HSE) are a widely used approach to enhance reliability and safety of complex systems. The integrated health, safety, environment and ergonomics management system (HSEE-MS) is defined however as integration of conventional HSE with ergonomics. To show the need for and superiority of HSEE over conventional HSE, a gas treatment company in Iran was studied. Evaluation of ergonomics was carried out by 195 male employees responding to questionnaires. The integrated HSEE system introduces a unique, effective and systemic mechanism, which integrates the structure of the human and organizational systems with a conventional HSE system. It is utilized to enhance reliability, availability, maintainability and safety through the proposed integrated framework of this study.
Author
Complex Systems; Human Factors Engineering; Safety Management; Systems Engineering

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COMMUNICATIONS AND RADAR

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

20090030116 Federal Emergency Management Agency, Washington, DC USA
Developing and Promoting Mitigation Best Practices and Case Studies. Communication Strategy
Sep. 2004; 125 pp.; In English
Report No.(s): PB2008-107213; No Copyright; Avail.: CASI: A06, Hardcopy

For years, mitigation actions have been taken throughout the USA to save lives, reduce property damage and decrease the money spent on disaster recovery efforts. Documenting and promoting these actions have proven to be equally valuable--to the public, government decision-makers and recovery entities--because people can learn by example how to better protect themselves and their communities. The Communication Strategy for Developing and Promoting Mitigation Best Practices and

Case Studies is designed to facilitate the sharing of effective mitigation strategies and practices, to increase public awareness and to compel citizens to take action. Documented accomplishments include individual, business and community initiatives as well as those involving program areas (e.g., Hazard Mitigation Grant Program (HMGP), National Flood Insurance Program (NFIP), Flood Mitigation Assistance (FMA) Program, Pre-Disaster Mitigation (PDM), Planning, 406 Mitigation, Map Modernization), community education and outreach activities, and training and academic initiatives. For the purposes of this Communication Strategy, by definition: Best Practices tell a story and generally use a human-interest approach to document a variety of mitigation ideas and techniques that will reduce adverse impacts from natural and man-made disasters. Case Studies provide a greater in-depth, technical and/or statistical look at some of these same effective mitigation practices. The strategy builds on the longtime efforts by federal, state, local and private-sector entities that have invested resources to implement and document effective mitigation measures.
NTIS
Disasters; Emergencies; Procedures

20090030150 Strategic Policy Research, Inc., Bethesda, MD, USA; Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 1, Initial Review. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 64 pp.; In English
Report No.(s): PB2008-106781; No Copyright; Avail.: CASI: A04, Hardcopy
Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Standards

20090030151 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 2, Interviews with Broadcasters. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 15 pp.; In English
Report No.(s): PB2008-106782; No Copyright; Avail.: CASI: A03, Hardcopy
Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Standards

20090030152 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 3.1, Benefits of Digital Broadcasting. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 8 pp.; In English
Report No.(s): PB2008-106783; No Copyright; Avail.: CASI: A02, Hardcopy
Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Economic Analysis

20090030153 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 3.2, Technical Analysis. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 113 pp.; In English
Report No.(s): PB2008-106784; No Copyright; Avail.: CASI: A06, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Digital Systems

20090030154 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 3.3, Economic Analysis. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 105 pp.; In English
Report No.(s): PB2008-106785; No Copyright; Avail.: CASI: A06, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Economic Analysis; Pulse Communication; Digital Systems

20090030155 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 3.4, Development of Feasible Options and Preferred Alternatives. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 31 pp.; In English
Report No.(s): PB2008-106786; No Copyright; Avail.: CASI: A03, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Alternatives; Broadcasting; Pulse Communication

20090030156 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 4, Organizational Analysis. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 7 pp.; In English
Report No.(s): PB2008-106787; No Copyright; Avail.: CASI: A02, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Digital Systems

20090030157 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 5. Elaboration of New Legal/Regulatory Framework ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 37 pp.; In English
Report No.(s): PB2008-106788; No Copyright; Avail.: CASI: A03, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Standards

20090030158 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Executive Summary. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 8 pp.; In English
Report No.(s): PB2008-106789; No Copyright; Avail.: CASI: A02, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Digital Systems; Standards

20090030159 Strategic Policy Research, Inc., Bethesda, MD, USA
Technical Assistance for Digital Broadcast Standards. Section 6. Final Presentation. ANSP, Autoridad Nacional De Los Servicios Publicos Panama, Panama. Final Report (Revised)
Sep. 2006; 45 pp.; In English
Report No.(s): PB2008-106790; No Copyright; Avail.: CASI: A03, Hardcopy

Strategic Policy Research Inc. was selected to provide technical assistance to the telecommunications and broadcast regulator (ANSP) of the Republica de Panama in developing policies for managing the transition of broadcasting from the current analog system to digital systems. The study includes: an initial review of digital broadcasting in Panama; a survey of Panamanian broadcasters; technical, economic and policy analyses; an organizational analysis of ANSP for managing the digital transition; and legal/regulatory framework.
NTIS
Broadcasting; Pulse Communication; Standards

20090030201 Geological Survey, Reston, VA USA
U.S. Geological Survey Global Seismographic Network: Five-Year Plan 2006-2010
Leith, W. S.; Gee, L. S.; Hutt, C. R.; Jan. 2009; 32 pp.; In English
Report No.(s): PB2009-112793; USGS-OFR-2009-1013; No Copyright; Avail.: National Technical Information Service (NTIS)

;Contents: List of Acronyms; Executive summary; Introduction (Brief program history and authorizations, Program history, Funding history, Program evolution, Description of future initiatives and scientific directions); Program mission and long-term goals (Operation, Data and products, Research support, Education and outreach, Long-term goals); Program 5-year goals; Partners and customers; Program review; Expertise and capabilities; Facilities; Performance measures, goals and targets; Records management; References; Data sources; Appendix 1. List of external reviewers of this plan.
NTIS
Geological Surveys; Geophysics; Seismology; Telecommunication; Telemetry

20090030211 Federal Trade Commission, Washington, DC, USA

Prepared Statement of the Federal Trade Commission on Advertising Trends and Consumer Protection Before the Subcommittee on Consumer Protection, Product Safety, and Insurance of the Committee on Commerce, Science, and Transportation, July 22, 2009

Jul. 22, 2009; 21 pp.; In English

Report No.(s): PB2009-113125; No Copyright; Avail.: CASI: A03, Hardcopy

David Vladeck, Director of the Bureau of Consumer Protection at the Federal Trade Commission (FTC) appears before Chairman Pryor, Ranking Member Wicker, and Members of the Subcommittee to discuss the Commissions efforts to combat fraudulent and deceptive advertising.

NTIS

Commerce; Congressional Reports; Consumers; Insurance (Contracts); On-Line Systems; Protection; Safety

20090030212 Federal Communications Commission, Washington, DC USA

Local Telephone Competition: Status As of June 30, 2008

Jul. 2009; 24 pp.; In English

Report No.(s): PB2009-113140; No Copyright; Avail.: National Technical Information Service (NTIS)

We present here summary statistics of the latest data on local telephone service competition in the USA as reported in the Commissions local competition and broadband data gathering program (FCC Form 477). The summary statistics provide a snapshot of local telephone service competition based on switched access lines in service and state-specific mobile telephony service subscribers as of June 30, 2008. Twice a year, all incumbent local exchange carriers (incumbent LECs) and competitive local exchange carriers (CLECs) are required to report to the Commission basic information about their local telephone service, and all facilities-based mobile telephony providers are required to provide information about their subscribers. Prior to June 2005, the FCC collected data from carriers with at least 10,000 switched access lines, or mobile telephony subscribers, in service in a particular state. Small carriers, many of whom serve rural areas with relatively small populations, were therefore underrepresented in the earlier data. With the inclusion of these carriers, the number of incumbent LEC and CLEC holding companies and unaffiliated carriers reporting local telephone service information as of December 31, 2005 tripled, and the number of reporting facilities-based mobile telephony providers doubled.

NTIS

Competition; Telephones

20090030288 Kansas State Univ., Manhattan, KS, USA

Study and Implementation of Electrically Small Printed Antennas for an Integrated Transceiver Design

Speer, P.; Jan. 2009; 109 pp.; In English

Report No.(s): DE2009-952624; No Copyright; Avail.: National Technical Information Service (NTIS)

This work focuses on the design and evaluation of the inverted-F, meandering-monopole, and loop antenna geometries. These printed antennas are studied with the goal of identifying which is suitable for use in a miniaturized transceiver design and which has the ability to provide superior performance using minimal Printed Circuit Board (PCB) space. As a result, the main objective is to characterize tradeoffs and identify which antenna provides the best compromise among volume, bandwidth and efficiency. For experimentation purposes, three types of meandering-monopole antenna are examined resulting in five total antennas for the study. The performance of each antenna under study is evaluated based upon return loss, operational bandwidth, and radiation pattern characteristics. For our purposes, return loss is measured using the S11-port reflection coefficient which helps to characterize how well the small antenna is able to be efficiently fed. Operational bandwidth is measured as the frequency range over which the antenna maintains 2:1 Voltage Standing Wave Ratio (VSWR) or equivalently has 10-dB return loss. Ansoft High Frequency Structure Simulator (HFSS) is used to simulate expected resonant frequency, bandwidth, VSWR, and radiation pattern characteristics. Ansoft HFSS simulation is used to provide a good starting point for antenna design before actual prototype are built using an LPKF automated router. Simulated results are compared with actual measurements to highlight any differences and help demonstrate the effects of antenna miniaturization. Radiation characteristics are measured illustrating how each antenna is affected by the influence of a non-ideal ground plane. The antenna with outstanding performance is further evaluated to determine its maximum range of communication. Each designs range performance is evaluated using a pair of transceivers to demonstrate round-trip communication.

NTIS

Transmitter Receivers; Loop Antennas; Monopole Antennas; Antenna Design

20090030359 Center for Mathematics and Computer Science, Amsterdam, Netherlands
HP-adaptive Strategy for the Solution of the Exact Kernel Curved Wire Pocklington Equation
Lahaye, D.; Hemker, P. W.; Aug. 2007; 26 pp.; In English
Report No.(s): PB2008-108718; MAS-E0713; Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we introduce an adaptive method for the numerical solution of the Pocklington integro-differential equation with exact kernel for the current induced in a smoothly curved thin wire antenna. The hp-adaptive technique is based on the representation of the discrete solution, which is expanded in a piecewise p-hierarchical basis. The key element in the strategy is an element-by-element criterion that controls the h- or p-refinement. Numerical results demonstrate both the simplicity and efficiency of the approach.
NTIS
Electric Fields; Electromagnetic Scattering; Kernel Functions; Scattering; Wire

20090030406 Jackson (Henry M.) Foundation, Bethesda, MD, USA
E-Mail as a Communication Tool in Army Nursing Management
Lasome, C. E. M.; Nov. 30, 2001; 60 pp.; In English
Contract(s)/Grant(s): N99-016
Report No.(s): PB2008-108724; MDA-905-99-1-0014; No Copyright; Avail.: CASI: A04, Hardcopy

Grounded in communication theory and using the Ross Communication Model, the purpose of this study was to: (1) determine the impact of Computer-Mediated Communication (CMC) on the management relationship between Head Nurses (HNs) and Clinical Staf Nurses (CSNs) in a military health care setting, and (2) determine the consistency between perceptions versus actual messages sent by CMC. Data were collected using semistructured interviews and CMC transcripts between HNs and CSNs. Interviews were conducted over a 13-month period with participants working in three military treatment facilities located on the east coast (medical center, community hospital, ambulatory care clinic). A textual analysis of a two-week sample of CMC between HNs and their respective CSNs was conducted concurrently. Interviews were tape-recorded and transcribed verbatim. CMC text was analyzed in its original form. Data were analyzed using the constant comparative method.
NTIS
Ceramic Matrix Composites; Communication; Electronic Mail; Health; Interprocessor Communication; Management Methods; Medical Personnel; Military Personnel

20090030426 Battelle Memorial Inst., Columbus, OH USA
Expanded Satellite-Based Mobile Communications Tracking System
Houser, A.; Willimas, D.; Raman, M.; Vercoe, D.; Erlandson, P.; Jun. 2007; 188 pp.; In English
Contract(s)/Grant(s): DTMC75-04-F-00105
Report No.(s): PB2008-107731; No Copyright; Avail.: National Technical Information Service (NTIS)

This U.S. Department of Transportation (USDOT) Federal Motor Carrier Safety Administration (FMCSA) project was authorized in the 2004 Senate Conference Report 108-401. As proposed by the Senate, the conference agreement directs $2,000,000 from funds provided for the high-priority initiative program for an expanded satellite-based mobile communications system to monitor and track hazardous materials and high-value cargo in uncovered areas of the USA. As a result, a regional assessment and 3-month pilot test was conducted to test a wireless, satellite-based mobile communications tracking system to monitor hazardous materials and high-value cargo in order to improve communications in certain regions of Alaska and Hawaii, where satellite-based tracking services were only partially available. This document represents the Final Report for this pilot test of an Expanded Satellite-based Mobile Communications Tracking System.
NTIS
Hazardous Materials; Mobile Communication Systems

20090030574 Army Research Lab., Adelphi, MD USA
An Implementation of Physical Layer Authentication Using Software Radio
Yu, Paul; Baras, John; Sadler, Brian; Jul. 2009; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502531; ARL-TR-4888; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Authentication is the process where claims of identity are verified and is a critical first step for sensitive communications. We propose a physical layer authentication technique that identifies radios based on their unique signal characteristics. The transmit signal is superimposed with a secret message-dependent authentication tag for the receiver to detect and validate. We

present experimental results that indicate the usefulness of this technique: it has low impact on packet error, gives high quality authentication decisions, and is resistant to collisions.
DTIC
Computer Information Security; Radio Signals; Radio Transmission; Telecommunication

20090030726 Bureau of Justice Statistics, Washington, DC, USA
Internet Crime Report, 2007
Jan. 2007; 28 pp.; In English
Report No.(s): PB2008-108105; No Copyright; Avail.: National Technical Information Service (NTIS)

The 2007 Internet Crime Report is the seventh annual compilation of information on complaints received and referred by the Internet Crime Complaint Center (IC3) to law enforcement or regulatory agencies for appropriate investigative action. From January 1, 2007 to December 31, 2007, the IC3 website received 206,884 complaint submissions. This is a 0.3% decrease when compared to 2006 when 207,492 complaints were received. These filings were composed of fraudulent and non-fraudulent complaints primarily related to the Internet. In 2007, IC3 processed more than 219,553 complaints that support Internet crime investigations by law enforcement and regulatory agencies nationwide. These complaints were composed of many different fraud types such as auction fraud, non-delivery, and credit/debit card fraud, as well as other illegal behavior, such as computer intrusions, spam/unsolicited e-mail, and child pornography. All of these complaints are accessible to federal, state, and local law enforcement to support active investigations, trend analysis, and public outreach and awareness efforts. From the submissions, IC3 referred 90,008 complaints of crime to federal, state, and local law enforcement agencies around the country for further consideration.
NTIS
Crime; Internets; Law (Jurisprudence)

20090030755 Commerce Dept., Washington, DC, USA
Spectrum Management for the 21st Century. The President's Spectrum Policy Initiative Second Annual Progress Report
Oct. 2007; 25 pp.; In English
Report No.(s): PB2008-109284; No Copyright; Avail.: CASI: A03, Hardcopy

This Second Annual Progress Report describes recent steps the Executive Branch has taken to realize the Presidents vision of a USA spectrum policy for the 21st century. In May 2003, the President launched an initiative to ensure that USA spectrum policy for the 21st century continues to mobilize the radio frequency resource in service of federal missions and national prosperity. This Presidential Initiative serves to foster economic growth; defend and secure our Nation; maintain U.S. global leadership in communications technology and services; and satisfy other vital U.S. needs in public safety, scientific research, federal transportation infrastructure, and law enforcement.
NTIS
Policies; Radio Frequencies

20090030784 Mine Safety and Health Administration, Arlington, VA, USA
Emergency Communication and Tracking Committee Underground Communication and Tracking Systems Tests at CONSOL Energy Inc., McElroy Mine. Report of Findings, June 13, 2006
Jun. 13, 2006; 31 pp.; In English
Report No.(s): PB2008-106975; No Copyright; Avail.: National Technical Information Service (NTIS)

The Mine Safety and Health Administration formed a committee to evaluate communication and tracking system technology that could be adapted for use in underground mines. This effort was in response to the recent Sago and Alma mine accidents which indicated that functioning communication and tracking systems would benefit search and rescue efforts. MSHA solicited input from the public through its website for technology that could be applied in the underground mine environment to improve communications or provide personnel tracking ability. To date, MSHA has received more than 100 proposals in response to the solicitation. At the time the committee reviewed the proposals and selected six systems for further evaluation, approximately 25 proposals had been submitted. The systems selected represent a cross-section of different technologies proposed including wireless mesh networks; ultra-wide band radio; and very low frequency through-the-earth. The systems selected feature the capability to provide either two-way voice communications and/or tracking, do not depend on wired communication, and were ready to test at the time the selection was made. CONSOL Energy, Inc. offered to assist in the evaluation of these technologies by providing the McElroy Mine in which to test the systems. The purpose of the

underground field tests was to evaluate how well the signals propagate; how much overburden through-the-earth systems could penetrate; how interference affected system performance; and to determine the accuracy of tracking systems.
NTIS
Emergencies; Industries; Telecommunication; Underground Communication

20090030919 Eaton Corp., Milwaukee, WI, USA
Low-Cost, Robust, Threat-aware Wireless Sensor Network for Assuring the Nation's Energy Infrastructure, Topical
Rentel, C. H.; Mar. 31, 2007; 13 pp.; In English
Contract(s)/Grant(s): FC26-04NT42071
Report No.(s): DE2008-920622; FC26-04NT42071; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this project was to create a low-cost, robust anticipatory wireless sensor network (A-WSN) to ensure the security and reliability of the USA energy infrastructure. This document highlights Eaton Corporation's plan to bring these technologies to market.
NTIS
Low Cost; Security

20090030920 Oak Ridge National Lab., TN USA
Low-Cost, Robust, Threat-Aware Wireless Sensor Network for Assuring the Nation's Energy Infrastructure
Rentel, C. H.; Mar. 31, 2007; 64 pp.; In English
Contract(s)/Grant(s): FC26-04NT42071
Report No.(s): DE2008-920623; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this project was to create a low-cost, robust anticipatory wireless sensor network (A-WSN) to ensure the security and reliability of the USA energy infrastructure. This project has shown the feasibility of an intelligent wireless sensor network for the protection of electrical infrastructure.
NTIS
Low Cost; Security

20090030941 Southwest Region Univ. Transportation Center, College Station, TX, USA; Texas A&M Univ., College Station, TX USA
Trucking Industry Response in a Changing World of Tolling and Rising Fuel Prices
Vadali, S. R.; Gupta, R. S.; Womack, K. N.; Pappu, M.; Dec. 2007; 162 pp.; In English
Report No.(s): PB2008-109364; SWUTC-07-167167-1; No Copyright; Avail.: National Technical Information Service (NTIS)
Direct user fees based options are gaining further momentum all across the USA and particularly in the state of TX. The success of such ventures or projects requires a clear assessment of demand for toll roads among the potential user groups. However, there is too little information about the trucking industry as far as their attitude towards toll roads is concerned. This lack of attention to response patterns can lead to optimism bias in truck toll forecasts. Through literature reviews, Texas specific focus groups, and surveys this study aims to establish the range in demand variation and route preferences for tolled roads across various segments of the trucking community. Fuel prices are found to influence route choices and consequently toll road revenue forecasts. In addition to fuel costs, the other trade-offs that emanate from this study include cargo characteristics, haul characteristics, etc. Therefore a better understanding of the demand structure of the trucking firms requires all the relevant trade-offs be taken into consideration.
NTIS
Industries; Routes; Tradeoffs

20090031724 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Characterising the Ionosphere
January 2009; 266 pp.; In English; See also 20090031725 - 20090031730; Original contains color and black and white illustrations
Report No.(s): RTO-TR-IST-051; AC/323(IST-051)TP/207; Copyright; Avail.: CASI: C01, CD-ROM; A12, Hardcopy
This report is a compilation of papers from academic and other research institutes that describe ionospheric phenomena and parameters that affect electromagnetic propagation. The report addresses both mid-latitude and high-latitude effects. The first chapter describes the morphology of the ionosphere, briefly covers the neutral atmosphere and expands on the influence

of the geomagnetic field, ionospheric electric field and currents, and particle precipitation at high latitudes. Chapter 2 looks at the instrumentation for obtaining the relevant data. An analysis of the mapping of total electron content in geographic co-ordinates is presented in Chapter 3 with an aim of providing timely information to the users. Chapter 4 addresses spontaneous emissions observed during ground-based and rocket-borne experiments. The final chapter considers the specific effects of space weather on the ionosphere during severe geomagnetic and ionospheric storms, the impact on technology including communication and navigation systems, and emphasises the need for a global perspective of the system. Extensive references are provided for each subject. For completeness, the proceedings of a Specialists Meeting held in conjunction with the study are added as an appendix.
Author
Ionospheric Currents; Magnetic Storms; Electromagnetic Wave Transmission; Telecommunication; Space Weather; Geomagnetism; Ionospheric Storms; Electron Density (Concentration); Electric Fields

20090031725 Massachusetts Inst. of Tech., Westford, MA, USA
Space Weather, Chapter 5
Foster, John C.; Characterising the Ionosphere; January 2009, pp. 5-1 - 5-40; In English; See also 20090031724; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Earth s ionosphere responds dramatically to severe geomagnetic storms. Coupled closely to the neutral thermosphere and the overlying magnetosphere, stormtime ionospheric effects appear with a wide variety of scale sizes, characteristics, time histories, and associated drivers. The strong interconnection between the magnetosphere and ionosphere points to the need to take a global perspective in characterizing and understanding this system. Penetrating electric fields and plasma redistribution combine to produce severe enhancements and reductions of ionospheric TEC (total electron content), steep localized density gradients, and stormtime space weather effects.
Author
Space Weather; Earth Ionosphere; Ionospheric Electron Density; Magnetic Storms; Storms (Meteorology); Electric Fields

20090031726 University of Western Ontario, London, Ontario, Canada
Instrumentation, Chapter 2
MacDougall, John; Characterising the Ionosphere; January 2009, pp. 2-1 - 2-17; In English; See also 20090031724; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An Ionosonde is an HF radar used for obtaining electron density profiles of the ionosphere. It basically works on the principle that a radio wave will be totally reflected if the radio frequency is equal to the characteristic frequency of the ionosphere which depends on plasma frequency, f(sub p) = (80.5N)(exp 1/2) Hz, where N is the electron density in electrons per m3. Thus knowing the height of reflection and the radio frequency one has a measurement of the electron density at that height. This simplified principle is somewhat more complex in practice since the group velocity of the radio wave is slower in the ionosphere so the height obtained using the time delay of the echo and assuming that the radio wave travels at the speed of light is an overestimation of the actual height of reflection. Also, the ionosphere is birefringent for radio waves so that the reflection conditions for one mode, the extraordinary wave, are different from the reflection conditions for the other mode, the ordinary wave. The electric field of the ordinary wave is left hand circularly polarized when viewed along the direction of the terrestrial magnetic field. For ordinary waves the reflection condition is simple in that the wave is reflected at the level where the frequency just equals the plasma frequency as defined above. It is therefore necessary to have a way of separating out the ordinary wave reflections when calculating ionospheric densities from the echoes obtained by an ionosonde. Having separated out the O mode echoes an estimation of the electron density profile can be obtained using a 'true height analysis' program. The best known true height analysis program is Polan [Titheridge, 1985, 1998].
Author
Ionosondes; High Frequencies; Electron Density (Concentration); Radio Frequencies; Radio Waves; Wave Reflection; Magnetic Fields; Electrons; Electric Fields

20090031727 NATO Research and Technology Organization, Neuilly-sur-Seine, France

Characterising the Ionosphere

Characterising the Ionosphere; January 2009, pp. ES1 - ES-2; In English; In French; See also 20090031724; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NATO RTO Task Group on Characterising the Ionosphere was an initiative taken by the Information Systems Technology (IST) Panel to report on the status of research associated with the ionosphere. The aim was to alert the user groups in the wide community, but with an emphasis on the military applications, to the effects of the medium on systems. It also provides guidance on prediction methods for any event which has an influence on the ionosphere. The report is a result of three years work by the Technical Group supported by contributions from academia and other national research institutes. The group actively involved five nations (Canada, Germany, Norway, UK and US) but with grateful contributions from others as appropriate. We were very fortunate to have benefited from the experience of experts in the field; the Group hosted a Specialists Meeting in Fairbanks Alaska supported by the URSI community; the proceedings are attached as an annex to this report. The properties of the ionosphere inherently influence the performance of various systems which rely on rf waves traversing the region; for example satellite navigation, HF communications and HF Radar. The resurgence of HF for communications requires improvements to the propagation prediction methods in order to maintain an efficient communications media. Whilst the first order diurnal effects and the influence of space weather are already known, this report describes the physics which could influence the behaviour from events not previously regarded as significant. Several decision aids are described to assist the operators in coping with the inherent instabilities, but identifies further work which would enhance the knowledge. The ionisation is caused by a variety of mechanisms but predominantly by extreme ultra violet (EUV), X-rays, Lyman and solar cosmic rays. Different ionisation processes occur at specific altitudes giving rise to a layered structure designated as D, E and F; a more comprehensive discussion is available in Chapter 1 'Morphology'. The auroral region is a specific case for discussion because it is subject to mechanisms which are generally not well understood. The military community should be aware of the properties and adapt to the effects on their systems when exploiting the media or when deployed in northern latitudes. We have incorporated a section relating to mapping total electron content in near real time, which reduces the latency in establishing the ionospheric propagation delay, a necessary parameter for good navigation using satellite signals e.g. GPS. Galileo Space weather is addressed where interest has been shown from a variety of quarters including the insurance sector.

Author

Ionospheric Propagation; Military Technology; Radio Frequencies; Prediction Analysis Techniques; Satellite Communication; Electron Density (Concentration); Extreme Ultraviolet Radiation; Information Systems; Auroral Zones

20090031728 Bath Univ., Bath, UK

Mapping, Chapter 3

Mitchell, Cathryn; Characterising the Ionosphere; January 2009, pp. 3-1 - 3-58; In English; See also 20090031724; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Currently there are a number of different methods to produce estimates of the electron density in the ionosphere. Model-based approaches range from empirical models (e.g. IRI, Bilitza, 2001), through to methods that combine such models with real-time data (e.g. Bust et al., 2004) and finally approaches that constrain a physical model with measurements (e.g. Hajj et al., 2004). For well-instrumented regions of the Earth it is possible to design algorithms that use mathematical constraints and measurements to produce electron-density images without including ionospheric models (Spencer and Mitchell, 2001; Mitchell and Spencer, 2003). For global solutions of the electron density either model-assisted approaches or interpolation methods (e.g. solar-fixed persistence) are required to fill in large data-sparse regions of the Southern Hemisphere, in particular over the oceans. This paper focuses on the development of the Multi-Instrument Data Analysis System (MIDAS) algorithm. Of all the approaches summarised above MIDAS is probably the most mathematical and data driven and least model reliant. This approach was taken in the development of MIDAS for a number of reasons. Firstly, it was apparent an early stage in the development (1999) that the number of available data sources for the ionosphere was increasing, mainly because of the increased use of GPS for scientific studies in other fields (mainly geodesy). In addition, it was also clear that much of the available data already being recorded was not being systematically utilized for ionospheric imaging (e.g. navigation data on low Earth orbit, LEO, satellites; Superdarn; ad-hoc HF links), either because of a lack of central collation or because of the required nonlinear inversion techniques had not yet been developed. Finally, the strength of minimising the model-reliance in the MIDAS approach is that in data-rich regions images that can show actual behaviour of the ionosphere at a given instant and not a merged model-data solution. This also makes MIDAS a suitable technique for producing statistical results that could be used to produce new ionospheric models with improved ability match actual events. In this paper the development of

MIDAS is described. Examples of results for global and local ionospheric specification are given. Finally the future directions and required modifications to the technique for specific systems uses are discussed.
Author
Electron Density (Concentration); Navigation; Imaging Techniques; Global Positioning System; Earth Ionosphere; Atmospheric Models; Real Time Operation

20090031729 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany
Morphology and Dynamics, Chapter 1
Hawlitschka, Stefan; Characterising the Ionosphere; January 2009, pp. 1-1 - 1-104; In English; See also 20090031724; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A06, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Ionosphere is a constituent of the atmosphere where at altitudes in excess of 50 km the earth s atmosphere becomes increasingly rarefied and can support free electrons for short periods. This region has the properties of a gas and a plasma which exhibit some interesting effects. Neutral atoms and molecules, such as N2, N, NO, O2, O, H and He are ionised by impact of photons of the extreme ultraviolet (EUV) and X-ray radiation, emanating from the sun. Different mechanisms are predominant at specific altitudes; at the outer reaches of the atmosphere the solar radiation amounts to some 1370 Watts per square metre but the density of atoms is low resulting in a small amount of ionisation. At lower altitudes atoms are more numerous increasing the rate of ionisation but at the same time allowing increased rate of recombination. A further mechanism is the absorption of the incident energy which is a function of the gas density and composition; causing attenuation to increase at lower altitudes. The resultant effect is horizontal stratification denoted as the D-, E-, and F-layer of the ionosphere (Figure 1-1). The C-layer also exists generated by cosmic rays but plays a minor role for our purposes.
Author
Ionization; Free Electrons; Ionospheres; Oxygen; Nitrogen; Ultraviolet Radiation; Gas Density; Molecules; Earth Atmosphere

20090031730 Dartmouth Coll., Hanover, NH, USA
Spontaneous Radio Frequency Emissions from Natural Aurora, Chapter 4
LaBelle, J.; Characterising the Ionosphere; January 2009, pp. 4-1 - 4-21; In English; See also 20090031724; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG04WC27G; NNG05GM37G; NNG04WC44G; NSF ATM-0243595; NSF ANT-0442369; NSF ANT-0341050; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At high latitudes, suitably sensitive radio experiments tuned below 5 MHz detect up to three types of spontaneous radio emissions from the Earth s ionosphere. In recent years, ground-based and rocket-borne experiments have provided strong evidence for theoretical explanations of the generation mechanism of some of these emissions, but others remain unexplained. Achieving a thorough understanding of these ionospheric emissions, accessible to ground-based experiments, will not only bring a deeper understanding of Earth s radio environment and the interactions between waves and particles in the ionosphere but also shed light on similar spontaneous emissions occurring elsewhere in Earth s environment as well as other planetary and stellar atmospheres.
Author
Earth Ionosphere; Radio Frequencies; Stellar Atmospheres; Rocket-Borne Instruments; Auroras

20090031769 NASA Johnson Space Center, Houston, TX, USA
Unified Communications for Space Inventory Management
Gifford, Kevin K.; Fink, Patrick W.; Barton, Richard; Ngo, Phong H.; [2009]; 15 pp.; In English; AIAA Space 2009 Conference and Exposition, 14-17 Sep. 2009, Pasadena, CA, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18761; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090031769

To help assure mission success for long-duration exploration activities, NASA is actively pursuing wireless technologies that promote situational awareness and autonomy. Wireless technologies are typically extensible, offer freedom from wire tethers, readily support redundancy, offer potential for decreased wire weight, and can represent dissimilar implementation for increased reliability. In addition, wireless technologies can enable additional situational awareness that otherwise would be infeasible. For example, addition of wired sensors, the need for which might not have been apparent at the outset of a program,

night be extremely costly due in part to the necessary routing of cables through the vehicle. RFID, or radio frequency identification, is a wireless technology with the potential for significant savings and increased reliability and safety in space operations. Perhaps the most obvious savings relate to the application of inventory management. A fully automated inventory management system is highly desirable for long-term sustaining operations in space environments. This assertion is evidenced by inventory activities on the International Space Station, which represents the most extensive inventory tracking experience base in the history of space operations. In the short tern, handheld RFID readers offer substantial savings owing to reduced crew time for inventory audits. Over the long term, a combination of improved RFID technology and operational concepts modified to fully utilize the technology should result in space based inventory management that is highly reliable and requires very little crew time. In addition to inventory management, RFID is likely to find space applications in real-time location and tracking systems. These could vary from coarse-resolution RFID portals to the high resolution afforded by ultra-wideband (UWB) RFID. Longer range RFID technologies that leverage passive surface acoustic wave (SAW) devices are being investigated to track assets on a lunar or planetary surface.
Author
Inventory Management; Technology Utilization; Wireless Communication; Autonomy; Radio Frequencies; International Space Station

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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*.

20090029943 NASA Glenn Research Center, Cleveland, OH, USA
MEMS Direct Chip Attach Packaging Methodologies and Apparatuses for Harsh Environments
Okojie, Robert S., Inventor; April 14, 2009; 26 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 25 Aug. 2004; US-Patent-7518234; NASA-Case-LEW-17256-2; US-Patent-Appl-SN-10/926206; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029943

Methods of bulk manufacturing high temperature sensor subassembly packages are disclosed and claimed. Sensors are sandwiched between a top cover and a bottom cover so as to enable the peripheries of the top covers, sensors and bottom covers to be sealed and bound securely together are disclosed and claimed. Sensors are placed on the bottom covers leaving the periphery of the bottom cover exposed. Likewise, top covers are placed on the sensors leaving the periphery of the sensor exposed. Individual sensor sub-assemblies are inserted into final packaging elements which are also disclosed and claimed. Methods of directly attaching wires or pins to contact pads on the sensors are disclosed and claimed. Sensors, such as pressure sensors and accelerometers, and headers made out of silicon carbide and aluminum nitride are disclosed and claimed. Reference cavities are formed in some embodiments disclosed and claimed herein where top covers are not employed.
Author
Chips; Microelectromechanical Systems; High Temperature Environments; Electronic Packaging

20090029957 TRS Technologies, Inc., State College, PA, USA
Cryogenic Piezoelectric Actuator
Jiang, Xiaoning; Cook, William B.; Hackenberger, Wesley S.; August 02, 2009; 8 pp.; In English; SPIE Optics and Photonics 2009, 2 - 7 Aug. 2009, San Diego, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL06AA09C
Report No.(s): LF99-9142; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029957

In this paper, PMN-PT single crystal piezoelectric stack actuators and flextensional actuators were designed, prototyped and characterized for space optics applications. Single crystal stack actuators with footprint of 10 mm x10 mm and the height of 50 mm were assembled using 10 mm x10mm x0.15mm PMN-PT plates. These actuators showed stroke > 65 - 85 microns at 150 V at room temperature, and > 30 microns stroke at 77 K. Flextensional actuators with dimension of 10mm x 5 mm x 7.6 mm showed stroke of >50 microns at room temperature at driving voltage of 150 V. A flextensional stack actuator with dimension of 10 mm x 5 mm x 47 mm showed stroke of approx. 285 microns at 150 V at room temperature and > 100 microns

at 77K under driving of 150 V should be expected. The large cryogenic stroke and high precision of these actuators are promising for cryogenic optics applications.
Author
Actuators; Electric Potential; Piezoelectric Actuators; Piezoelectricity; Single Crystals; Cryogenics

20090030204 International Trade Commission, Washington, DC USA
Pedestal Actuators from China
Nov. 2002; 53 pp.; In English
Report No.(s): PB2009-113044; USITC/PUB-3557; No Copyright; Avail.: CASI: A04, Hardcopy
On the basis of information developed in the subject investigation, the USA International Trade Commission determines, pursuant to section 421(b)(1) of the Trade Act of 1974, that pedestal actuators from the Peoples Republic of China are being imported into the USA in such increased quantities or under such conditions as to cause market disruption to the domestic producers of like or directly competitive products.
NTIS
Actuators; China

20090030224 Pacific Northwest National Lab., Richland, WA, USA
Joint Institute for Nanoscience Annual Report, 2004
Jan. 2004; 149 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2009-951875; PNNL-15353; No Copyright; Avail.: National Technical Information Service (NTIS)
Due to the inherently interdisciplinary nature of nanoscience and nanotechnology, research in this arena is often significantly enhanced through creative cooperative activities. The Joint Institute for Nanoscience (JIN) is a venture of the University of Washington (UW) and Pacific Northwest National Laboratory (PNNL) to encourage and enhance high impact and high quality nanoscience and nanotechnology research that leverages the strengths and capabilities of both institutions, and to facilitate education in these areas. This report summarizes JIN award activities that took place during fiscal year 2004 and provides a historical list of JIN awardees, their resulting publications, and JIN-related meetings. Major portions of the JIN efforts and resources are dedicated to funding graduate students and postdoctoral research associates to perform research in collaborations jointly directed by PNNL staff scientists and UW professors. JIN fellowships are awarded on the basis of applications that include research proposals. They have been very successful in expanding collaborations between PNNL and UW, which have led to many excellent joint publications and presentations and enhanced the competitiveness of both institutions for external grant funding. JIN-based interactions are playing a significant role in creating new research directions and reshaping existing research programs at both the UW and PNNL.
NTIS
Nanotechnology; Research; Histories

20090030226 Pacific Northwest National Lab., Richland, WA, USA
Joint Institute for Nanoscience Annual Report, 2003
Jan. 2003; 123 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2009-951877; No Copyright; Avail.: National Technical Information Service (NTIS)
The Joint Institute for Nanoscience (JIN) is a cooperative venture of the University of Washington and Pacific Northwest National Laboratory to encourage and enhance high-impact and high-quality nanoscience and nanotechnology of all types. This first annual report for the JIN summarizes activities beginning in 2001 and ending at the close of fiscal year 2003 and therefore represents somewhat less than two years of activities. Major portions of the JIN resources are dedicated to funding graduate students and postdoctoral research associates to perform research in collaborations jointly directed by Pacific Northwest National Laboratory (PNNL) staff scientists and University of Washington (UW) professors. These fellowships were awarded on the basis of applications that included research proposals. JIN co-sponsors an annual Nanoscale Science and Technology Workshop held in Seattle. In addition to involving PNNL staff in various UW nanoscience courses and seminars, a National Science Foundation grant Development of UW-PNL Collaborative Curriculums in Nano-Science and Technology

has allowed the development of three intensive short courses that are taught by UW faculty, PNNL staff, and faculty from other institutions, including Washington State University, the University of Idaho, Stanford University, and the University of Alaska.
NTIS
Nanotechnology; Nanostructures (Devices); Research and Development

20090030227 Paulsson Geophysical Services, Inc., Brea, CA, USA
Robust MEMS Based Multi-Component Sensor For 3D Borehole Seismic Arrays
Jul. 30, 2007; 47 pp.; In English
Contract(s)/Grant(s): DE-FC26-06NT42241
Report No.(s): DE2009-951898; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this project was to develop, prototype and test a robust multi-component sensor that combines both Fiber Optic and MEMS technology for use in a borehole seismic array. The use such FOMEMS based sensors allows a dramatic increase in the number of sensors that can be deployed simultaneously in a borehole seismic array. Therefore, denser sampling of the seismic wave field can be afforded, which in turn allows us to efficiently and adequately sample P-wave as well as S-wave for high-resolution imaging purposes. Design, packaging and integration of the multi-component sensors and deployment system will target maximum operating temperature of 350-400 F and a maximum pressure of 15000-25000 psi, thus allowing operation under conditions encountered in deep gas reservoirs. This project aimed at using existing pieces of deployment technology as well as MEMS and fiber-optic technology. A sensor design and analysis study has been carried out and a laboratory prototype of an interrogator for a robust borehole seismic array system has been assembled and validated.
NTIS
Boreholes; Microelectromechanical Systems; Seismology; Seismic Waves

20090030295 Fermi National Accelerator Lab., Batavia, IL, USA; Cambridge Univ., Cambridge, UK; Royal Holloway Coll., Egham, UK; London Univ., UK
Resolution of a High Performance Cavity Beam Position Monitor System
Walston, S.; Slater, M.; Chung, C.; Fitsos, P.; Ross, M.; Jul. 06, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921979; FERMILAB-CONF-07-675-TD; No Copyright; Avail.: Department of Energy Information Bridge

International Linear Collider (ILC) interaction region beam sizes and component position stability requirements will be as small as a few nanometers. It is important to the ILC design effort to demonstrate that these tolerances can be achieved idealy using beam-based stability measurement. It has been estimated that RF cavity beam position monitors (BPMs) could provide position measurement resolutions of less than one nanometer and could form the basis of the desired beam-based stability measurement. We have developed a high resolution RF cavity BPM system. A triplet of these BPMs has been installed in the extraction line of the KEK Accelerator Test Facility (ATF) for testing with its ultra-low emittance beam. A metrology system for the three BPMs was recently installed. This system employed optical encoders to measure each BPMs position and orientation relative to a zero-coefficient of thermal expansion carbon fiber frame and has demonstrated that the three BPMs behave as a rigid-body to less than 5 nm. To date, we have demonstrated a BPM resolution of less than 20 nm over a dynamic range of +/- 20 microns.
NTIS
Beams (Radiation); Cavities; Monitors; Radio Frequencies

20090030306 RTI International, Research Triangle Park, NC, USA
Economic Impact of Measurement in the Semiconductor Industry. Planning Report 07-2
Gallaher, M. P.; Rowe, B. R.; Rogozhin, A. V.; Houghton, S. A.; Davis, J. L.; Dec. 2007; 191 pp.; In English
Report No.(s): PB2008-108354; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this study was to quantify the investment made by the semiconductor industry, government, and consortia in the measurement infrastructure between 1996 and 2006 and to compare that estimate with the economic benefits firms accrued as a consequence. This study also analyzed the trends catalyzing a broad-based, public-private strategy for improving the industry's measurement capabilities and thereby the industry's competitiveness in the global market.
NTIS
Economic Impact; Industries; Semiconductors (Materials); Planning

20090030342 Oak Ridge National Lab., TN USA; Department of Energy, Washington, DC, USA
Study of the Advantages of Internal Permanent Magnet Drive Motor with Selectable Windings for Hybrid-Electric Vehicles Technical Report
Otaduy, P. J.; Hsu, J. S.; Adams, D. J.; Nov. 30, 2007; 55 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2008-921779; ORNL/TM-2007/142; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes research performed on the viability of changing the effectively active number of turns in the stator windings of an internal permanent magnet (IPM) electric motor to strengthen or weaken the magnetic fields in order to optimize the motors performance at specific operating speeds and loads. Analytical and simulation studies have been complemented with research on switching mechanisms to accomplish the task. The simulation studies conducted examine the power and energy demands on a vehicle following a series of standard driving cycles and the impact on the efficiency and battery size of an electrically propelled vehicle when it uses an IPM motor with turn-switching capabilities. Both full driving cycle electric propulsion and propulsion limited starting from zero to a set speed have been investigated.
NTIS
Electric Motor Vehicles; Permanent Magnets; Winding

20090030345 Oak Ridge National Lab., TN USA; Department of Energy, Washington, DC, USA
Power Modulation Investigation for High Temperature (175-200 degrees Celcius) Automotive Application, Technical Report
McCluskey, F. P.; Apr. 30, 2007; 54 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2008-921887; ORNL/TM-2007/046; No Copyright; Avail.: National Technical Information Service (NTIS)

Hybrid electric vehicles were re-introduced in the late 1990s after a century dominated by purely internal combustion powered engines. Automotive players, such as GM, Ford, DaimlerChrysler, Honda, and Toyota, together with major energy producers, such as BPAmoco, were the major force in the development of hybrid electric vehicles. Most notable was the development by Toyota of its Prius, which was launched in Japan in 1997 and worldwide in 2001. The shift to hybrids was driven by the fact that the sheer volume of vehicles on the road had begun to tax the ability of the environment to withstand the pollution of the internal combustion engine and the ability of the fossil fuel industry to produce a sufficient amount of refined gasoline. In addition, the number of vehicles was anticipated to rise exponentially with the increasing affluence of China and India. Over the last fifteen years, major advances have been made in all the technologies essential to hybrid vehicle success, including batteries, motors, power control and conditioning electronics, regenerative braking, and power sources, including fuel cells. Current hybrid electric vehicles are gasoline internal combustion electric motor hybrids.
NTIS
Automobiles; Electric Motor Vehicles; High Temperature; Modulation

20090030395 Oak Ridge National Lab., TN USA; Department of Energy, Washington, DC, USA
Investigations Into High Temperature Components and Packaging
Marlino, L. D.; Chinthavali, M. S.; McCluskey, F. P.; Seiber, L. E.; Scudiere, M. B.; Jun. 01, 2007; 109 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2008-921778; ORNL/TM-2007/159; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this report is to document the work that was performed at the Oak Ridge National Laboratory (ORNL) in support of the development of high temperature power electronics and components with monies remaining from the Semikron High Temperature Inverter Project managed by the National Energy Technology Laboratory (NETL). High temperature electronic components are needed to allow inverters to operate in more extreme operating conditions as required in advanced traction drive applications. The trend to try to eliminate secondary cooling loops and utilize the internal combustion (IC) cooling system, which operates with approximately 105C water/ethylene glycol coolant at the output of the radiator, is necessary to further reduce vehicle costs and weight. The activity documented in this report includes development and testing of high temperature components, activities in support of high temperature testing, an assessment of several component packaging methods, and how elevated operating temperatures would impact their reliability.
NTIS
High Temperature; Electronic Packaging; Cooling

20090030416 Idaho National Lab., Idaho Falls, ID, USA
Hybrid Electric and Plug-In Hybrid Electric Vehicle Testing Activities. EVS-23
Francfort, J.; Karner, D.; Dec. 2007; 20 pp.; In English
Report No.(s): DE2008-923510; INL/CON-07-12227; No Copyright; Avail.: National Technical Information Service (NTIS)

The Advanced Vehicle Testing Activity (AVTA) conducts hybrid electric vehicle (HEV) and plug-in hybrid electric vehicle (PHEV) testing in order to provide benchmark data for technology modeling and research and development programs, and to be an independent source of test data for fleet managers and other early adaptors of advanced-technology vehicles. To date, the AVTA has completed baseline performance testing on 12 HEV models and accumulated 2.7 million fleet testing miles on 35 HEVs. The HEV baseline performance testing includes dynamometer and closed-track testing to document HEV performance in a controlled environment. During fleet testing, two of each HEV model accumulate 160,000 test miles within 36 months, during which maintenance and repair events and fuel use were recorded. Three models of PHEVs, from vehicle converters Energy CS and Hymotion and the original equipment manufacturer Renault, are currently in testing. The PHEV baseline performance testing includes 5 days of dynamometer testing with a minimum of 26 test drive cycles, including the Urban Dynamometer Driving Schedule, the Highway Fuel Economy Driving Schedule, and the US06 test cycle, in charge-depleting and charge-sustaining modes. The PHEV accelerated testing is conducted with dedicated drivers for 4,240 miles, over a series of 132 driving loops that range from 10 to 200 miles over various combinations of defined 10-mile urban and 10-mile highway loops, with 984 hours of vehicle charging.
NTIS
Electric Motor Vehicles; Enhanced Vision

20090030435 California Univ., Berkeley, CA USA
Plasma Ion Sources and Ion Beam Technology in Microfabrications
Ji, L.; Jan. 2007; 165 pp.; In English
Report No.(s): DE2008-924801; No Copyright; Avail.: National Technical Information Service (NTIS)

For over decades, focused ion beam (FIB) has been playing a very important role in microscale technology and research, among which, semiconductor microfabrication is one of its biggest application area. As the dimensions of IC devices are scaled down, it has shown the need for new ion beam tools and new approaches to the fabrication of small-scale devices. In the meanwhile, nanotechnology has also deeply involved in material science research and bioresearch in recent years. The conventional FIB systems which utilize liquid gallium ion sources to achieve nanometer scale resolution can no longer meet the various requirements raised from such a wide application area such as low contamination, high throughput and so on. The drive towards controlling materials properties at nanometer length scales relies on the availability of efficient tools. In this thesis, three novel ion beam tools have been developed and investigated as the alternatives for the conventional FIB systems in some particular applications.
NTIS
Ion Beams; Ion Sources; Plasmas (Physics); Semiconductors (Materials)

20090030561 Department of Energy, Washington, DC, USA
Route-Based Control of Hybrid Electric Vehicles: Preprint
Gonder, J. D.; Jan. 01, 2008; 11 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922540; NREL/CP-540-42557; No Copyright; Avail.: National Technical Information Service (NTIS)

Today's hybrid electric vehicle controls cannot always provide maximum fuel savings over all drive cycles. Route-based controls could improve HEV fuel efficiency by 2%-4% and help save nearly 6.5 million gallons of fuel annually.
NTIS
Electric Motor Vehicles; Routes

20090030573 Army Research Lab., Adelphi, MD USA
Characterization of High Temperature Polymer Thin Films for Power Conditioning Capacitors
Ho, Janet; Jow, Richard; Jul. 2009; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502532; ARL-TR-4880; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Capacitor dielectrics that can operate above 150 deg C are needed for power electronics in military propulsion and

weapons systems. This report characterized and compares two high temperature polymer film capacitor candidates, poly(ether imide) (PEI) and poly(ether ether ketone) (PEEK), with poly(phenylene sulfide) (PPS) and biaxially oriented polypropylene (BOPP), which offer limited performance at high temperature. Breakdown strength at room temperature was about 320 MV/m for PEEK, 500 MV/m for PPS and PEI, and 720 MV/m for BOPP. At 150 deg C, breakdown strength for PEI decreased about 16% and about 13% for PEEK, while PPS remained unchanged. BOPP's maximum test temperature was 100 deg C, at which breakdown strength decreased by about 11%. Dielectric loss measurements suggest PPS has greater electrical conductivity at 200 deg C than PEEK or PEI, and PEI has a lower loss than PEEK at temperatures above 150 deg C and frequencies higher than 1 kHz. The low E-field conductivity for PPS was 6.90x10(-14) S/m at 165 deg C and 1.72x10(-11) S/m at 200 deg C; the manufacturer listed room temperature conductivity as 2x10(-16) S/m. The effect of conductivity on the temperature rise of the capacitors was analyzed. More measurements are needed to determine the conductivity of PEEK and PEI. Based on the measured data for breakdown strength and dielectric properties, PEI appears to be the better candidate.
DTIC
Capacitors; Dielectrics; High Temperature; Power Conditioning; Propulsion System Configurations; Propulsion System Performance; Thin Films; Weapon Systems

20090030581 Louisiana State Univ., Baton Rouge, LA USA
Quantum Lidar - Remote Sensing at the Ultimate Limit
Dowling, Jonathan P.; Jul. 2009; 97 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-07-2-0214; DARPA ORDER-AJ11/00; Proj-AJ11
Report No.(s): AD-A502521; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Louisiana State University (LSU) led team carried out an exhaustive study of a two-mode quantum optical sensor. The classical baseline of comparison was a standard two-mode coherent Light Detection and Ranging (LIDAR) system. The LSU quantum LIDAR system has many of the same features of the classical system, with the critical exception that the photon source and detection scheme were treated quantum mechanically and the complete analysis of loss was carried out in a quantum optical setting. A critical deliverable or our Phase I also is to provide a complete quantum theory and analysis of the performance of what is typically known as classical coherent LIDAR. A crucial point to realize here is that there is no such thing as classical LIDAR. The standard laser beam used in classical LIDAR is a quantum coherent state of light whose properties set the limits to resolution and sensitivity. Hence the classical baseline is in fact a quantum baseline, in this sense.
DTIC
Optical Measuring Instruments; Optical Radar; Quantum Optics; Remote Sensing; Remote Sensors

20090030629 Army Research Lab., White Sands Missile Range, NM USA
Effects of Fiberglass Poles on Radiation Patterns of Log-Periodic Antennas
Maragoudakis, Christos E; Jul. 2009; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502795; ARL-TN-0357; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The effects of fiberglass poles of various cross-section and chemical composition on the radiation pattern of log-periodic antennas are presented in this document. The antennas were mounted with the poles parallel to the antenna boom and vertical to the radiating elements. Normalized antenna patterns depicting the effects of the poles on the radiation pattern in the 100 megahertz (MHz) to 1 gigahertz (GHz) frequency range are included in the appendix of this document.
DTIC
Antenna Radiation Patterns; Glass Fibers; Log Periodic Antennas

20090030638 Army Research Lab., Adelphi, MD USA
Effects of Differing Carbon Nanotube Field-effect Transistor Architectures
Dorsey, Andrew M; Ervin, Matthew H; Jul 2009; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502660; ARL-TR-4883; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Single-walled carbon nanotube field-effect transistors (SWCNTFETs) were fabricated with varying device architectures. Variations on the standard back-gated architecture included varying the gate oxide material and thickness, changing source and drain contact metallization, suspending the carbon nanotubes to minimize interaction with the gate oxide, and fabricating a topgated architecture employing a thin layer of aluminum oxide (Al2O3) as the gate oxide. Devices were characterized and compared to each other based on the CNTFET properties of noise, hysteresis, sub-threshold slope, and threshold voltage.

Results show that some properties of the CNTFET, such as hysteresis and noise can be modified; other properties, however, are intrinsic to the CNT.
DTIC
Carbon Nanotubes; Field Effect Transistors

20090030641 Commerce Dept., Washington, DC USA
Defense Industrial Base Assessment: U.S. Integrated Circuit Design and Fabrication Capability
Crawford, Mark; Telesco, Teresa; Nelson, Christopher; Botwin, Brad; May 2009; 255 pp.; In English
Report No.(s): AD-A502658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The capability to design and fabricate integrated circuit (IC) products is critical to the economic and national security of the USA. IC products are fundamental building blocks for commercial, industrial, and national security electronic systems. In recent years, there have been questions about the possible erosion of the U.S. manufacturing base and increasing reliance on offshore producers to supply microprocessors, memory chips, and other IC devices. In July 2007, the Department of Commerce's (DOC) Office of Technology Evaluation (OTE) in the Bureau of Industry and Security (BIS), with support from the U.S. Department of Defense, initiated a study to assess U.S. IC design and fabrication capabilities. Forty-nine fabricators and 106 fabless firms participated in an OTE survey and provided detailed information on their ability to create a range of conventional and radiation resistant IC devices across technology nodes, using standard and non-standard semiconductor materials. Data collected through the OTE survey covered the period of 2003 to 2006, with projections through 2011. Overall, companies reported broad capability in the USA to manufacture and design both conventional and radiation resistant ICs across almost all technology nodes, materials, wafer sizes, and device types. Based on projections through 2011, this core capability reportedly will be maintained despite some increases in outsourcing to non-U.S. locations. During the 2003-2006 period, U.S. manufacturing and design activity was supported by significant growth in corporate net sales, research and development (R&D) spending, and capital expenditures. The vast majority of R&D and capital expenditures was allocated to activities within the USA, with a small but growing portion directed to overseas operations.
DTIC
Defense Industry; Fabrication; Integrated Circuits; Manufacturing

20090030648 Air Force Research Lab., Wright-Patterson AFB, OH USA
Digital Image Correlation of Ni-Base Superalloy Rene 88DT Using In-Situ SEM Tension Experiments
Fairchild, S.; Tschopp, M. A.; Bartha, B. B.; Murray, T.; Porter, W. J.; Nov. 2008; 14 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A502792; AFRL-RX-WP-TP-2009-4135; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Digital image correlation was used to obtain the strain behavior of a polycrystalline nickel-based superalloy, Rene 88DT, from an in situ scanning electron microscope tensile experiment at room temperature. A subsequent correlation with crystal orientations shows that the average maximum principal strain tends to increase with increasing Schmid factor. The range of the extreme values for the maximum principal strain also increases closer to the grain boundary, signifying that grain boundaries and triple junctions initiate plasticity within polycrystalline Rene 88DT.
DTIC
Data Correlation; Digital Techniques; Heat Resistant Alloys; Image Correlators; In Situ Measurement; Nickel Alloys; Plastic Properties; Scanning Electron Microscopy

20090030915 National Renewable Energy Lab., Golden, CO USA
Factors and Conditions for Widespread Use of Ultracapacitors in Automotive Applications (Presentation)
Pesaran, A.; Jul. 01, 2007; 30 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-913589; NREL/PR-540-41969; No Copyright; Avail.: National Technical Information Service (NTIS)

;Contents:Background Potential (Ultracapacitor (Ucaps) functions in vehicles, Energy and power requirements of various HEVs, Hybrids with Ucaps, Start-stop vehicle fuel economy); Simulations -Impact of energy window on fuel economy of power assist hybrids; Ucaps and Plug-in HEVs; Suitability of Ucaps for different hybrid vehicles; What would make the Ucap market grow; Fuel consumption considerations; Concluding remarks.
NTIS
Automobiles; Capacitance; Electrochemical Capacitors; Energy Storage; Propulsion System Configurations; Propulsion System Performance

20090030924 Stanford Linear Accelerator Center, CA, USA
Active RF Pulse Compression Using Electrically Controlled Semiconductor Switches
Guo, J.; Tantawi, S.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922953; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper, we will present our recent results on the research of the ultra-fast high power RF switches based on silicon. We have developed a switch module at X-band which can use a silicon window as the switch. The switching is realized by generation of carriers in the bulk silicon. The carriers can be generated electrically or/and optically. The electrically controlled switches use PIN diodes to inject carrier. We have built the PIN diode switches at X-band, with <300ns switching time. The optically controlled switches use powerful lasers to excite carriers. By combining the laser excitation and electrical carrier generation, significant reduction in the required power of both the laser and the electrical driver is expected. High power test is under going.
NTIS
Pulse Compression; Radio Frequencies; Semiconductors (Materials); Switches

20090031745 Chang Gung Univ., Taipei, Taiwan, Province of China
Design and Implementation of Single-Phase Three-Arm Rectifier-Inverter with one Diode-Arm
Chang, Jhy-Ming; Chang, Wei-Neng; Chiang, Hsuang-Chang; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 293-298; In English; See also 20090031741; Copyright; Avail.: Other Sources

The single-phase rectifier-inverter is the main circuit of the single-phase UPS. Traditionally, the half-bridge with split capacitor topology and the three-arm topology are employed for pursuing low cost and high efficiency. This paper presents a three-arm topology replacing one transistor-arm with one diode-arm to further reduce the cost as compared to three-arm topology. The diode-arm is placed on the rectifier side and the power factor correction (PFC) function is achieved through the rectifier arm (REC-arm) which provides the common path for the rectifier'and inverter. To control the inverter voltage with only the inverter arm (INV-arm), the feedforward control method is adopted for the INV-arm to reduce the interaction with the rectifier through the REC-arm. Modeling of the proposed rectifier-inverter with the diode-arm and controller design of the rectifier and inverter portions are provided in this paper. A 500VA UPS is built. The effectiveness of the proposed method is confirmed with some experimental results.
Author
Circuits; Diodes; Inverters; Rectifiers; Electric Power Supplies

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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*.

20090029948 NASA Marshall Space Flight Center, Huntsville, AL, USA
Method and Apparatus for Predicting Unsteady Pressure and Flow Rate Distribution in a Fluid Network
Majumdar, Alok K., Inventor; June 02, 2009; 22 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 22 Dec. 2005; US-Patent-7542885; NASA-Case-MFS-32125-1; US-Patent-Appl-SN-11/326676; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029948

A method and apparatus for analyzing steady state and transient flow in a complex fluid network, modeling phase changes, compressibility, mixture thermodynamics, external body forces such as gravity and centrifugal force and conjugate heat transfer. In some embodiments, a graphical user interface provides for the interactive development of a fluid network simulation having nodes and branches. In some embodiments, mass, energy, and specific conservation equations are solved at the nodes, and momentum conservation equations are solved in the branches. In some embodiments, contained herein are data objects for computing thermodynamic and thermophysical properties for fluids. In some embodiments, the systems of equations describing the fluid network are solved by a hybrid numerical method that is a combination of the Newton-Raphson and successive substitution methods.
Author
Equilibrium Flow; Thermodynamics; Thermophysical Properties; Unsteady Flow; Computerized Simulation

20090030057 NASA Glenn Research Center, Cleveland, OH USA

A Three-Dimensional Foil Bearing Performance Map Applied to Oil-Free Turbomachinery

Radil, Kevin C.; DellaCorte, Christopher; Apr. 2009; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A499621; ARL-TR-4473; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090030057; http://hdl.handle.net/100.2/ADA499621

To effectively apply compliant foil gas bearings to increasingly larger and more challenging turbomachinery, a comprehensive method that compares a foil bearing's capabilities with the application's operating requirements is needed. Extensive laboratory and field experience suggests foil bearing failure is generally due to thermal stress brought on by excessive viscous power loss; therefore a map that graphically relates component and system-level parameters (bearing size, applied loads, and shaft rotational speeds) directly to bearing power loss is more elucidating than a map based on a lumped speed/load parameter like the Sommerfeld number. In this report we describe a performance map featuring a three-dimensional contour plot.

Author

Foil Bearings; Gas Bearings; Oils; Turbomachinery

20090030093 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Accurate and Efficient Computation of Steady Water Flow with Surface Waves and Turbulence

Wackers, J.; Koren, B.; Feb. 2007; 18 pp.; In English

Report No.(s): PB2008-108136; MAS-R0704; Copyright; Avail.: National Technical Information Service (NTIS)

A surface capturing method is developed for steady water-air flow with gravity. Second-order accuracy is obtained with flux limiting and turbulence is modeled with Menter's model. The model is solved efficiently with a combination of multigrid and defect correction. Results for two test cases confirm the efficiency and accuracy of the method.

NTIS

Steady Flow; Surface Waves; Turbulence; Water Flow; Mathematical Models

20090030094 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Runge-Kutta Discontinuous-Galerkin Level-Set Method for Unsteady Compressible Two-Fluid Flow

Naber, J.; Koren, B.; Feb. 2007; 24 pp.; In English

Report No.(s): PB2008-108137; MAS-E0704; Copyright; Avail.: National Technical Information Service (NTIS)

In this work a numerical method for the solution of the two-dimensional Euler equations describing unsteady compressible two-fluid flow is presented. The method is based on the combination of a Runge-Kutta discontinuous Galerkin discretization of the Euler equations and a level-set method for the treatment of the two-fluid interface. The corresponding level-set equation is used in its advective form which, as opposed to the frequently used conservative form, does not generate an erroneous off-set in the interface location. A simple fix is applied to prevent the solution from becoming oscillatory near the two-fluid interface. Application of this fix requires the development of a special two-fluid slope limiter for the discontinuous Galerkin method. Numerical results show the competence of the developed method.

NTIS

Compressible Flow; Galerkin Method; Runge-Kutta Method; Two Dimensional Flow; Unsteady Flow

20090030096 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Towards an H-Adaptive Immersed Boundary Method for the Unsteady Incompressible Navier-Stokes Equations

Naber, J.; Koren, B.; Feb. 2007; 26 pp.; In English

Report No.(s): PB2008-108139; MAS-E0705; Copyright; Avail.: National Technical Information Service (NTIS)

This paper treats the development and validation of a numerical method for the solution of the unsteady incompressible Navier-Stokes equations in two dimensions. The method of choice is a Godunov-type pressure-free correction method similar to the method developed by Lee and LeVeque. Validation is done by considering a two-dimensional boundary-layer flow along a flat-plate. The resulting method provides a starting point for the development of an h-adaptive immersed boundary method to be applied to the flapping flexible filament problem proposed by Zhu and Peskin.

NTIS

Boundaries; Incompressible Flow; Navier-Stokes Equation; Unsteady Flow; Godunov Method; Computational Fluid Dynamics

20090030097 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Efficient Computation of Steady Water Flow with Waves
Wackers, J.; Koren, B.; Mar. 2007; 10 pp.; In English
Report No.(s): PB2008-108140; MAS-R0706; Copyright; Avail.: National Technical Information Service (NTIS)
A surface capturing model for steady water flow is presented that can be solved very efficiently. The model contains a high-accuracy water surface discretization and turbulence; it is solved with a novel linear multigrid technique and defect correction. Results show the accuracy of the model and the fast convergence of the solver.
NTIS
Steady Flow; Water Flow; Water Waves; Mathematical Models

20090030102 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Multigrid Solution Method for the Steady RANS Equations
Wackers, J.; Koren, B.; Nov. 2007; 30 pp.; In English
Report No.(s): PB2008-108144; MAS-R0708; Copyright; Avail.: National Technical Information Service (NTIS)
A novel multigrid method for the solution of the steady Reynolds-Averaged Navier-Stokes equations is presented, that gives convergence speeds similar to laminar-flow multigrid solvers. The method is applied to Menter's one-equation turbulence model. New aspects of the method are the combination of nonlinear Gauss-Seidel smoothing on the finest grid with linear coarse grid corrections, and local damping in the initial stages of the computation, to keep the solution stable; the damping needed is estimated with the nonlinear smoother. Efficiency on the finest grid is increased with full multigrid, second-order accuracy is obtained with defect correction. Tests on boundary layers and airfoil flows show the efficiency of the method.
NTIS
Navier-Stokes Equation; Reynolds Number; Steady State; Mathematical Models; Computational Fluid Dynamics; Reynolds Averaging; Multigrid Methods

20090030122 Texas A&M Univ., Kingsville, TX, USA
Wave Forces on Bridge Decks: State of the Art and State of the Practice Review
Aguiniga, F.; Matakis, K.; Estrada, H.; Sai, J.; Leelani, P.; Oct. 2007; 95 pp.; In English
Report No.(s): PB2008-107650; REPT-0-5516-1; No Copyright; Avail.: CASI: A05, Hardcopy
The extensive bridge damage caused by recent hurricanes on the Gulf of Mexico showed a need for a design method against wave forces. A literature review revealed that current guidelines offer limited help to bridge designers, since current information related to the design of bridge superstructures when subjected to the action of waves is inadequate. This document presents a compilation of available sources of information that contain information related to forces produced by waves acting on engineering structures such as sea walls, suspended walls, and bridge decks.
NTIS
Loads (Forces); Wave Generation

20090030127 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Multigrid Method for the Computation of Steady Water Waves
Wackers, J.; Koren, B.; Feb. 2007; 14 pp.; In English
Report No.(s): PB2008-108132; MAS-R0702; Copyright; Avail.: National Technical Information Service (NTIS)
An efficient method for the computation of steady water-air flow with gravity is presented. The method is designed for fast solution using multigrid, combined with a line Gauss-Seidel smoother. A capturing model is used for the water surface, with fluxes based on artificial compressibility. A test on a channel flow with a bottom bump shows the accuracy of the method and the efficiency of the multigrid solver.
NTIS
Water Waves; Channel Flow

20090030170 Los Alamos National Lab., NM USA
Nonstandard Jump Functions for Radially Symmetric Shock Waves
Baty, S.; Tucker, D. H.; Stanescu, D.; Oct. 01, 2008; 27 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25396
Report No.(s): DE2009-948551; LA-14380; No Copyright; Avail.: Department of Energy Information Bridge
Nonstandard analysis is applied to derive generalized jump functions for radially symmetric, one-dimensional,

magnetogasdynamic shock waves. It is assumed that the shock wave jumps occur on infinitesimal intervals, and the jump functions for the physical parameters occur smoothly across these intervals. Locally integrable predistributions of the Heaviside function are used to model the flow variables across a shock wave. The equations of motion expressed in nonconservative form are then applied to derive unambiguous relationships between the jump functions for the physical parameters for two families of self-similar flows. It is shown that the microstructures for these families of radially symmetric, magnetogasdynamic shock waves coincide in a nonstandard sense for a specified density jump function.
NTIS
Shock Waves; Superconductivity

20090030216 Idaho National Lab., Idaho Falls, ID, USA
PIV Experiments to Measure Flow Phenomena in a Scaled Model of a VHTR Lower Plenum
Hugh, M. M.; McEligot, D.; Schultz, R.; Christensen, D.; Johnson, R. C.; Sep. 01, 2006; 33 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727
Report No.(s): DE2009-948590; INL/EXT-08-15161; No Copyright; Avail.: National Technical Information Service (NTIS)
This report illustrates a comparative study to analyze the physical differences between numerical simulations obtained with both the conservation and incompressible forms of the Navier-Stokes equations for natural convection flows in simple geometries. The purpose of this study is to quantify how the incompressible flow assumption (which is based upon constant density advection, divergence-free flow, and the Boussinesq gravitational body force approximation) differs from the conservation form (which only assumes that the fluid is a continuum) when solving flows driven by gravity acting upon density variations resulting from local temperature gradients. Driving this study is the common use of the incompressible flow assumption in fluid flow simulations for nuclear power applications in natural convection flows subjected to a high heat flux (large temperature differences). A series of simulations were conducted on two-dimensional, differentially-heated rectangular geometries and modeled with both hydrodynamic formulations. From these simulations, the selected characterization parameters of maximum Nusselt number, average Nusselt number, and normalized pressure reduction were calculated. Comparisons of these parameters were made with available benchmark solutions for air with the ideal gas assumption at both low and high heat fluxes.
NTIS
Particle Image Velocimetry; Fluid Flow; Gas Cooled Reactors

20090030255 Louisiana State Univ., Baton Rouge, LA USA
Loop Current Frontal Eddies Based on Satellite Remote-Sensing and Drifter Data
Walker, N.; Leben, R.; Anderson, S.; Feeney, J.; Coholan, P.; Jul. 2009; 88 pp.; In English
Report No.(s): PB2009-113249; No Copyright; Avail.: National Technical Information Service (NTIS)
The over-arching goal of this project was to develop and apply new remote sensing methodologies to improve upon the surveillance of ocean features and the understanding of near surface circulation processes in the Gulf of Mexico (GoM). The Loop Current (LC) and its associated eddies are the most energetic ocean circulation features in the GoM, exhibiting surface current velocities of 1-2 m/s. As oil and gas exploration and drilling moves into deeper water, a better understanding of circulation processes and energetic current events associated with the LC will increase in importance for the effective management of these offshore activities.
NTIS
Oceans; Remote Sensing; Surveillance; Vortices

20090030340 Sandia National Labs., Albuquerque, NM USA; National Nuclear Security Administration, Las Vegas, NV, USA; Lockheed Martin Corp., Hampton, VA, USA
Conjugate Heat Transfer Analysis using the Calore and Fuego Codes
Francis, N. D.; Jun. 01, 2007; 60 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-921734; SAND2007-5876; No Copyright; Avail.: National Technical Information Service (NTIS)
Full coupling of the Calore and Fuego codes has been exercised in this report. This is done to allow solution of general conjugate heat transfer applications that require more than a fluid flow analysis with a very simple conduction region (solved using Fuego alone) or more than a complex conduction/radiation analysis using a simple Newtons law of cooling boundary condition (solved using Calore alone). Code coupling allows for solution of both complex fluid and solid regions, with or without thermal radiation, either participating or non-participating. A coupled physics model is developed to compare to data

taken from a horizontal concentric cylinder arrangement using the Penlight heating apparatus located at the thermal test complex (TTC) at Sandia National Laboratories. The experimental set-up requires use of a conjugate heat transfer analysis including conduction, nonparticipating thermal radiation, and internal natural convection. The fluids domain in the model is complex and can be characterized by stagnant fluid regions, laminar circulation, a transition regime, and low-level turbulent regions, all in the same domain. Subsequently, the fluids region requires a refined mesh near the wall so that numerical resolution is achieved. Near the wall, buoyancy exhibits its strongest influence on turbulence (i.e., where turbulence conditions exist). Because low-Reynolds number effects are important in anisotropic natural convective flows of this type, the v2 -f turbulence model in Fuego is selected and compared to results of laminar flow only. Coupled code predictions are compared to temperature measurements made both in the solid regions and a fluid region. Turbulent and laminar flow predictions are nearly identical for both regions. Predicted temperatures in the solid regions compare well to data. The largest discrepancies occur at the bottom of the annulus. Predicted temperatures in the fluid region, for the most part, compare well to data. As before, the largest discrepancies occur at the bottom of the annulus where the flow transitions to or is a low-level turbulent flow.
NTIS
Conjugates; Heat Transfer; Computer Programs; Fluid Flow

20090030364 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Unsteady Compressible Two-Fluid Flow Model for Interface Capturing: On the Dynamics of a Shock-Bubble Interaction
Kreeft, J. J.; Nov. 2007; 104 pp.; In English
Report No.(s): PB2008-108727; MAS-E0717; Copyright; Avail.: National Technical Information Service (NTIS)

Multi-fluid flows are found in many applications in engineering and physics. Examples of these flows from engineering are water-air flows in ship hydrodynamics, exhaust-air flows behind rockets, gas-petroleum flows in upstream pipes of oil rigs, air-fuel bubble interaction flows in scramjets and many others. To gain better insight in the behavior of multi-fluid flows, especially two-fluid flows, numerical simulations are needed. We assume that the fluids do not mix or chemically react, but remain separated by a sharp interface. With these assumptions a model is developed for unsteady, compressible two-fluid flow, with pressures and velocities that are equal on both sides of the interface. The model describes the behavior of a numerical mixture of the two fluids (not a physical mixture). This kind of interface modeling is called interface capturing. Numerically, the interface becomes a transition layer between both fluids. The model consists of five equations; mass, momentum and energy equation for the mixture (these are the standard Euler equations), mass equation for one of the two fluids and energy equation for one of the two fluids. This last equation is not conservative, but contains a source term. The source term represents the exchange of energy between the two fluids. The model is discretized by using a finite-volume approximation. The finite-volume method consists of a third-order Runge-Kutta scheme for temporal discretization and a limited second-order spatial discretization. For the flux evaluation Osher's Riemann solver is constructed, which uses a new set of Riemann invariants that was derived for the two-fluid model. The source term is evaluated using the limited state distribution and the wave pattern in the Osher solver. The two-fluid model is validated on several shock tube problems.
NTIS
Compressible Flow; Fluid Flow; Shock Wave Interaction; Two Fluid Models; Unsteady Flow; Finite Volume Method; Mathematical Models

20090030414 Idaho National Lab., Idaho Falls, ID, USA
Review of Experimental Capabilities and Hydrodynamic Data for Validation of CFD Based Predictions for Slurry Bubble Column Reactors. 2007 AIChE Annual Meeting
Guillen, D. P.; Wendt, D. S.; Antal, S. P.; Podowski, M. Z.; Nov. 2007; 15 pp.; In English
Report No.(s): DE2008-923507; INL/CON-07-12613; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this paper is to document the review of several open-literature sources of both experimental capabilities and published hydrodynamic data to aid in the validation of a Computational Fluid Dynamics (CFD) based model of a slurry bubble column (SBC). The review included searching the Web of Science, ISI Proceedings, and Inspec databases, internet searches as well as other open literature sources. The goal of this study was to identify available experimental facilities and relevant data. Integral (i.e., pertaining to the SBC system), as well as fundamental (i.e., separate effects are considered), data are included in the scope of this effort. The fundamental data is needed to validate the individual mechanistic models or closure laws used in a Computational Multiphase Fluid Dynamics (CMFD) simulation of a SBC. The fundamental data is generally focused on simple geometries (i.e., flow between parallel plates or cylindrical pipes) or custom-designed tests to focus on selected interfacial phenomena. Integral data covers the operation of a SBC as a system with coupled effects. This work

highlights selected experimental capabilities and data for the purpose of SBC model validation, and is not meant to be an exhaustive summary.
NTIS
Bubbles; Chemical Reactors; Computational Fluid Dynamics; Hydrodynamics; Slurries

20090030499 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Blue Ridge Numerics, Charlottesville, VA, USA
Hydrodynamic Thermal Modeling of 9-Cell ILC Cavity Electropolishing and Implications for Improving the EP Process
Reece, C. E.; Ortega, J.; Mammosser, J.; Jan. 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923383; No Copyright; Avail.: National Technical Information Service (NTIS)
Multi-cell niobium cavities often obtain the highest performance levels after having been subjected to an electropolishing (EP) process. The horizontal EP process first developed at KEK/Nomura Plating for TRISTAN cavities is being applied to TESLA-style cavities and other structures for the XFEL and ILC R&D. Jefferson Lab is presently carrying this activity in the US. Because the local electropolishing current density is highly temperature dependent, we have created using CFDesign a full-scale hydrodynamic model which simulates the various thermal conditions present during 9-cell cavity electropolishing. The results of these simulations are compared with exterior surface temperature data gathered during ILC cavity EP at JLab. Having benchmarked the simulation, we explore the affect of altered boundary conditions in order to evaluate potentially beneficial modifications to the current standard process.
NTIS
Cavities; Electropolishing; Hydrodynamics

20090030724 Geological Survey, Reston, VA USA
Methods for Estimating Magnitude and Frequency of Peak Flows for Natural Streams in Utah
Kenney, T. A.; Wilkowske, C. D.; Wright, S. J.; Jan. 2007; 36 pp.; In English
Report No.(s): PB2008-108360; USGS/SIR-2007-5158; No Copyright; Avail.: National Technical Information Service (NTIS)
Estimates of the magnitude and frequency of peak streamflows is critical for the safe and cost-effective design of hydraulic structures and stream crossings, and accurate delineation of flood plains. Engineers, planners, resource managers, and scientists need accurate estimates of peak-flow return frequencies for locations on streams with and without streamflow-gaging stations. The 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year recurrence-interval flows were estimated for 344 unregulated U.S. Geological Survey streamflow-gaging stations in Utah and nearby in bordering states. These data along with 23 basin and climatic characteristics computed for each station were used to develop regional peak-flow frequency and magnitude regression equations for 7 geohydrologic regions of Utah. These regression equations can be used to estimate the magnitude and frequency of peak flows for natural streams in Utah within the presented range of predictor variables. Uncertainty, presented as the average standard error of prediction, was computed for each developed equation. Equations developed using data from more than 35 gaging stations had standard errors of prediction that ranged from 35 to 108 percent, and errors for equations developed using data from less than 35 gaging stations ranged from 50 to 357 percent.
NTIS
Estimates; Estimating; Frequencies; Streams

20090030817 Geological Survey, Tallahassee, FL, USA
MODFLOW-2000, the U.S. Geological Survey Modular Ground-Water Model-Documentation of the SEAWAT-2000 Version with the Variable-Density Flow Process (VDF) and the Integrated MT3DMS Transport Process (IMT)
Langevin, C. D.; Shoemaker, W. B.; Guo, W.; Jan. 2003; 54 pp.; In English
Report No.(s): PB2008-108531; USGS-OFR-03-426; No Copyright; Avail.: National Technical Information Service (NTIS)
SEAWAT-2000 is the latest release of the SEAWAT computer program for simulation of three-dimensional, variable-density, transient ground-water flow in porous media. SEA-WAT-2000 was designed by combining a modified version of MODFLOW-2000 and MT3DMS into a single computer program. The code was developed using the MOD-FLOW-2000 concept of a process, which is defined as part of the code that solves a fundamental equation by a specified numerical method. SEAWAT-2000 contains all of the processes distributed with MODFLOW-2000 and also includes the Variable-Density Flow Process (as an alternative to the constant-density Ground-Water Flow Process) and the Integrated MT3DMS Transport

Process. Processes may be active or inactive, depending on simulation objectives; however, not all processes are compatible. For example, the Sensitivity and Parameter Estimation Processes are not compatible with the Variable-Density Flow and Integrated MT3DMS Transport Processes. The SEAWAT-2000 computer code was tested with the common variable-density benchmark problems and also with problems representing evaporation from a salt lake and rotation of immiscible fluids.
NTIS
Computer Programs; Geological Surveys; Ground Water; Hydrology Models

20090030917 Pacific Northwest National Lab., Richland, WA, USA
Particle Methods for Simulation of Subsurface Multiphase Fluid Flow and Biogeological Processes
Xu, Z.; Brooks, S.; Long, P. E.; Redden, G.; Meakin, P.; Aug. 01, 2007; 10 pp.; In English
Contract(s)/Grant(s): AC05-76RL01830
Report No.(s): DE2008-918850; PNNL-SA-55963; No Copyright; Avail.: National Technical Information Service (NTIS)

A number of particle models that are suitable for simulating multiphase fluid flow and biogeological processes have been developed during the last few decades. Here we discuss three of them: a microscopic model - molecular dynamics; a mesoscopic model - dissipative particle dynamics; and a macroscopic model - smoothed particle hydrodynamics. Particle methods are robust and versatile, and it is relatively easy to add additional physical, chemical and biological processes into particle codes. However, the computational efficiency of particle methods is low relative to continuum methods. Multiscale particle methods and hybrid (particleparticle and particlecontinuum) methods are needed to improve computational efficiency and make effective use of emerging computational capabilities. These new methods are under development.
NTIS
Biogeochemistry; Biomass; Computerized Simulation; Fluid Flow; Fuels; Multiphase Flow; Particle Motion

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*.

20090031752 National Sun Yat-Sen Univ., Kaohsiung, China
A Two-Stage Committee Machine of Neural Networks
Wang, Jen-Feng; Yeh, Chinson; Yen, Chen-Wen; Nagurka, Mark L.; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 169-178; See also 20090031741; Copyright; Avail.: Other Sources

In solving pattern recognition problems, many ensemble methods have been proposed to replace a single classifier by a classifier committee. These methods can be divided roughly into two categories: serial and parallel approaches. In the serial approach, component classifiers are created by focusing on different parts of the training set in different learning phases. In contrast, without paying special attention to any part of the dataset, the parallel approach generates classifiers independently. By integrating these two techniques and by using a neural network approach for the base classifier, this work proposes a design method for a two-stage committee machine. In the first stage of the approach the entire dataset is used to train an averaging ensemble. Based on the classification results of this first stage, hard-to-classify samples are selected and sent to the second stage. To improve the classification accuracy for these samples, a computationally more intensive bagging ensemble is employed in the second stage. These two neural network ensembles work in series whereas the component neural networks in each of the ensembles are trained in parallel. Experimental results demonstrate the accuracy and robustness of the proposed approach.
Author
Classifications; Neural Nets; Pattern Recognition; Image Classification

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*.

20090030237 Physical Optics Corp., Torrance, CA USA
Dual Optical Ultra-Wide Band Laser Eyewear Transmission Field Evaluation Device Operation Manual
Aye, Tin M; Wigle, Jeffrey; May 2009; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-07-C-6743; Proj-3005
Report No.(s): AD-A501569; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501569

Dual Optical Ultrawide-Band Laser Eyewear Transmission (DOUBLET) Field Evaluation Device was developed by POC to meet the Air Force need for a simple device to measure the optical density (OD) of laser eye protection (LEP) spectacles, goggles, and visors with the OD 0 to 5, a precision of +/-0.1 OD at OD=1 and +/-0.5 at OD=5, across the VIS-NIR (400 nm to 1400 nm) spectral range. DOUBLET does not use wavelength scanning technology, so it can perform a nearly instantaneous measurement of the OD spectrum of laser eye protection (LEP).
DTIC
Broadband; Eye (Anatomy); Eye Protection; Laser Outputs; Lasers; Safety; Spectrometers

20090030474 National Defense Univ., Washington, DC USA
The Active Denial System. A Revolutionary, Non-lethal Weapon for Today's Battlefield
LeVine, Susan; Jun 2009; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A501865; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since the end of the Cold War, U.S. Armed Forces have participated in many operations that combine military operations against combatants in situations where the civilian population is at risk. Such complex operations, as they are now called, necessarily place troops in close contact with local civilians?and sometimes in confrontations that lead to violence. Use of force against civilians can create local tensions that undermine efforts to rebuild a society and, thanks to the globalization of communications, widespread condemnation that can jeopardize the entire mission. Non-lethal weapons provide an additional set of tools for our troops engaged in complex operations. Research efforts to advance the types and efficacy of non-lethal weapons available to our warfighters is producing novel capabilities. One such capability is the Active Denial System (ADS). ADS can provide our troops a capability they currently do not have, the ability to reach out and engage potential adversaries at distances well beyond small arms range, and in a safe, effective, and non-lethal manner. The ADS can immediately compel an individual to cease threatening behavior or depart through application of a directed energy beam that provides a sensation of intense heat on the surface of the skin. The effect is overwhelming, causing an immediate repel response by the targeted individual.
DTIC
Reflexes; Military Operations; Armed Forces

20090030750 Stanford Linear Accelerator Center, CA, USA
Correlating Pulses from Two Spitfire, 800NM Lasers
Zacherl, W.; Colby, E.; Plettner, T.; McGuinnes, C.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922954; SLAC-PUB-13103; No Copyright; Avail.: Department of Energy Information Bridge

The E163 laser acceleration experiments conducted at SLAC have stringent requirements on the temporal properties of two regeneratively amplified, 800nm, Spitfire laser systems. To determine the magnitude and cause of timing instabilities between the two Ti:Sapphire amplifiers, we pass the two beams through a cross correlator and focus the combined beam onto a Hamamatsu G1117 photodiode. The photodiode has a bandgap such that single photon processes are suppressed and only the second order, two-photon process produces an observable response. The response is proportional to the square of the intensity. The diode is also useful as a diagnostic to determine the optimal configuration of the compression cavity.
NTIS
Correlation; Lasers; Particle Acceleration

37
MECHANICAL ENGINEERING

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

20090029958 State Univ. of New York, Binghamton, NY, USA
Evaluating Effectiveness of Modeling Motion System Feedback in the Enhanced Hess Structural Model of the Human Operator
Zaychik, Kirill; Cardullo, Frank; George, Gary; Kelly, Lon C.; August 10, 2009; 14 pp.; In English; 2009 AIAA Modeling and Sim Tech Conference, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 160961.01.01.01
Report No.(s): LF99-9155; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029958

In order to use the Hess Structural Model to predict the need for certain cueing systems, George and Cardullo significantly expanded it by adding motion feedback to the model and incorporating models of the motion system dynamics, motion cueing algorithm and a vestibular system. This paper proposes a methodology to evaluate effectiveness of these innovations by performing a comparison analysis of the model performance with and without the expanded motion feedback. The proposed methodology is composed of two stages. The first stage involves fine-tuning parameters of the original Hess structural model in order to match the actual control behavior recorded during the experiments at NASA Visual Motion Simulator (VMS) facility. The parameter tuning procedure utilizes a new automated parameter identification technique, which was developed at the Man-Machine Systems Lab at SUNY Binghamton. In the second stage of the proposed methodology, an expanded motion feedback is added to the structural model. The resulting performance of the model is then compared to that of the original one. As proposed by Hess, metrics to evaluate the performance of the models include comparison against the crossover models standards imposed on the crossover frequency and phase margin of the overall man-machine system. Preliminary results indicate the advantage of having the model of the motion system and motion cueing incorporated into the model of the human operator. It is also demonstrated that the crossover frequency and the phase margin of the expanded model are well within the limits imposed by the crossover model.
Author
Man Machine Systems; Motion Simulators; Feedback; Tuning; Parameter Identification; Algorithms

20090030244 National Renewable Energy Lab., Golden, CO USA; Oak Ridge National Lab., TN USA
Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines, Report 1 - Updated
Knoll, K.; West, B.; Clark, W.; Graves, R.; Orban, J.; Feb. 01, 2009; 135 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2009-949053; ORNL/TM-2008-117-UPDATE; NREL/TP-540-43543; No Copyright; Avail.: National Technical Information Service (NTIS)

Intended for policymakers and others who make decisions about, and set guidelines for, the proper use of intermediate ethanol blends such as E20 in both vehicle engines and other engine types.
NTIS
Diesel Engines; Engine Design; Ethyl Alcohol; Exhaust Emission; Mixtures; Roads

20090030343 National Renewable Energy Lab., Golden, CO USA
Hydrogen Fueling - Coming Soon to a Station Near You
Dec. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-921805; DOE/GO-102007-2380; No Copyright; Avail.: National Technical Information Service (NTIS)

Hydrogen-fueled vehicles are becoming a more common and important part of a cleaner and more sustainable transportation future. The development of a network of hydrogen-dispensing fueling stations is essential to enable further progress. For local regulatory agencies, this future poses the challenge of applying codes and standards to allow safe but expeditious permitting of new hydrogen fueling stations, as well as the addition of hydrogen fueling at existing gasoline stations. While hydrogen is a new and different fuel for vehicles, it is used extensively in other applications, such as a chemical

feedstock and to power space exploration. The experience of hydrogen fueling station developers and vehicle manufacturers is still limited, but hydrogen is an established fuel that is fully safe if handled properly as all fuels must be.
NTIS
Cleaners; Hydrogen; Refueling

20090030374 National Renewable Energy Lab., Golden, CO USA
Comparison of Hybrid Electric Vehicle Power Electronics Cooling Options
O'Keefe, M.; Bennion, K.; Jan. 01, 2008; 11 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922156; NREL/CP-540-41886; No Copyright; Avail.: National Technical Information Service (NTIS)

This study quantifies the heat dissipation potential of three inverter package configurations over a range of control factors. These factors include coolant temperature, number of sides available for cooling, effective heat transfer coefficient, maximum semiconductor junction temperature, and interface material thermal resistance. Heat dissipation potentials are examined in contrast to a research goal to use 105C coolant and dissipate 200 W/cm2 heat across the insulated gate bipolar transistor and diode silicon area. Advanced double-sided cooling configurations with aggressive heat transfer coefficients show the possibility of meeting these targets for a 125C maximum junction temperature, but further investigation is needed. Even with maximum tolerable junction temperatures of 200C, effective heat transfer coefficients of 5,000 to 10,000 W/m2-K will be needed for coolant temperatures of 105C or higher.
NTIS
Cooling; Electric Motor Vehicles; Inverters; Heat Transfer Coefficients; Coolants

20090030445 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Advanced Combustion Technology, Inc., San Diego, CA, USA
Development of the Low Swirl Injector for Fuel-Flexible Gas Turbines
Littlejohn, D.; Cheng, R. K.; Nazeer, W. A.; Smith, K. O.; Jan. 2006; 9 pp.; In English
Report No.(s): DE2008-923206; No Copyright; Avail.: National Technical Information Service (NTIS)

Industrial gas turbines are primarily fueled with natural gas. However, changes in fuel cost and availability, and a desire to control carbon dioxide emissions, are creating pressure to utilize other fuels. There is an increased interest in the use of fuels from coal gasification, such as syngas and hydrogen, and renewable fuels, such as biogas and biodiesel. Current turbine fuel injectors have had years of development to optimize their performance with natural gas. The new fuels appearing on the horizon can have combustion properties that differ substantially from natural gas. Factors such as turbulent flame speed, heat content, autoignition characteristics, and range of flammability must be considered when evaluating injector performance. The low swirl injector utilizes a unique flame stabilization mechanism and is under development for gas turbine applications. Its design and mode of operation allow it to operate effectively over a wide range of conditions. Studies conducted at LBNL indicate that the LSI can operate on fuels with a wide range of flame speeds, including hydrogen. It can also utilize low heat content fuels, such as biogas and syngas. We will discuss the low swirl injector operating parameters, and how the LSC performs with various alternative fuels.
NTIS
Fuel Injection; Gas Turbines; Injectors

20090030555 Clean Vehicle Education Foundation, Atlanta, GA, USA
Roadmap for Development of Natural Gas Vehicle Fueling Infrastructure and Analysis of Vehicular Natural Gas Consumption by Niche Sector, Final
Yborra, S. C.; Apr. 30, 2007; 111 pp.; In English
Report No.(s): DE2008-922579; FC26-05NT42609; No Copyright; Avail.: Department of Energy Information Bridge

America's dependence on petroleum-based fuels for the transportation sector creates serious energy security, economic, air quality and other environmental challenges. Greater use of alternative fuel vehicles (AFV) is part of the solution to these challenges and natural gas vehicles (NGV) are an AFV option that offers substantial environmental, economic and energy security benefits. Despite these advantages, after more than forty years of industry and government investment in NGV and fueling infrastructure technology research and development (R&D), NGVs still account for only a very small percentage of the total U.S. vehicle inventory and transportation fuel use. For NGVs to make a greater contribution, there must be an acceleration of vehicle deployment and, critical to achieving that goal, greater infrastructure development. The U.S

Department of Energy, through its National Energy Technology Laboratory, tasked the Clean Vehicle Education Foundation (CVEF) with assessing the current status of NGV fueling infrastructure and vehicular natural gas consumption in order to evaluate successes and failures, the market factors that impacted these outcomes and what steps should be taken next to facilitate further station development. While the task statement placed particular emphasis on heavy-duty niche markets where vehicle deployment and fuel consumption have been greatest, it also directed that the report address public NGV fueling infrastructure as natural gas fueling technology and standards are viewed by many as the logical pathway or bridge to future hydrogen infrastructure market development. NGV fueling infrastructure development cannot be viewed in a vacuum absent the influences of vehicle availability, government policy, market sales and service support, economic incentives and other market drivers. Individual favorable market drivers all existed at one point or another over the past forty years but were rarely in place at the same time. This directly impacted the type and amount of fuel station development, the level of station utilization and which stakeholders participated.
NTIS
Natural Gas; Automobiles; Support Systems

20090030560 Department of Energy, Washington, DC, USA
Vehicle Ancillary Load Reduction Project Close-Out Report: An Overview of the Task and a Compilation of the Research Results
Rugh, J.; Farrington, R.; Jan. 01, 2008; 85 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922542; NREL/TP-540-42454; No Copyright; Avail.: National Technical Information Service (NTIS)

The amount of fuel used for climate control in U.S. vehicles reduces the fuel economy of more than 200 million light-duty conventional vehicles and thus affects U.S. energy security. Researchers at the DOE National Renewable Energy Laboratory estimated that the USA consumes about 7 billion gallons of fuel per year for air-conditioning (A/C) light-duty vehicles. Using a variety of tools, NREL researchers developed innovative techniques and technologies to reduce the amount of fuel needed for these vehicles' ancillary loads. For example, they found that the A/C cooling capacity of 5.7 kW in a Cadillac STS could be reduced by 30% while maintaining a cooldown performance of 30 minutes. A simulation showed that reducing the A/C load by 30% decreased A/C fuel consumption by 26%. Other simulations supported the great potential for improving fuel economy by using new technologies and techniques developed to reduce ancillary loads.
NTIS
Air Conditioning; Cooling Systems; Temperature Control

20090030720 West Virginia Univ., Morgantown, WV USA
Evaluation of Exhaust Emissions from Elizabeth River Ferries
Thompson, G. J.; Carder, D. K.; Riddle, W. C.; Gautam, M.; Lyons, D. W.; Jul. 2002; 39 pp.; In English
Report No.(s): PB2008-108498; No Copyright; Avail.: CASI: A03, Hardcopy

Hampton Roads Transit Authority in Norfolk, Virginia, owns and operates a pair of similar passenger ferries on the Elizabeth River between Norfolk and Portsmouth VA. Several years ago one of the ferries was converted from diesel to natural gas fueled engines. The ferries were the James C Echols, which is powered by twin Caterpillar 3406-G natural gas engines and the Elizabeth River II, powered by twin Detroit Diesel 671 diesel fueled engines. This project was undertaken to perform in-use emissions testing to determine environmental benefits of ferry conversion to CNG, and to compare the operating economics of the two vessels. Sponsors of the program included USA Coast Guard, Hampton Roads Transit, Norfolk by Boat, U.S. Department of Energy, U.S. Maritime Administration, U.S. Environmental Protection Agency, Lyons Shipyard and NAVSEA. The project was designed to measure exhaust emissions under two separate sets of conditions. (1) Under constant engine speed conditions (idle, 40%, 60%, 80%, 100%) in order to duplicate as far as possible the ISO test protocol, and (2) under transient conditions, where emissions were averaged over one complete circuit of the ferry route (1.37 miles). The parameters measured were: particulate mass, gaseous emission analysis, NOx, CO, CO2, THC, fuel mass flow rate, intake air & exhaust flow rates, shaft speed/torque and air temperature, pressure, and humidity. All the data was recorded in real time and later reduced to industry standard units such as grams of NOx per horsepower-hour.
NTIS
Air Pollution; Boats; Exhaust Emission; Pollution Control; Rivers

20090030721 Seaworthy Systems, Inc., Essex, CT, USA
On-Demand Hydrogen Generating System Demonstration Concept Development, Phase I: Task 5.0: Final Report. FY 2001, Program Element 2.19
Sep. 2002; 100 pp.; In English
Report No.(s): PB2008-108497; No Copyright; Avail.: CASI: A05, Hardcopy

The air quality in many USA ports is already at or in excess of EPA limits of harmful pollutants. Engine exhaust emissions of NOx, SOx, HC and particulate, as well as greenhouse gases, have reached levels high enough to significantly hamper civilian and military port and industrial commerce and development. The Port of Houston, for example, faces a potential total shutdown as a result of extremely poor air quality. Further, California's major ports have a number of important programs, such as dredging the Port of Oakland's harbor, expanding runways at the San Francisco International Airport, introducing new fast ferry services, and sighting new electric power generating stations. All of these projects are being held in abeyance pending the development of plans and techniques to minimize their anticipated impact on air quality. To that end, hydrogen fuel generation, based on non-petroleum fuels, offers a non-toxic, renewable, recyclable, and clean burning energy source for fuel cells, reciprocating engines and combustion turbine engines. The potential for this technology to reduce engine exhaust emissions is significant, given that the emission streams from the combustion (oxidation) of pure hydrogen are heat and water vapor. The proposed technology under review in this project will directly support CCDoTT goals by providing an option to obtain zero emissions from fuel cells. The technology originates with New Jersey-based Millennium Cell Corporation, which has developed a chemical process that solves the problems associated with generating, storing, and transporting hydrogen by extracting pure hydrogen gas from safe, environment-friendly raw materials.
NTIS
Air Pollution; Hydrogen; Pollution Control

20090031748 National Central Univ., Jung-Li, Taiwan, Province of China
A NURBS Curve Interpolator with Jerk-limited Trajectory Planning
Tseng, Sheng-Jung; Lin, Kuan-Yuan; Lai, Jing-Hih; Ueng, Wen-Der; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 215-228; See also 20090031741; Copyright; Avail.: Other Sources

The control of the maximum acceleration and jerk in the trajectory planning of the CNC controller is very important because it affects the smoothness of the machined surface substantially. We proposed a parametric interpolator composed of a look-ahead stage and a real-time sampling stage for jerk-limited acceleration planning. A pre-sampling process was implemented in the look-ahead stage to identify the segment points, where the acceleration changed across zero. A check of the acceleration and jerk was implemented and the feedrate was modified accordingly. In addition, a backtracking process was carried out during the deceleration stage to ensure that the modified feedrate was satisfied. In the real-time sampling stage, an acceleration profile based on constant jerk was implemented for each region between two segment points. With this algorithm, we ensured that both the chord error and the maximum acceleration and jerk were within the allowable limits. Also, it kept the similarity of the speed profiles for adjacent cutting paths in zigzag machining.
Author
Controllers; Repeaters; Computer Aided Design; Algorithms; Machining

38
QUALITY ASSURANCE AND RELIABILITY

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

20090030118 National Inst. of Standards and Technology, Gaithersburg, MD USA
National Construction Safety Teams Annual Report, Fiscal Year 2006
January 2006; 42 pp.; In English
Report No.(s): PB2008-107639; No Copyright; Avail.: CASI: A03, Hardcopy

In October 2002, the President signed into law the National Construction Safety Team (NCST) Act (P.L. 107-231), which authorized the Director of the National Institute of Standards and Technology (NIST) to establish National Construction Safety Teams for deployment after events causing the failure of a building or buildings that has resulted in substantial loss of life or that posed significant potential for substantial loss of life. The purpose of these investigations is to improve the safety and structural integrity of buildings in the USA. A team shall: (A) establish the likely technical cause or causes of the building failure; (B) evaluate the technical aspects of evacuation and emergency response procedures; (C) recommend as necessary, specific improvements to building standards, codes, and practices based on the findings made pursuant to subparagraphs (A)

and (B); and, (D) recommend any research and other appropriate actions needed to improve the structural safety of buildings, and improve the evacuation and emergency response procedures, based on the findings and recommendations of the investigation. Under Section 10 of the NCST Act, NIST is to provide by February 15 of each year a report that includes: (1) a summary of the investigations conducted by Teams during the prior fiscal year; (2) a summary of recommendations made by Teams in reports issued under Section 8 during the prior fiscal year and a description of the extent to which those recommendations have been implemented; and, (3) a description of the actions taken to improve building safety and structural integrity by the National Institute of Standards and Technology during the prior fiscal year in response to reports issued under Section 8. This report summarizes NISTs activities under the NCST Act for Fiscal Year 2006.
NTIS
Buildings; Construction; Safety; Structural Failure

20090031753 National Kaohsiung First Univ. of Science and Technology, Kaoshsiung, Taiwan, Province of China
Surface Defect Inspection of Light Guided Plates with the Computer-Vision Assisted Detection Method
Huang, Ming-Shyan; Chiu, Hsueh-Yuan; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 179-191; In English; See also 20090031741; Copyright; Avail.: Other Sources

This work proposes an automatic computer-vision based inspection method for the detection and classification of defects occurred in molding light guided plates. Its benefits include the prevention of misjudgments caused by human inspection, and it thus can reduce production cost. In this study the target is to inspect for the most common defects on the surface of light guided plates, including shining particles, flow marks, and scratches. This approach first applies the image segmentation method to allocate the defect area, and the Fourier transform model to eliminate the texture formed by the periodic circular pattern on a light guided plate. Otsu's threshold method and morphology technique are then used to foreground the defects. Second, this paper utilizes the artificial neural network method coupled with the perceptron-based learning algorithm to efficiently classify the defects. The network is manipulated by the values of the area of the defect zone, the gray-level value and so forth as criteria. To verify the performance, many experiments have been conducted and the results show that this innovative method is efficient in detecting and classifying defects on light guided plates.
Author
Computer Vision; Detection; Imaging Techniques; Surface Defects

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*.

20090029942 NASA Ames Research Center, Moffett Field, CA, USA
Method for Real-Time Structure Shape-Sensing
Ko, William L., Inventor; Richards, William Lance, Inventor; April 21, 2009; 12 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 5 Dec. 2006; US-Patent-7520176; NASA-Case-ARC-006024; US-Patent-Appl-SN-11/567118; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029942

The invention is a method for obtaining the displacement of a flexible structure by using strain measurements obtained by stain sensor,. By obtaining the displacement of structures in this manner, one may construct the deformed shape of the structure and display said deformed shape in real-time, enabling active control of the structure shape if desired.
Author
Flexible Bodies; Shapes; Deformation; Strain Measurement; Displacement

20090029956 NASA Langley Research Center, Hampton, VA, USA

Simple Formulas and Results for Buckling-Resistance and Stiffness Design of Compression-Loaded Laminated-Composite Cylinders

Nemeth, Michael P.; Mikulas, Martin M., Jr.; August 2009; 55 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 136905.02.04.04.16.06

Report No.(s): NASA/TP-2009-215778; LF99-8638; Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090029956

Simple formulas for the buckling stress of homogeneous, specially orthotropic, laminated-composite cylinders are presented. The formulas are obtained by using nondimensional parameters and equations that facilitate general validation, and are validated against the exact solution for a wide range of cylinder geometries and laminate constructions. Results are presented that establish the ranges of the nondimensional parameters and coefficients used. General results, given in terms of the nondimensional parameters, are presented that encompass a wide range of geometries and laminate constructions. These general results also illustrate a wide spectrum of behavioral trends. Design-oriented results are also presented that provide a simple, clear indication of laminate composition on critical stress, critical strain, and axial stiffness. An example is provided to demonstrate the application of these results to thin-walled column designs.

Author

Buckling; Critical Loading; Laminates; Thin Walls; Structural Design; Orthotropic Cylinders

20090030105 Federal Insurance Administration, Washington, DC, USA

Openings in Foundations Walls for Buildings Located in Special Flood Hazard Area in Accordance with the National Flood Insurance Program

Apr. 1993; 14 pp.; In English

Report No.(s): PB2008-108178; FIA-TB-1; No Copyright; Avail.: CASI: A03, Hardcopy

An important objective of the National Flood Insurance Program (NFIP) is to protect buildings constructed in floodplains from structural damage caused by flood forces. In support of this objective, the NFIP regulations include building design criteria that apply to new construction and substantial improvements of existing buildings in Special Flood Hazard Areas (SFHAs). According to these criteria, residential buildings constructed in A zones (Zones A, AE, A1-A30, AR, AO, and AH) must have their lowest floors at or above the base flood elevation (BFE). Non-residential buildings constructed in A zones must either have their lowest floors at or above the BFE or be dry floodproofed (made watertight) to or above the BFE. Residential and nonresidential buildings whose lowest floors have been constructed at or above the BFE usually are elevated on piers, columns, piles, extended foundation walls, or fill. While the main portion of such a building is protected from the 100-year and lesser-magnitude floods, the foundation and any enclosures below the BFE used for parking, building access, or limited storage will be exposed to flood forces.

NTIS

Buildings; Floods; Hazards; Openings; Walls; Flood Plains

20090030106 Federal Insurance Administration, Washington, DC, USA

Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program

Apr. 1993; 18 pp.; In English

Report No.(s): PB2008-108179; FIA-TB-2; No Copyright; Avail.: CASI: A03, Hardcopy

The requirement to use construction and finishing materials that are resistant to flood damage in all new and substantially improved buildings in identified Special Flood Hazard Areas (SFHAs) is an important part of the National Flood Insurance Programs (NFIPs) flood-damage-resistant design and construction standards. A residential buildings lowest floor is required to be elevated to or above the base flood elevation (BFE). All construction below the lowest floor is susceptible to flooding and must consist of flood-resistant materials. Uses of enclosed areas below the lowest floor in a residential building are limited to parking, building access, and limited storage areas that can withstand inundation by floodwater without sustaining significant structural damage. The purpose of this Technical Bulletin is to provide data and guidance on what constitute materials resistant to flood damage and how and when these materials must be used to improve a buildings ability to withstand flooding.

NTIS

Buildings; Floods; Hazards; Flood Plains; Construction Materials; Flood Damage

20090030107 Federal Insurance Administration, Washington, DC, USA
Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program
Dec. 1993; 19 pp.; In English
Report No.(s): PB2008-108180; FIA-TB-7; No Copyright; Avail.: CASI: A03, Hardcopy

This bulletin describes planning, design, and construction requirements for wet floodproofing certain types of structures and their uses under the National Flood Insurance Program (NFIP). The basic characteristic that distinguishes wet floodproofing from dry floodproofing is the internal flooding of a structure as opposed to providing essentially watertight protection. Specifically, wet floodproofing can be defined as: Permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure.
NTIS
Buildings; Flood Control; Floods; Hazards; Waterproofing; Flood Plains; Flood Damage

20090030108 Federal Insurance Administration, Washington, DC, USA
Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program
Apr. 1993; 8 pp.; In English
Report No.(s): PB2008-108181; FIA-TB-6; No Copyright; Avail.: CASI: A02, Hardcopy

The purpose of this bulletin is to provide technical guidance on the National Flood Insurance Program (NFIP) floodplain management requirements for below-grade parking garages for nonresidential buildings in Special Flood Hazard Areas (SFHAS) shown on Flood Insurance Rate Maps (FIRMs). Below-grade parking garages are commonly found in large engineered commercial buildings and are used for parking and access to the above-grade floors of the building.
NTIS
Buildings; Floods; Hazards; Flood Plains

20090030109 Federal Emergency Management Agency, Washington, DC, USA
Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings in Accordance with the National Flood Insurance Program
Sep. 1999; 17 pp.; In English
Report No.(s): PB2008-108184; FIA-TB-9; No Copyright; Avail.: CASI: A03, Hardcopy

Specific design requirements are included in the NFIP regulations for breakaway walls. More recent research on breakaway walls performed for the Federal Emergency Management Agency (FEMA) and the National Science Foundation by North Carolina State University and Oregon State University evaluated the failure mechanisms. The research included full-scale, laboratory wave-tank tests of breakaway wall panels. This bulletin describes prescriptive design details that comply with the requirements of the NFIP regulations and that may be used by design professionals as an alternative to the performance requirements listed in the regulations.
NTIS
Buildings; Floods; Walls

20090030110 Federal Insurance Administration, Washington, DC, USA
Non-Residential Floodproofing--Requirements and Certificaiton for Buildings Located in Special Flood Hazard Area in Accordance with the National Flood Insurance Program
Apr. 1993; 17 pp.; In English
Report No.(s): PB2008-108185; FIA-TB-3; No Copyright; Avail.: CASI: A03, Hardcopy

This bulletin describes design, construction, and planning requirements for the floodproofing of non-residential buildings under the National Flood Insurance Program (NFIP) regulations and how to correctly complete the NFIP's Floodproofing Certificate for Non-Residential Structures form. For the purposes of this bulletin, floodproofing means making a building watertight, substantially impermeable to floodwaters.
NTIS
Buildings; Floods; Hazards; Waterproofing; Flood Damage; Flood Plains

20090030123 National Inst. of Standards and Technology, Gaithersburg, MD USA
National Construction Safety Team Act Annual Report, Fiscal Year 2007
January 2007; 51 pp.; In English
Report No.(s): PB2008-107836; No Copyright; Avail.: CASI: A04, Hardcopy

In October 2002, the President signed into law the National Construction Safety Team (NCST) Act (P.L. 107-231), which authorized the Director of the National Institute of Standards and Technology (NIST) to establish National Construction Safety Teams for deployment after events causing the failure of a building or buildings that result in substantial loss of life or that pose significant potential for substantial loss of life. The purpose of these investigations is to improve the safety and structural integrity of buildings in the USA. A team shall: (A) establish the likely technical cause or causes of the building failure; (B) evaluate the technical aspects of evacuation and emergency response procedures; (C) recommend as necessary, specific improvements to building standards, codes, and practices based on the findings made pursuant to subparagraphs (A) and (B); and, (D) recommend any research and other appropriate actions needed to improve the structural safety of buildings, and improve the evacuation and emergency response procedures, based on the findings and recommendations of the investigation. Under Section 10 of the NCST Act, NIST is to provide by February 15 of each year a report that includes: (1) a summary of the investigations conducted by Teams during the prior fiscal year; (2) a summary of recommendations made by Teams in reports issued under Section 8 during the prior fiscal year and a description of the extent to which those recommendations have been implemented; and, (3) a description of the actions taken to improve building safety and structural integrity by the National Institute of Standards and Technology during the prior fiscal year in response to reports issued under Section 8. This report summarizes NISTs activities under the NCST Act for Fiscal Year 2007.
NTIS
Buildings; Construction; Safety; Structural Failure

20090030134 Bureau of Reclamation, Denver, CO, USA
LS-DYNA vs. DYNA3D Benchmark and Validation Testing. Dam Safety Technology Development Program
Oshea, K. M.; Dec. 2006; 30 pp.; In English
Report No.(s): PB2008-107903; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes the basic results comparing program performance and stability between DYNA3D and LS-DYNA as well as the validation and benchmark testing of LS-DYNA. The finite element models (FEM) for Parker Dam and Black Canyon Diversion Dam were selected to be used as the test cases in comparing DYNA3D and LS-DYNA due to their size and contact surface complexity.
NTIS
Dams; Safety Devices; Structural Analysis

20090030260 Winter (Steven) Associates, Inc., Norwalk, CT, USA
Research and Analysis for Manufactured Housing Foundations. Reports: 2a: Preliminary Review of Protocol and Related Literature. 2b: Search and Review of State Requirements. 2c: Verification of Applied Engineering Principles and Sound Engineering Judgement
Zoeller, W.; Jan. 31, 2006; 70 pp.; In English
Report No.(s): PB2009-113522; No Copyright; Avail.: CASI: A04, Hardcopy

A preliminary review of the MHCC draft protocol was accomplished along with related literature with the hopes of identifying key issues which shall prove to be imperative in development of ground anchor and testing protocols. There appear to be few outside precedents against which to measure the MHCC protocol. Therefore, the only available precedent is the credible independent analysis of a neutral party in consideration of past industry practice represented by housing manufacturers, anchor producers, design professionals, and general or professional experience. To validate this work a review of related literature in the following categories were conducted: Foundation Installation Guides; Earthquake Related; Comparative Performance Criteria; Performance Evaluations & Recommendations; Test Reports on Conventional Ground Anchor Systems; and Test Reports on Alternative Anchorage Systems.
NTIS
Buildings; Protocol (Computers); Structural Engineering

20090030261 Winter (Steven) Associates, Inc., Norwalk, CT, USA
Research and Analysis for Manufactured Housing Foundations. Reports: 3a: Non-Conventional Foundation and Stabilization Systems and 3b: Analysis of General Design Principles and Evaluation of Sound Engineering Judgement
Zoeller, W.; Aug. 18, 2006; 34 pp.; In English
Report No.(s): PB2009-113523; No Copyright; Avail.: CASI: A03, Hardcopy

Three key objectives define the purpose of Tasks 3a and 3b: 1) Review current alternatives for conventional foundation systems, and 2) Identify and compare new alternatives based on industry research that could be adapted for use in manufactured housing foundation systems. 3) Verify analysis, testing methods and design approaches used by manufacturers for design and State approval purposes.
NTIS
Buildings; Design Analysis; Systems Analysis

20090030521 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal, Volume 68, No. 5
Arthur, Robert, Editor; Whelchel, James L., Editor; May 1928; 101 pp.; In English
Report No.(s): AD-A502549; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: The R.O.T.C., by Colonel John T. Geary, C.A.C.; Some Aspects of Mechanization, by Colonel H. Rowan-Robinson, C.M.G., D.S.O.; Danger Zones -- The Balkans; Scores of Yesterday, by Captain Homer Case, C.A.C.; What Price Machine Guns, by Captain Gerald B. Robinson, 61st C.A. (AA); The British Merchant Marine, by Captain Frank H. Hastings, C.A.C.; Subsidized Merchant Marine, by Captain D. W. Hickey; and Coast Forts of Colonial New York. The remainder of the issue contains the following features: an editorial on mechanization; Professional Notes on Harbor Defenses of New Bedford, A Spotting Board, An Irish Free State Army List, Joint Review and Exhibition by 243rd C.A. (HD) and 211th C.A. (AA), Army Stagnation, Americanizing the Army, Motor as a National Defense, War Fundamentalists, and The Romans as Military Road Builders; Coast Artillery Board Notes; and book reviews.
DTIC
Artillery; Coasts; Education; Guns (Ordnance); Japan; Mechanization; United Kingdom

20090030547 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal, Volume 70, No. 5
Arthur, Robert, Editor; Miller, Charles R., Editor; May 1929, pp. 374 - 458; In English
Report No.(s): AD-A502664; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: The Role of the 37-mm Full Automatic Antiaircraft Gun, by Major J. C. Haw, C.A.C.; Caretaking, by Captain Robert N. Mackin, Jr., 14th Coast Artillery; The Care of Seacoast Armament and Its Relation to the Mission of the Coast Artillery Corps, by Lieutenant Edward Barber, C.A.C.; Imperial vs. National Sea Power, by Captain George J. B. Fisher, C.A.C.; Colonial Forts on the Pacific Coast; Activities of Anti-War Societies, by Captain A. W. Waldron, C.A.C.; and History of Battery C, 65th Coast Artillery, by Captain B. L. Milburn, C.A.C. The remainder of the issue contains the following features: Professional Notes on Target Practice, Battery G. 241st C.A., A New Administration and a New War, Those Who Know War Want Peace, Radio and Aviation, The Military Significance of the Recoil Principle, Chinese Moon-Feast and Mid-Autumn Festival, Echo Sounding Gear, New British Submarines, and Foreign Periodicals; and book reviews.
DTIC
Artillery; Coasts; Guns (Ordnance); Maintenance; Navy; Preserving; United Kingdom

20090030597 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 70, Number 1, January 1929
Arthur, Robert; Whelchel, James L; Jan. 1929; 95 pp.; In English
Report No.(s): AD-A502556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: The Pipes of Peace, by Major Sherman Miles, C.A.C.; Annual Report of the Chief of Coast Artillery; Mechanization -- Aloft and Alow, by Major C. C. Benson, Cavalry; Some Notes on 155-mm Gun Firing, by Major C. D. Y. Ostrom, C.A.C.; Colonial Coast Forts of the South Atlantic -- North Carolina, South Carolina, Georgia, and Florida; Camouflage for Artillery, by Lieutenant A. E. Wilson, C.A.C.; and Morale in Armies, by Major F. A. Hause, C.A.C. The remainder of the issue contains the following features: an editorial about the journal; Professional Notes on Coat of Arms of Harbor Defenses of San Diego, Extracts from Annual Reports, Military

Situation of Holland, Government Insures Supply of Helium for Military Dirigibles, and Ten Years After the Armistice; Coast Artillery Board Notes; and book reviews.
DTIC
Artillery; Artillery Fire; Camouflage; Coasts; Mechanization; Morale

20090030598 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 69, Number 4, October 1928
Arthur, Robert; Whelchel, James L; Oct. 1928; 91 pp.; In English
Report No.(s): AD-A502554; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of The Coast Artillery Journal contains the following articles: Seacoast Defense, by Major Rodney H. Smith, C.A.C.; Antiaircraft Field Exercises; The War Industries Board, by Captain Thomas R. Parker, C.A.C.; Elements of Military Psychology, by Commandant Taboureau; The Reserve Officers' Association and National Defense, by Captain Floyd W. Newman, AG.-Reserves; The Military Situation of Japan, by Major R. T. Gibson, C.A.C.; War and Human Nature, by Captain J. T. De Camp, 64th C.A.; and Coast Forts of Colonial Maryland. The remainder of the issue contains the following features: Professional Notes on Coat of Arms for the Harbor Defenses of Charleston, Training Problems -- Rapid Artillery Fight, The Battle of Vittorio Veneto, Names of New Cruisers, A German's Tribute to a Departed Distinguished Military Opponent, Promotion from the Ranks, Is Gas Humane?, Regulate the Driver, War Dogs, and Foreign Periodicals; and Coast Artillery Board Notes.
DTIC
Armed Forces; Artillery; Coasts; Harbors; Industrial Management; Industries; Japan; Military Psychology; Warfare

20090030601 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 69, Number 1, July 1928
Arthur, Robert; Whelchel, James L; Jul. 1928; 99 pp.; In English
Report No.(s): AD-A502551; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of The Coast Artillery Journal contains the following articles: Alaska: Its Relation and Its Value to the USA, by 1st Lieutenant Albert J. Wick, C.A.C.; The Effect of Permanent Fortifications on Military Operations in the World War, by Colonel Karl Schneck (translated by Colonel George Ruhlen, U.S.A., Ret.); The Landing at Gallipoli, by Lieutenant Colonel Ned B. Rehkopf, F.A.; The Military Situation of Holland, by 2nd Lieutenant Carl B. Wahle, C.A.C.; Coast Forts of Colonial New Jersey, Pennsylvania, and Delaware; History of the 'Oozlefinch' by Colonel E. R. Tilton, C.A.; and The Cruiser Question, by 1st Lieutenant J. A. Weeks, C.A.C. The remainder of the issue contains the following features: editorials on battle practice, summer camps, and promotion legislation; Professional Notes on Conduct of Fire at Moving Targets -- Coast Artillery School, Generalship in the World War, The Outlawing of War, Compulsory Military Training, The Coast Artillery, and Foreign Military Periodicals; Coast Artillery Board Notes; and book reviews.
DTIC
Artillery; Coasts; Military Operations

20090030624 Royal Aircraft Establishment, Farnborough, UK
Structural Features of A-4
Sep. 1944; 45 pp.; In English
Report No.(s): AD-A800664; RAE-EA-228/1; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Missiles; Dynamic Structural Analysis

20090030637 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 70, Number 3, March 1929
Arthur, Robert; Mar 1929; 97 pp.; In English
Report No.(s): AD-A502662; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of The Coast Artillery Journal contains the following articles: Attributes of Efficiency: A Treatise on the Mobile Antiaircraft Gun Battery, by Captain Benjamin F. Harmon, C.A.C.; Spotting and Plotting for Antiaircraft Artillery: From the Aberdeen Tests; The Battles Around Chattanooga, by Major Edward B. Dennis, C.A.C., Major Edgar B. Colladay, C.A.C., Major Roger B. Colton, C.A.C., and Major Franklin Babcock, I.G.D.; Colonial Forts of the Gulf Coast: Florida, Alabama, Mississippi, Louisiana, and Texas; Ships on the Battlefield, by Major C. C. Benson, Cavalry; and The Weak Spot in Military

Progress, by Major Ralph E. Jones, Infantry. The remainder of the issue contains the following features: an editorial on mechanization and motorization; Professional Notes on Coat of Arms for the Harbor Defenses of Balboa, Modification of 155-mm Rammer, Ballistic Effects Due to the Rotation of the Earth, The Irish Free State Army, and Target Glider Experiments at Wright Field; and book reviews.
DTIC
Air Defense; Artillery; Coasts; Electric Batteries; Fire Control; Mobility

20090030693 Purdue Univ., West Lafayette, IN, USA
Damage Analysis of Jointed Plain Concrete Pavements in Indiana, Part 1, Finite Element Modeling and Damage Analysis
Sotelino, E. D.; Asgari, A.; Saksa, A.; Cedeno, G.; Aug. 2005; 337 pp.; In English
Contract(s)/Grant(s): SPR-2643
Report No.(s): PB2008-107976; No Copyright; Avail.: CASI: A15, Hardcopy

Current design procedures for concrete pavements do not account for several factors that can influence their service life. In this work, these factors are investigated and the findings are integrated into a procedure for better predicting longterm performance of concrete pavements. To achieve this, sophisticated finite element techniques are employed and parametric studies are performed. The findings are then integrated into a nonlinear procedure for damage accumulation. In the development of the comprehensive 3D Finite Element (FE) model several issues are studied including the geometry of the model, mesh refinement, element selection, interaction between pavement components, and loading simulation. The developed model is then used in a number of parametric studies to investigate the effect of soil conditions, subbase and slab thickness, and slab length and stiffness on the developed stresses. Among other findings, it is established that for a given slab length, increasing the slab thickness beyond a certain limit is not justifiable. The developed FE model is also used to investigate the behavior of skewed concrete pavement slabs under several loading conditions. In particular, the crack patterns obtained from the FE analyses are compared to those observed in an actual skewed concrete pavement. It is found that the developed FE model is able to successfully predict the cause and orientation of the failure of this pavement section.
NTIS
Concretes; Damage Assessment; Finite Element Method; Mathematical Models; Pavements

20090030694 Purdue Univ., West Lafayette, IN, USA
Interaction between Micro-Cracking, Cracking, and Reduced Durability of Concrete: Developing Methods for Considering Cumulative Damage in Life-Cycle Modeling
Yang, Z.; Weiss, W. J.; Olek, J.; Aug. 2005; 266 pp.; In English
Contract(s)/Grant(s): SPR-2474
Report No.(s): PB2008-107973; No Copyright; Avail.: National Technical Information Service (NTIS)

It is becoming increasingly popular to utilize numerical simulation models to predict the long-term performance of concrete pavements and structures. The majority of these models have been developed using laboratory test data that considers concrete in an uncracked state. While uncracked concrete exists as the best case scenario, frequent cracking occurs in real structures that could have a profound impact on life cycle performance. Cracks from several sources may accumulate and interact thereby accelerating the deterioration of concrete. For example, the distributed cracking caused by freeze/thaw damage can substantially increases the rate of water absorption and reduces the load carrying capacity of concrete. To accurately simulate the performance of actual concrete facilities, the role of cracking and its cumulative effect on the changes of material properties should be accounted for in these models. The main goal of this investigation was to assess the influence of cumulative damage in concrete and to quantify its influence for use in life-cycle performance modeling. Samples were taken from five concrete pavement sections based on age, traffic, and overall performance to assess existing damage and to identify possible sources responsible for inducing the damage. These results were used as a baseline to assess the types of damage that merited laboratory investigation. After the field assessment, laboratory investigations were conducted to simulate the damage that may be expected in the field. After various levels of damage were introduced in laboratory specimens, durability tests (freezing and thawing and water absorption) and direct tensile test were performed to develop an understanding of how the pre-existing damage accelerated the deterioration process.
NTIS
Concretes; Cumulative Damage; Durability; Life (Durability); Microcracks

20090030896 NASA Glenn Research Center, Cleveland, OH, USA

Coupled Thermo-Electro-Magneto-Elastic Response of Smart Stiffened Panels

Bednarcyk, Brett A.; Yarrington, Phillip W.; July 2009; 56 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC3-878; WBS 645846.02.07.03.03.02

Report No.(s): NASA/CR-2009-215269; E-16540; Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090030896

This report documents the procedures developed for incorporating smart laminate and panel analysis capabilities within the HyperSizer aerospace structural sizing software package. HyperSizer analyzes stiffened panels composed of arbitrary composite laminates through stiffener homogenization, or 'smearing ' techniques. The result is an effective constitutive equation for the stiffened panel that is suitable for use in a full vehicle-scale finite element analysis via MSC/NASTRAN. The existing thermo-elastic capabilities of HyperSizer have herein been extended to include coupled thermo-electro-magneto-elastic analysis capabilities. This represents a significant step toward realization of design tools capable of guiding the development of the next generation of smart aerospace structures. Verification results are presented that compare the developed smart HyperSizer capability with an ABAQUS piezoelectric finite element solution for a facesheet-flange combination. These results show good agreement between HyperSizer and ABAQUS, but highlight a limitation of the HyperSizer formulation in that constant electric field components are assumed.

Author

Smart Structures; Piezoelectricity; Laminates; Applications Programs (Computers); Homogenizing

20090030912 Savannah River National Lab., Aiken, SC, USA

Excitation of Structural Resonance Due to a Bearing Failure

Leishear, R.; Stefanko, D.; Apr. 30, 2007; 10 pp.; In English

Contract(s)/Grant(s): DE-AC09-96SR18500

Report No.(s): DE2008-913127; IMECE2007-41055; No Copyright; Avail.: National Technical Information Service (NTIS)

Vibration due to a bearing failure in a pump created significant vibrations in a fifteen foot by fifteen foot by eight feet tall mounting platform due to excitation of resonant frequencies. In this particular application, an 18,000 pound pump was mounted to a structural steel platform. When bearing damage commenced, the platform vibrated with sufficient magnitude that conversations could not be heard within forty feet of the pump. Vibration analysis determined that the frequency of the bearing was coincident to one of the natural frequencies of the pump, which was, in turn, coincident to one of the natural frequencies of the mounting platform. This coincidence of frequencies defines resonance. Resonance creates excessive vibrations when the natural frequency of a structure is coincident to an excitation frequency. In this well documented case, the excitation frequency was related to ball bearing failures. The pump is a forty foot long vertical pump used to mix nuclear waste in 1,300,000 gallon tanks. A 300 horsepower drive motor is mounted to a structural steel platform on top of the tank. The pump hangs down into the tank from above to mix the waste and is inaccessible after installation. Initial awareness of the problem was due to increased noise from the pump. Initial vibration analysis indicated that the vibration levels of the bearing were within the expected range for this type of bearing, and the resonant condition was not obvious.

NTIS

Failure; Vibration; Ball Bearings; Acoustic Resonance; Acoustic Excitation

20090031750 University of Engineering and Technology, Taxila, Pakistan

Evaluation of the Shear Strength of Four Pile Cap Using Strut and Tie Model (STM)

Ahmad, Saeed; Shah, Attaullah; Zaman, Saeed; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 243-249; In English; See also 20090031741; Copyright; Avail.: Other Sources

Strut and Tie Model (STM) has been widely used for the design of disturbed region and non flexural members in RC structures. Pile cap is typically a disturbed region with small length to depth ratio, hence ordinary flexural theory for beams cannot be applied to it. In this research, six pile caps were designed for certain theoretical ultimate loads on the basis of STM. These pile caps were tested on four simply supporting piles. Loads were applied at the centre of pile cap. The experimental values were compared with the theoretical capacities of the pile caps on the basis of STM. It has been observed that STM has provided a reliable solution for predicting the shear strength of the four-pile caps and the experimental values fall very close to the theoretical values based on STM.

Author

Shear Strength; Struts; Models

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*.

20090030736 EG and G Energy Measurements, Inc., Idaho Falls, ID, USA
COMIDA: A Radionuclide Food Chain Model for Acute Fallout Deposition
Abbott, M. L.; Rood, A. S.; Nov. 1993; 138 pp.; In English
Contract(s)/Grant(s): DE-AC07-761DO1570
Report No.(s): PB2008-108924; EGG-GEO-10367-REV-0; No Copyright; Avail.: CASI: A07, Hardcopy

A dynamic food chain model and computer code, named 'COMIDA', has been developed to estimate radionuclide concentrations in agricultural food products following an acute fallout event. COMIDA estimates yearly harvest concentrations for five human crop types (Bq kg-1 crop per Bq m-2 deposited) and integrated concentrations for four animal products (Bq d kg-1 animal product per Bq m-2) for a unit deposition that occurs on any user-specified day of the year. COMIDA is structurally very similar to the PATHWAY model and includes the same seasonal transport processes and discrete events for soil and vegetation compartments. Animal product assimilation is modeled using simpler equilibrium models. Differential transport and ingrowth of up to three radioactive progeny are also evaluated. Benchmark results between COMIDA and PATHWAY for monthly fallout events show very similar seasonal agreement for integrated concentrations in milk and beef. Benchmark results between COMIDA and four international steady-state models show good agreement for deposition events that occur during the middle of the growing season. COMIDA will be implemented in the new Department of Energy version of the MELCOR Accident Consequence Code System for evaluation of accidental releases from nuclear power plants.
NTIS
Agriculture; Deposition; Fallout; Food Chain; Radioactive Isotopes

20090030799 Geological Survey, Reston, VA USA
Preliminary Volcano-Hazard Assessment for the Tanaga Volcanic Cluster, Tanaga Island, Alaska
Coombs, M. L.; McGimsey, R. G.; Browne, B. L.; Jan. 2007; 47 pp.; In English
Report No.(s): PB2008-109248; USGS/SIR-2007-5094; No Copyright; Avail.: National Technical Information Service (NTIS)

The Tanaga volcanic cluster lies on the northwest part of Tanaga Island, about 100 kilometers west of Adak, Alaska, and 2,025 kilometers southwest of Anchorage, Alaska. The cluster consists of three volcanoes from west to east, they are Sajaka, Tanaga, and Takawangha. All three volcanoes have erupted in the last 1,000 years, producing lava flows and tephra (ash) deposits. A much less frequent, but potentially more hazardous phenomenon, is volcanic edifice collapse into the sea, which likely happens only on a timescale of every few thousands of years, at most. Parts of the volcanic bedrock near Takawangha have been altered by hydrothermal activity and are prone to slope failure, but such events only present a local hazard. Given the volcanic cluster's remote location, the primary hazard from the Tanaga volcanoes is airborne ash that could affect aircraft. In this report, we summarize the major volcanic hazards associated with the Tanaga volcanic cluster.
NTIS
Hazards; Volcanoes; Geomorphology

20090030910 Geological Survey, Reston, VA USA; Indiana Dept. of Environmental Management, Indianapolis, IN, USA
Relations of Principal Components Analysis Site Scores to Algal-Biomass, Habitat, Basin-Characteristics, Nutrient and Biological-Community Data in the Whitewater River and East Fork White River Basins, Indiana, 2002
Caskey, B. J.; Frey, J. W.; Lowe, B. S.; Jan. 2007; 41 pp.; In English
Report No.(s): PB2008-108769; USGS-SIR-2007-5229; No Copyright; Avail.: CASI: A03, Hardcopy

Data were gathered from May through September 2002 at 76 randomly selected sites in the Whitewater River and East Fork White River Basins, Indiana, for algal biomass, habitat, nutrients, and biological communities (fish and invertebrates). Basin characteristics (land use and drainage area) and biological- community attributes and metric scores were determined for the basin of each sampling site. Yearly Principal Components Analysis site scores were calculated for algal biomass (periphyton and seston). The yearly Principal Components Analysis site scores for the first axis (PC1) were related using Spearmans rho to the seasonal algal-biomass, basin-characteristics, habitat, seasonal nutrient, and biological-community attribute and metric score data. The periphyton PC1 site score was not significantly related to the nine habitat or 12 nutrient variables examined. One land-use variable, drainage area, was negatively related to the periphyton PC1. Of the 43

fish-community attributes and metrics examined, the periphyton PC1 was negatively related to one attribute (large-river percent) and one metric score (carnivore percent metric score). It was positively related to three fish-community attributes (headwater percent, pioneer percent, and simple lithophil percent). The periphyton PC1 was not statistically related to any of the 21 invertebrate-community attributes or metric scores examined.
NTIS
Algae; Biomass; Habitats; Principal Components Analysis; River Basins; Rivers

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*.

20090030160 Forest Service, Albany, CA, USA
Ecosystem Management Strategy for Sierran Mixed-Conifer Forests
North, M.; Stine, P.; O'Hara, K.; Zielinski, W.; Stephens, S.; Mar. 2009; 56 pp.; In English
Report No.(s): PB2009-113231; FSGTR-PSW-220; No Copyright; Avail.: National Technical Information Service (NTIS)

Current Sierra Nevada forest management is often focused on strategically reducing fuels without an explicit strategy for ecological restoration across the landscape matrix. Summarizing recent scientific literature, we suggest managers produce different stand structures and densities across the landscape using topographic variables (i.e., slope shape, aspect, and slope position) as a guide for varying treatments. Local cool or moist areas, where historically fire would have burned less frequently or at lower severity, would have higher density and canopy cover, providing habitat for sensitive species. In contrast upper, southern-aspect slopes would have low densities of large fire-resistant trees. For thinning, marking rules would be based on crown strata or age cohorts and species, rather than uniform diameter limits. Collectively, our management recommendations emphasize the ecological role of fire, changing climate conditions, sensitive wildlife habitat, and the importance of forest structure heterogeneity.
NTIS
Conifers; Ecosystems; Forest Management; Forests; Management Planning; Sierra Nevada Mountains (CA)

20090030161 Forest Service, Portland, OR USA
Land Use Planning: A Time-Tested Approach for Addressing Climate Change
Jun. 2009; 6 pp.; In English
Report No.(s): PB2009-113233; No Copyright; Avail.: CASI: A02, Hardcopy

Oregon's land use planning program has protected an estimated 1.2 million acres of forest and agricultural land from development since its inception in 1973. As a result, these resource lands continue to provide forest products and food as well as another unexpected benefit: carbon storage. By keeping forests as forests, land use planning capitalizes on the natural landscapes ability to sequester atmospheric carbon, a key contributor to climate change. Nationwide, however, forest land is the land type most frequently converted to more developed uses. When this happens, carbon storage opportunities are lost, and the new use, such as a housing development, often becomes a net carbon producer. Scientists from the Pacific Northwest Research Station and Oregon Department of Forestry quantified the carbon storage maintained by the land use planning program in western Oregon. They found these gains were equivalent to avoiding 1.7 million metric tons of carbon dioxide emissions annually the amount of carbon that would have been emitted by 395,000 cars in a year. Had the 1.7 million metric tons of stored carbon been released through development, Oregons annual increase in CO2 emissions between 1990 and 2000 would have been three times what it actually was. As policymakers look for ways to mitigate climate change, land use planning is a proven tool with measurable results.
NTIS
Climate Change; Land Management; Land Use; Environment Management; Regional Planning

20090031799 NASA Johnson Space Center, Houston, TX, USA
Sequential Imaging of Earth by Astronauts: 50 Years of Global Change
Evans, Cynthia A.; [2009]; 2 pp.; In English; Geological Society of America Annual Meeting, 17-21 Oct. 2009, Denver, CO, USA
Report No.(s): JSC-CN-18766; No Copyright; Avail.: Other Sources; Abstract Only

For nearly 50 years, astronauts have collected sequential imagery of the Earth. In fact, the collection of astronaut

photography comprises one of the earliest sets of data (1961 to present) available to scientists to study the regional context of the Earth s surface and how it changes. While today s availability of global high resolution satellite imagery enables anyone with an internet connection to examine specific features on the Earth s surface with a regional context, historical satellite imagery adds another dimension (time) that provides researchers and students insight about the features and processes of a region. For example, one of the geographic areas with the longest length of record contained within the astronaut photography database is the lower Nile River. The database contains images that document the flooding of Lake Nasser (an analog to today s flooding behind China s Three Gorges Dam), the changing levels of Lake Nasser s water with multiyear cycles of flood and drought, the recent flooding and drying of the Toshka Lakes, as well as urban growth, changes in agriculture and coastal subsidence. The imagery database allows investigations using different time scales (hours to decades) and spatial scales (resolutions and fields of view) as variables. To continue the imagery collection, the astronauts on the International Space Station are trained to understand basic the Earth Sciences and look for and photograph major events such as tropical storms, landslides, and volcanic eruptions, and document landscapes undergoing change (e.g., coastal systems, cities, changing forest cover). We present examples of selected sequences of astronaut imagery that illustrate the interdependence of geological processes, climate cycles, human geography and development, and prompt additional questions about the underlying elements of change.
Author
Earth Surface; Satellite Imagery; Imaging Techniques; Tropical Storms; Topography; Terrain; Earth Sciences; Geography; Photography; Sequencing

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*.

20090030144 Florida Solar Energy Center, Cape Canaveral, FL, USA
Assessment of Thermal Heating Requirements for Non-Industry Dependent Warm-Water Refuges for Florida Manatees. Revised Final Report
Gu, L.; Feb. 16, 2005; 145 pp.; In English
Report No.(s): PB2008-108313; FSEC-CR-1481-04; No Copyright; Avail.: National Technical Information Service (NTIS)
About two-thirds of all Florida manatees now depend on warm water outfalls from powerplants to survive cold winter periods. Many of these plants may be retired in the next 10-20 years. These closures and the loss of their heated outfalls could cause high levels of cold-stress-related manatee deaths. To help identify possible steps to prevent such deaths, this study was undertaken to determine if non-industry dependent warm-water refuges for Florida manatees could be created using solar water heating technology. This approach assumes manatees would find and begin using these refuges as they have found and used power plant outfalls. Providing asteady source of freshwater, a known manatee attractant, might facilitate such use. A previous modeling study funded by Florida Power & Light Company (FP&L) examined the possible creation of a solar heated refuge at an embayment in West Palm Beach Florida in the central part of the manatees current winter range along Atlantic coast. The study, using average daily water temperature and weather data, concluded that solar water heating technology could be used at that site to create a 20oC warm-water refuge, but that a more detailed analysis should be undertaken using hourly winter water temperature and weather data.
NTIS
Heating; Industries; Manatees; Water

20090030307 New Mexico State Univ., Las Cruces, NM, USA; New Mexico State Univ., University Park, NM, USA
Solar Desalination of Brackish Water Using Membrane Distillation Process
Deng, S.; Jan. 2008; 40 pp.; In English
Report No.(s): PB2008-108707; WRRI-TCR-342; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this research was to evaluate the thermal efficiency of different solar collectors as water heaters and to determine the process parameters of the membrane distillation process using a hollow fiber membrane module for brackish water desalination through experimental and process modeling studies. It was found from the experimental studies that the Sunearth (Trade Name) flat solar collector had the highest solar to thermal conversion efficiency and a homemade parabolic solar collector had the lowest solar to thermal conversion efficiency. An experiment of direct contact membrane distillation

using hollow fiber membrane module was done to purify brackish water and saline water of high salt content. The salt rejection rate obtained was approximately 99 percent. Modeling of heat and mass transfer phenomena associated with the membrane distillation process was also performed. The process parameters like temperature polarization coefficient (TPC), heat transfer coefficient, membrane distillation coefficient (MDC), vapor pressure polarization coefficient (VPC), and permeate stream mass flux have been obtained by modeling calculation. The calculated value of permeate stream flux was then compared with experimental results to check the consistency of the data obtained in this process. The calculated and experimentally obtained mass flux with operating temperature showed a similar behavior, which is desired for an effective direct contact membrane distillation process.
NTIS
Desalinization; Distillation; Membranes; Salinity; Solar Collectors; Water Resources

20090030371 National Renewable Energy Lab., Golden, CO USA
Heat-Loss Testing of Solel's UVAC3 Parabolic Trough Receiver
Burkholder, E.; Kutscher, C.; Jan. 01, 2008; 19 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922153; NREL/TP-550-42394; No Copyright; Avail.: Department of Energy Information Bridge

Researchers at the National Renewable Energy Laboratory completed heat-loss testing on two of Solels UVAC3 parabolic trough receivers. The receivers showed identical heat losses within experimental uncertainty. Normalized per meter of receiver length, heat losses are 130, 200, 310, and 460 W/m at average absorber temperatures of 300DG, 350DG, 400DG, and 450DGC, respectively. Experimental uncertainty is about -10 W/m. A correlation was developed to predict receiver heat loss as a function of the difference in DGC between the average absorber temperature and ambient temperature. Care must be taken to apply this correlation within context. The correlation was derived with ambient temperatures of about 23DGC, and it should not be used to predict heat losses at ambient temperatures more or less than 10DGC from this value. This limitation is explained further in the report. UVAC3 heat losses were compared to heat losses from UVAC2, the previous generation of receiver.
NTIS
Cooling; Parabolic Reflectors; Receivers; Solar Collectors; Solar Energy

20090030397 National Renewable Energy Lab., Golden, CO USA; Department of Energy, Washington, DC, USA
World Biofuels Assessment; Worldwide Biomass Potential: Technology Characterizations (Milestone Report), Technical Report
Bain, R. L.; Dec. 01, 2007; 164 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-921804; NREL/MP-510-42467; No Copyright; Avail.: National Technical Information Service (NTIS)

The first task was completed by all participants in consultation with DOE. The next two tasks, which are largely data collection, analysis, and synthesis, have been integrated into the MARKAL model to improve its global representation of biofuels. ORNL was responsible for the completion of Task 2; NREL was responsible for Task 3; and BNL was responsible for the MARKAL model integration, Task 4. The time frame for the study is designed to coincide with the Presidents 20 in 10 initiative and thus will be focused on two periods what can be produced in 5 years and 10 years. The study also considers a longer-term period of 20 years in which barriers, constraints, and study assumptions (e.g., crop yields) can be somewhat more relaxed. The longer time period allows consideration of scenarios more comparable to the joint DOE-USDA billion-ton assessment. The NREL effort focused on the conversion technologies for ethanol from starch and sugar, lignocellulosic ethanol, biodiesel, and residual fuel oil via pyrolysis; conversion scale-up and infrastructure requirements, and estimated costs of biofuels in the context of conventional fuels and financial operating conditions.
NTIS
Diesel Fuels; Biomass; Biomass Energy Production; Renewable Energy

20090030423 Massachusetts Inst. of Tech., Cambridge, MA, USA
Photo-Activated Low Temperature, Micro Fuel Cell Power Source. Report for the period of September 20, 2005 to September 30, 2007
Tuller, H. L.; Jan. 2008; 18 pp.; In English
Contract(s)/Grant(s): DE-FC26-05NT42624
Report No.(s): DE2008-924770; No Copyright; Avail.: National Technical Information Service (NTIS)

A key objective of this program is to identify electrodes that will make it possible to significantly reduce the operating

temperature of micro-SOFC and thin film-based SOFCs. Towards this end, efforts are directed towards (a) identifying the key rate limiting steps which limit presently utilized electrodes from performing at reduced temperatures, as well as, (b) investigating the use of optical, as opposed to thermal energy, as a means for photocatalyzing electrode reactions and enabling reduced operating temperatures. During Phase I, the following objectives were achieved: (a) assembly and testing of our unique Microprobe Thin Film Characterization System; (b) fabrication of the model cathode materials system in thin film form by both PLD and ink jet printing; and (c) the successful configuration and testing of the model materials as cathodes in electrochemical cells. A further key objective (d) to test the potential of illumination in enhancing electrode performance was also achieved.
NTIS
Electrodes; Fuel Cells; Low Temperature; Operating Temperature; Thin Films

20090030443 National Renewable Energy Lab., Golden, CO USA
Battery Requirements for Plug-In Hybrid Electric Vehicles--Analysis and Rationale. EVS 23 Sustainability: The Future of Transportation
Pesaran, A.; Dec. 2007; 26 pp.; In English
Report No.(s): DE2008-923227; NREL/PR-42469; No Copyright; Avail.: National Technical Information Service (NTIS)
Slide presentation to EVS-23 conference describing NREL work to help identify appropriate requirements for batteries to be useful for plug-in hybrid-electric vehicles (PHEVs). Suggested requirements were submitted to the U.S. Advanced Battery Consortium, which used them for a 2007 request for proposals. Requirements were provided both for charge-depleting mode and charge-sustaining mode and for high power/energy ratio and hige energy/power ration batteries for each (different modes of PHEV operation), along with battery and system level requirements.
NTIS
Electric Batteries; Electric Motor Vehicles; Transportation

20090030575 Army Research Lab., Adelphi, MD USA
Power for Microsystems Strategic Technology Initiative Report on MAST Mission Power Requirements
Morgan, Brian; Bedair, Sarah; Jul. 2009; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502529; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The development of Micro Autonomous Systems faces numerous technical hurdles. Beyond fundamental questions about locomotion at small scales and cooperative group behaviors is an ever-increasing need for efficiency and power, as each additional function on the system will require a finite amount of energy to execute its task. This report analyzes some of the basic power requirements for a mobile Microsystem in the context of a hypothetical military mission profile. The needs for various locomotion modalities, as well as system sizes, are compared with existing or emerging power sources to determine feasibility. A survey of systems being developed under the Micro Autonomous Systems and Technologies (MAST) Collaborative Technologies Alliance (CTA) is included to give the reader a concept of the breadth of power-consuming devices envisioned for future platforms.
DTIC
Beams (Supports); Microelectronics; Mission Planning; Supplying

20090030709 National Renewable Energy Lab., Golden, CO USA
Thermal Management of Batteries in Advanced Vehicles Using Phase-Change Materials. EVS 23 Sustainability: The Future of Transportation
Kim, G. H.; Gonder, J.; Lustbader, J.; Pesaran, A.; Dec. 2007; 32 pp.; In English
Report No.(s): DE2008-922155; NREL/PR-42544; No Copyright; Avail.: National Technical Information Service (NTIS)
This Powerpoint presentation examines battery thermal management using PCM and concludes excellent performance in limiting peak temperatures at short period extensive battery use; although, vehicle designers will need to weigh the potential increase in mass and cost associated with adding PCM against the anticipated benefits.
NTIS
Electric Batteries; Enhanced Vision; Temperature Control; Transportation

20090030712 National Renewable Energy Lab., Golden, CO USA
Regional Per Capita Solar Electric Footprint for the USA
Denholm, F.; Margolis, R.; Dec. 01, 2007; 34 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-921203; NREL/TP-670-42463; No Copyright; Avail.: National Technical Information Service (NTIS)

In this report, we quantify the state-by-state per-capita 'solar electric footprint' for the USA. We use state-level data on population, electricity consumption, economic activity and solar insolation, along with solar photovoltaic (PV) array packing density data to develop a range of estimates of the solar electric footprint. We find that the solar electric footprint, defined as the land area required to supply all end-use electricity from solar photovoltaics, is about 181 m2 per person in the USA. Two key factors that influence the magnitude of the state-level solar electric footprint include how industrial energy is allocated (based on location of use vs. where goods are consumed) and the assumed distribution of PV configurations (flat rooftop vs. fixed tilt vs. tracking). The solar electric footprint is about 0.6% of the total land area of the USA with state-level estimates ranging from less than 0.1% for Wyoming to about 9% for New Jersey. We also compare the solar electric footprint to a number of other land uses. For example, we find that the solar electric footprint is equal to less than 2% of the land dedicated to cropland and grazing in the USA.
NTIS
Electricity; Flux Density; Footprints; Solar Energy; United States

20090030715 National Renewable Energy Lab., Golden, CO USA; California Univ., Berkeley, CA USA
Efficiency Improvement of Crystalline Solar Cells
Weber, E. R.; Nov. 01, 2007; 85 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-920929; NREL/SR-520-42323; No Copyright; Avail.: National Technical Information Service (NTIS)

UC-Berkeley study of transition metal related defects in PV-grade mc-Si to understand their pathways into solar cells; chemical state/distribution; interaction with structural defects; defect engineering.
NTIS
Crystallinity; Neutron Activation Analysis; Photons; Silicon; Solar Cells

20090030808 Geological Survey, Reston, VA USA
Flow of Cadmium from Rechargeable Batteries in the USA, 1996-2005
Wilburn, D. R.; Jan. 2007; 34 pp.; In English
Report No.(s): PB2008-108763; USGS-SIR-2007-5198; No Copyright; Avail.: CASI: A03, Hardcopy

Cadmium metal has been found to be toxic to humans and the environment under certain conditions; therefore, a thorough understanding of the use and disposal of the metal is warranted. Most of the cadmium used in the USA comes from imported products. In 2005, more than 80 percent of the cadmium used in the USA was contained in batteries, mostly in rechargeable nickel-cadmium batteries used in popular consumer products such as cordless phones and power tools. The flow of cadmium contained in rechargeable nickel-cadmium batteries used in the USA was tracked for the years 1996 to 2005. The amount of cadmium metal contained in imported products in 2004 was estimated to be about 3,000 metric tons, or about three times the reported cadmium production in the USA from all primary and secondary sources. More than 40,000 metric tons of cadmium were estimated to be contained in rechargeable batteries that became obsolete during the 10-year study period. As much as 11 percent of this material was recycled, and the balance was placed in municipal solid waste landfills.
NTIS
Cadmium; Electric Batteries; Toxicity; Nickel Cadmium Batteries

20090030916 National Renewable Energy Lab., Golden, CO USA
Analysis of Heat Dissipation in Li-Ion Cells & Modules for Modeling of Thermal Runaway (Presentation)
Kim, G. H.; Pesaran, A.; May 15, 2007; 29 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-913594; NREL/PR-540-41531; No Copyright; Avail.: National Technical Information Service (NTIS)

The objectives of this study are: (1) To develop 3D Li-Ion battery thermal abuse 'reaction' models for cell and module

analysis; (2) To understand the mechanisms and interactions between heat transfer and chemical reactions during thermal runaway for Li-Ion cells and modules; (3) To develop a tool and methodology to support the design of abuse-tolerant Li-Ion battery systems for PHEVs/HEVs; and (4) To help battery developers accelerate delivery of abuse-tolerant Li-Ion battery systems in support of the FreedomCAR's Energy Storage Program.
NTIS
Cooling; Modules

20090030922 Sandia National Labs., Albuquerque, NM USA
Power Conversion from Environmentally Scavenged Energy Sources
Druxman, L. D.; Sep. 01, 2007; 54 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-920810; SAND2007-5630; No Copyright; Avail.: National Technical Information Service (NTIS)

As the power requirements for modern electronics continue to decrease, many devices which were once dependent on wired power are now being implemented as portable devices operating from self-contained power sources. The most prominent source of portable power is the electrochemical battery, which converts chemical energy into electricity. However, long lasting batteries require large amounts of space for chemical storage, and inevitably require replacement when the chemical reaction no longer takes place. There are many transducers and scavenging energy sources (SES) that are able to exploit their environment to generate low levels of electrical power over a long-term time period, including photovoltaic cells, thermoelectric generators, thermionic generators, and kinetic/piezoelectric power generators. This generated power is sustainable as long as specific environmental conditions exist and also does not require the large volume of a long lifetime battery. In addition to the required voltage generation, stable power conversion requires excess energy to be efficiently stored in an ultracapacitor or similar device and monitoring control algorithms to be implemented, while computer modeling and simulation can be used to complement experimental testing. However, building an efficient and stable power source scavenged from a varying input source is challenging.
NTIS
Electric Batteries; Electric Generators

45
ENVIRONMENT POLLUTION

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

20090030125 California Dept. of Health Services, Richmond, VA, USA
Air Pollution and Cardiovascular Disease in the California Teachers Study Cohort
Lipsett, M.; Oct. 2007; 88 pp.; In English
Contract(s)/Grant(s): CARBA-03-313
Report No.(s): PB2008-107905; No Copyright; Avail.: CASI: A05, Hardcopy

There are few studies examining associations between long-term exposure to air pollution and adverse health outcomes. In an ongoing cohort study of over 100,000 female participants in the California Teachers Study (CTS), we developed estimates of long-term air pollution exposure at the subjects' residences and examined associations between these exposure estimates and the following health outcomes: total mortality, cardiopulmonary mortality, and incidence of both fatal and non-fatal heart attacks and stroke. In addition, we examined the potential impacts of several traffic metrics on these outcomes: In order to derive the pollutant exposure metrics, the CTS participants' addresses were linked with monthly estimates of long-term exposure to multiple air pollutants, including PM2.5 (particulate matter less than 2.5 microns in diameter), PM10, and several gases (including ozone, carbon monoxide (CO), nitrogen dioxide (NO2), and others). The addresses were linked as well with several cross-sectional measures of traffic-related exposures from the year 2000 or later. We analyzed these relationships while adjusting for many individual-level and neighborhood variables, and undertook a variety of sensitivity analyses. We found strong and consistent associations of PM2.5 not only with total and cardiopulmonary mortality, but also with the incidence of heart attacks and stroke. We also identified somewhat less consistent relationships between one or more of these adverse outcomes and PM10, CO, NO2 and ozone. Most of the traffic metrics were not associated with these outcomes. This study provides additional evidence that long-term exposure to air pollution is associated with mortality, and

demonstrates as well that exposure to several combustion-related pollutants is associated with the incidence of new cases of heart attacks and stroke.
NTIS
Air Pollution; Cardiovascular System; Heart Diseases; Instructors

20090030138 Geological Survey, Reston, VA USA; Indiana Dept. of Environmental Management, Indianapolis, IN, USA
Mercury in Precipitation in Indiana, January 2001-December 2003
Risch, M. R.; Jan. 2007; 86 pp.; In English
Report No.(s): PB2008-108044; USGS-SIR-2007-5063; No Copyright; Avail.: National Technical Information Service (NTIS)

Mercury in precipitation was monitored during 2001 through 2003 at four locations in Indiana as part of the National Atmospheric Deposition Program-Mercury Deposition Network (NADP-MDN). Monitoring stations were operated at Roush Lake near Huntington, Clifty Falls State Park near Madison, Monroe County Regional Airport near Bloomington, and Indiana Dunes National Lakeshore near Porter. At these monitoring stations, precipitation amounts were measured and weekly samples were collected for analysis of total mercury and methylmercury by low-level methods. Wet deposition was computed with the total mercury and methylmercury concentrations and the precipitation amounts.
NTIS
Mercury (Metal); Precipitation (Meteorology); Indiana

20090030162 Eastern Research Group, Inc., Arlington, MA, USA
Sampling and Analysis of Nanomaterials in the Environment: A State-of-Science Review
Sep. 2008; 178 pp.; In English
Report No.(s): PB2009-113239; EPA/600/R-08/098; No Copyright; Avail.: CASI: A09, Hardcopy

This state-of-the-science review was undertaken to identify and assess currently available sampling and analysis methods to identify and quantify the occurrence of nanomaterials in the environment. The environmental and human health risks associated with nanomaterials are largely unknown, and methods needed to monitor the environmental occurrence of nanomaterials are very limited or nonexistent. Because this research is current and ongoing, much of the applicable information is found in gray literature (e.g., conference proceeding, communications with research scientists and other experts).
NTIS
Nanotechnology; Nanostructure (Characteristics); Nanocomposites; Environmental Monitoring; Health

20090030165 Climate Change Science Program, Washington, DC, USA
Global Climate Change Impacts in the USA: A State of Knowledge Report from the U.S. Global Change Research Program
Jan. 2009; 196 pp.; In English
Report No.(s): PB2009-113516; No Copyright; Avail.: National Technical Information Service (NTIS)

Observations show that warming of the climate is unequivocal. The global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with important contributions from the clearing of forests, agricultural practices, and other activities. Warming over this century is projected to be considerably greater than over the last century. The global average temperature since 1900 has risen by about 1.5oF. By 2100, it is projected to rise another 2 to 11.5oF. The U.S. average temperature has risen by a comparable amount and is very likely to rise more than the global average over this century, with some variation from place to place. Several factors will determine future temperature increases. Increases at the lower end of this range are more likely if global heat-trapping gas emissions are cut substantially. If emissions continue to rise at or near current rates, temperature increases are more likely to be near the upper end of the range. Sizable early cuts in emissions would significantly reduce the pace and the overall amount of climate change. Climate-related changes have already been observed globally and in the USA. These include increases in air and water temperatures, reduced frost days, increased frequency and intensity of heavy downpours, a rise in sea level, and reduced snow cover, glaciers, permafrost, and sea ice. A longer ice-free period on lakes and rivers, lengthening of the growing season, and increased water vapor in the atmosphere have also been observed.
NTIS
Climate Change; Climatology; United States

20090030166 Environmental Protection Agency, Washington, DC, USA
Acid Rain Hourly Emissions Data 2007 (Raw Data File on CD-ROM)
Jan. 2008; In English
Report No.(s): PB2009-500034; No Copyright; Avail.: National Technical Information Service (NTIS)

This CD-ROM product contains data on emissions from fossil fuel-fired electric power plants, which was collected by the EPA Acid Rain Program under 40 CFR 75. Pollutants monitored include sulfur dioxide, nitrogen oxides, and carbon dioxide. The pollutants are generally monitored usingcontinuous emissions monitoring systems (CEMS) on an hourly basis. Also included is general operating data, including operating time, heat input, and gross unit load. There is also information on the unit's monitoring plan, and the results of tests required to be performed by the source to insure that its monitoring equipment is functioning properly. Electric utilities, energy consultants, and power marketing companies can use EPA Acid Rain Program emissions data to project futureSO2 allowance costs and availability. Academic institutions can perform data modeling to evaluate environmental benefits and estimate health effects of SO2 reductions. EPA and other agencies use it to try to correlate the reduction of SO2 emissions with a decrease in acid precitation, and also to measure the impacts of other existing and proposed emissions trading programs (e.g., for NOx and CO2). Starting in2nd qtr 2008 and 4th qtr 2008 files will have EDR data and XML data. In 2009 all data should be XML. To see schema please go to http://www.epa.gov/ airmarkets/business/ ecmps/technical-info.
NTIS
Acid Rain; Air Pollution; CD-ROM; Electric Generators; Pollution Monitoring

20090030173 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Carbon Trading Protocols for Geologic Sequestration
Hoversten, S.; Aug. 01, 2008; 16 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2009-948577; LBNL-1550E; No Copyright; Avail.: Department of Energy Information Bridge

Carbon capture and storage (CCS) could become an instrumental part of a future carbon trading system in the US. If the US starts operating an emissions trading scheme (ETS) similar to that of the European Union's then limits on CO(sub 2) emissions will be conservative in the beginning stages. The government will most likely start by distributing most credits for free; these free credits are called allowances. The US may follow the model of the EU ETS, which during the first five-year phase distributed 95% of the credits for free, bringing that level down to 90% for the second five-year phase. As the number of free allowances declines, companies will be forced to purchase an increasing number of credits at government auction, or else obtain them from companies selling surplus credits. In addition to reducing the number of credits allocated for free, with each subsequent trading period the number of overall credits released into the market will decline in an effort to gradually reduce overall emissions.
NTIS
Air Pollution; Carbon; Carbon Dioxide; Geology; Pollution Control; Protocol (Computers); Sinks

20090030190 Environmental Protection Agency, Washington, DC USA
Clean Energy Lead by Example Guide: Strategies, Resources, and Action Steps for State Programs
Jan. 15, 2009; 318 pp.; In English
Report No.(s): PB2009-112672; No Copyright; Avail.: National Technical Information Service (NTIS)

State governments can achieve substantial energy cost savings across their facilities, operations, and fleets through clean energy Lead by Example (LBE) programs. They can also demonstrate energy and environmental leadership, raise public awareness of the benefits of clean energy technologies, improve air quality, reduce greenhouse gas (GHG) emissions, improve energy supply and reliability, and foster markets for environmentally preferable products. The LBE Guide provides information to assist state governments as they develop and implement effective LBE programs to achieve their clean energy goals. It presents strategies, resources, and tools state decision makers can use throughout the process. EPA and other organizations recognize leading by example as a key policy option for states seeking to achieve their clean energy goals. For example, the importance of LBE programs is documented in the the National Action Plan for Energy Efficiency Vision for 2025 report. The Vision identifies LBE as a critical component of achieving the long-term goal of all cost-effective energy efficiency by 2025. Goal Six of the Visions ten implementation goals is to develop state policies such as LBE for pursuing robust energy efficiency practices.
NTIS
Clean Energy; Exhaust Emission; Exhaust Gases; Greenhouse Effect

20090030191 Idaho National Lab., Idaho Falls, ID, USA
CO2 Separation Using Thermally Optimized Membranes: A Comprehensive Project Report (2000 - 2007)
Mar. 04, 2008; 105 pp.; In English
Contract(s)/Grant(s): DE-AC07-05ID14517
Report No.(s): DE2009-948581; INL/CRADA-01-09; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a complete (Fiscal Years 2000-2006) collection of the Idaho National Laboratory's (INL) research and development contributions to the project, CO2 Separation Using Thermally Optimized Membranes. The INL scientific contribution to the project has varied due to the fluctuations in funding from year to year. The focus of the project was polybenzimidazole (PBI) membranes and developing PBI compounds (both substitution and blends) that provide good film formation and gas separation membranes. The underlying problem with PBI is its poor solubility in common solvents. Typically, PBI is dissolved in aggressive solvents, like N,N-dimethylacetamide (DMAc) and N methylpyrrolidone (NMP). The INL FY-03 research was directed toward making soluble N-substituted PBI polymers, where INL was very successful. Many different types of modified PBI polymers were synthesized; however, film formation proved to be a big problem with both unsubstituted and N-substituted PBIs. Therefore, INL researchers directed their attention to using plasticizers or additives to make the membranes more stable and workable. During the course of these studies, other high-performance polymers (like polyamides and polyimides) were found to be better materials, which could be used either by themselves or blends with PBI. These alternative high-performance polymers provided the best pathway forward for soluble high-temperature polymers with good stable film formation properties. At present, the VTEC polyimides (product of RBI, Inc.) are the best film formers that exhibit high-temperature resistance. INL's gas testing results show VTEC polyimides have very good gas selectivities for both H2/CO2 and CO2/CH4.
NTIS
Carbon Dioxide; Membranes

20090030220 Sandia National Labs., Albuquerque, NM USA; National Energy Technology Lab., Morgantown, WV, USA
West Pearl Queen CO2 Sequestration Pilot Test and Modeling Project 2006-2008
Engler, B. P.; Cooper, S. P.; Symons, N. P.; Bartel, C. L.; Byrer, C.; Aug. 01, 2008; 70 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2009-948691; SAND2008-4992; No Copyright; Avail.: National Technical Information Service (NTIS)

The West Pearl Queen is a depleted oil reservoir that has produced approximately 250,000 bbl of oil since 1984. Production had slowed prior to CO(sub 2) injection, but no previous secondary or tertiary recovery methods had been applied. The initial project involved reservoir characterization and field response to injection of CO(sub 2); the field experiment consisted of injection, soak, and venting. For fifty days (December 20, 2002, to February 11, 2003) 2090 tons of CO(sub 2) were injected into the Shattuck Sandstone Member of the Queen Formation at the West Pearl Queen site. This technical report highlights the test results of the numerous research participants and technical areas from 2006-2008. This work included determination of lateral extents of the permeability units using outcrop observations, core results, and well logs. Pre- and post-injection 3D seismic data were acquired. To aid in interpreting seismic data, we performed numerical simulations of the effects of CO(sub 2) replacement of brine where the reservoir model was based upon correlation lengths established by the permeability studies. These numerical simulations are not intended to replicate field data, but to provide insight of the effects of CO(sub 2).
NTIS
Carbon Dioxide; Crude Oil; Injection

20090030258 Rocky Mountain Research Station, Missoula, MT, USA
Automated Forecasting of Smoke Dispersion and Air Quality NASA Terra and Aqua Satellite Data (Task 5)
Jun. 2007; 19 pp.; In English
Report No.(s): PB2009-113439; No Copyright; Avail.: National Technical Information Service (NTIS)

Algorithms and techniques to inform an air quality forecasting system with near real-time satellite observations have been developed, demonstrated, and validated. These techniques are generally applicable to any air quality forecasting system, and in many cases do not depend on the particular satellite instrument chosen as the source of real time data. Validation of satellite derived fire products has been performed using ground truth provided by incident management teams; contrasting starkly with previous approaches of validation-by-simulation or by comparison with other measurements from space. This document contains a description of the air quality forecasting system in operation at the Missoula Fire Science Laboratory. This air quality forecasting system has been steadily assimilating new techniques and algorithms as they have been developed over the

past four years. Individual components as well as assemblies of components have utilized this system as a proving ground. Technology transfer from this project is realized in multiple forms. Data products, many of which were not previously available anywhere, are made available on our prototype website. These include: fire detections, burn scar detections, emission maps, and a fuel map defined in terms of the FOFEM reference database. Software applications have been upgraded and optimized for integration with the rest of the system: the Carbon Bond IV photochemical mechanism has been added to HYSPLIT, and the FARSITE fire area simulator has been modified to work from the Linux command line. Finally, the web based publishing of four dimensional grids, as both data and as maps, is being added to the publicly available GeoTools library and GeoServer web map server.
NTIS
Air Pollution; Air Quality; Fires; Forecasting; Pollution Monitoring; Smoke

20090030273 Forest Service, Portland, OR USA
Assessing the Potential for Conversion to Biomass Fuels in Interior Alaska
Fresco, N.; Chapin, F. S.; Jun. 2009; 64 pp.; In English
Report No.(s): PB2009-112311; FSRP-PNW-579; No Copyright; Avail.: National Technical Information Service (NTIS)

In rural Alaskan communities, high economic, social, and ecological costs are associated with fossil fuel use for power generation. Local concerns regarding fuel prices, environmental contamination, and the effects of global climate change have resulted in increased interest in renewable energy sources. In this study we assessed the feasibility of switching from fossil fuels to wood energy in rural Alaskan villages in forested regions of interior Alaska. Modeling results based on recent data on rural energy use, demographics, economics, and forest dynamics indicated that the installation costs of biomass systems would be recouped within 10 years for at least 21 communities in the region. In addition, results showed that all but the largest remote communities in the interior could meet all their electrical demand and some heating needs with a sustainable harvest of biomass within a radius of 10 km of the village. Marketable carbon credits may add an additional incentive for fuel conversion, particularly if U.S. prices eventually rise to match European levels. Biomass conversion also offers potential social benefits of providing local employment, retaining money locally, and reducing the risk of catastrophic wildfire near human habitation. This analysis demonstrated that conversion to biomass fuels is economically viable and socially beneficial for many villages across interior Alaska.
NTIS
Biomass; Fuels; Environment Effects; Renewable Energy; Bioconversion; Biomass Energy Production

20090030277 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Risk and Exposure Assessment for Review of the Secondary National Ambient Air Quality Standards for Oxides of Nitrogen and Oxides of Sulfur. Second Draft: Main Content
Jun. 05, 2009; 461 pp.; In English
Report No.(s): PB2009-112046; EPA/452/P-09/004A; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Environmental Protection Agency (EPA) is conducting a joint review of the existing secondary (welfare-based) National Ambient Air Quality Standards (NAAQS) for nitrogen oxides (NOx) and sulfur oxides (SOx). EPA has decided to jointly assess the scientific information, associated risks, and standards relevant to protecting the public welfare from adverse effects associated with NOx and SOx because NOx, SOx, and their associated transformation products are linked from an atmospheric chemistry perspective, as well as an environmental effects perspective, and because the National Research Council (NRC) has recommended that EPA consider multiple pollutants, as appropriate. This is the first time since the NAAQS were established in 1971 that a joint review of these two pollutants has been conducted.
NTIS
Air Quality; Ambience; Exposure; Nitrogen Oxides; Risk Assessment; Sulfur; Sulfur Oxides

20090030368 National Energy Technology Lab., Pittsburgh, PA USA; North Dakota Univ., Grand Forks, ND, USA
JV Task 106 - Feasibility of CO2 Capture Technologies for Existing North Dakota Lignite-Fired Pulverized Coal Boilers. Final Report for the Period of July 7, 2006-December 31, 2006
Jones, M. J.; Pavish, B. M.; Jensen, M. D.; May 01, 2007; 69 pp.; In English
Contract(s)/Grant(s): FC26-98FT40321
Report No.(s): DE2008-922137; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project is to provide a technical review and evaluation of various carbon dioxide (CO2) capture

technologies, with a focus on the applicability to lignite-fired facilities within North Dakota. The motivation for the project came from the Lignite Energy Councils (LECs) need to identify the feasibility of CO2 capture technologies for existing North Dakota lignite-fired, pulverized coal (pc) power plants. A literature review was completed to determine the commercially available technologies as well as to identify emerging CO2 capture technologies that are currently in the research or demonstration phase. The literature review revealed few commercially available technologies for a coal-fired power plant. CO2 separation and capture using amine scrubbing have been performed for several years in industry and could be applied to an existing pc-fired power plant. Other promising technologies do exist, but many are still in the research and demonstration phases. Oxyfuel combustion, a technology that has been used in industry for several years to increase boiler efficiency, is in the process of being tailored for CO2 separation and capture. These two technologies were chosen for evaluation for CO2 separation and capture from coal-fired power plants. Although oxyfuel combustion is still in the pilot-scale demonstration phase, it was chosen to be evaluated at LECs request because it is one of the most promising emerging technologies. As part of the evaluation of the two chosen technologies, a conceptual design, a mass and energy balance, and an economic evaluation were completed.
NTIS
Boilers; Carbon Dioxide; Coal; Combustion Chambers; Grinding (Comminution); Lignite

20090030369 National Renewable Energy Lab., Golden, CO USA
Texas - Energy Collaborations Working for the Environment
Dec. 01, 2007; 2 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922144; DOE/GO-102007-2502; No Copyright; Avail.: National Technical Information Service (NTIS)

How did legislation on energy efficiency and utility restructuring help Texas meet air quality regulations. Motivated by both economic and environmental goals, Texas state officials, regional U.S. Environmental Protection Agency (EPA) officials and, ultimately, the Texas Legislature were convinced of the need to address air quality issues using renewable energy (RE) and energy efficiency (EE). The Department of Energys (DOE) Office of Energy Efficiency and Renewable Energy (EERE) provided technical assistance on utilizing RE and EE technologies to meet legislated goals. This fact sheet outlines Texas unique approach to improving air quality through both stringent policies and innovative analytic methods.
NTIS
Air Pollution; Energy Conservation; Pollution Control; Environment Protection

20090030370 National Renewable Energy Lab., Golden, CO USA
New Jersey - A Leader in Fighting Pollution
Dec. 01, 2007; 2 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922151; DOE/GO-102007-2399; No Copyright; Avail.: Department of Energy Information Bridge

How much do state-funded energy programs reduce air emissions. The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) worked with the state of New Jersey to estimate reductions in nitrogen oxides (NOx) resulting from the states publicly funded Clean Energy Program (CEP). New Jersey is one of the first to apply a streamlined method to estimate the emissions effect of its renewable energy (RE) and energy efficiency (EE) programs. This fact sheet outlines the elements of this groundbreaking pilot project.
NTIS
Air Pollution; Energy Conservation; Nitrogen Oxides; Pollution Control; Environment Protection

20090030389 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Study of Ventilation Practices and Household Characteristics in New California Homes
Piazza, T.; Jun. 2007; 228 pp.; In English
Contract(s)/Grant(s): CAIR-03-326
Report No.(s): PB2008-105764; No Copyright; Avail.: CASI: A11, Hardcopy

A survey was conducted to determine occupant use of windows and mechanical ventilation devices; barriers that inhabit their use; occupant perception of and satisfaction with indoor air quality (IAO); and the relationships among these factors. A questionnaire was mailed to a stratified random sample of 4,972 single-family detached homes built in 2003, and 1,448 responses were received. A convenience sample of 230 houses known to have mechanical ventilation systems resulted in

another 67 completed interviews. The results are: Many houses are under-ventilated: depended on the season, only 10-50 percent of houses meet the standard recommendation of 0.35 air changes per hour; Local exhaust fans are underutilized. For instance, about 30 percent of households rarely or never use their bathroom fan; More than 95 percent of households report that indoor air quality is 'very' or 'somewhat acceptable,' although about one-third of households also report dustiness, dry air, or stagnant or humid air; Except in households where people cook several hours per week, there is no evidence that households with significant indoor pollutant sources get more ventilation; Except in households containing asthmatics, there is no evidence that health issues motivate ventilation behavior; Security and energy saving are the two main reasons people close windows or keep them closed.
NTIS
Procedures; Ventilation

20090030393 Environmental Protection Agency, Washington, DC, USA
Acid Rain Hourly Emissions Data 2007 (Raw Data File on CD-ROM)
Jan. 2007; In English
Report No.(s): PB2008-500037; No Copyright; Avail.: National Technical Information Service (NTIS)

This product of 2 CD-ROM's contains data on emissions from fossil fuel-fired electric power plants, which was collected by the EPA Acid Rain Program under 40 CFR 75. Pollutants monitored include sulfur dioxide, nitrogen oxides, and carbon dioxide. The pollutants are generally monitored using continuous emissions monitoring systems (CEMS) on an hourly basis. Also included is general operating data, including operating time, heat input, and gross unit load. There is also information on the unit's monitoring plan, and the results of tests required to be performed by the source to insure that its monitoring equipment is functioning properly. Electric utilities, energy consultants, and power marketing companies can use EPA Acid Rain Program emissions data to project future SO2 allowance costs and availability. Academic institutions can perform data modeling to evaluate environmental benefits and estimate health effects of SO2 reductions. EPA and other agencies use it to try to correlate the reduction of SO2 emissions with a decrease in acid precitation, and also to measure the impacts of other existing and proposed emissions trading programs (e.g., for NOx and CO2).
NTIS
Acid Rain; Air Pollution; Pollution Monitoring; Electric Power Plants

20090030410 Idaho National Lab., Idaho Falls, ID, USA
Consideration of In-Growth of Radionuclides for Facility Hazard Categorization. Safety Analysis Workshop
Miller, R. E.; May 2007; 11 pp.; In English
Report No.(s): DE2008-923497; INL/CON-07-12659; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper addresses issues associated with the effects of daughter product in-growth on the hazard categorization of facilities in accordance with DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. There is a list of issues that occur when performing facility hazard categorizations at DOE facilities. The first issue is when radionuclides are concentrated outside of their natural decay schemes, and the resulting daughter products exceed the hazard category three threshold quantity values (HC3 TQVs) while their parents do not. The second issue is if a parent nuclide is evaluated for the inhalation pathway, and the daughter product is evaluated using a different pathway and methodology. The third issue is when the parent and daughter are evaluated using the same pathway for exposure, but the daughter is significantly more radiotoxic than the parent. Lastly, when the TQVs were derived for hazard categorization, the methodology used involved a 24 hour exposure period during which, for the sake of simplicity, no consideration was given to decay and the subsequent in-growth of daughter products. Facility hazard categorization is a snapshot in time and does not provide an accurate inventory for long term operations and/or storage.
NTIS
Hazards; Radioactive Isotopes; Radioactive Wastes; Safety

20090030413 Idaho National Lab., Idaho Falls, ID, USA
Selective Enrichment of a Methanol-Utilizing Consortium Using Pulp & Paper Mill Waste Streams. 29th Symposium on Biotechnology for Fuels and Chemicals
Mockos, G. R.; Smith, W. A.; Loge, F. L.; Thompson, D. N.; Apr. 2007; 33 pp.; In English
Report No.(s): DE2008-923505; INL/CON-06-12012; No Copyright; Avail.: Department of Energy Information Bridge

Efficient utilization of carbon inputs is critical to the economic viability of the current forest products sector. Input carbon

losses occur in various locations within a pulp mill, including losses as volatile organics and wastewater. Opportunities exist to capture this carbon in the form of value-added products such as biodegradable polymers. Waste activated sludge from a pulp mill wastewater facility was enriched for 80 days for a methanol-utilizing consortium with the goal of using this consortium to produce biopolymers from methanol-rich pulp mill waste streams. Five enrichment conditions were utilized: three high-methanol streams from the kraft mill foul condensate system, one methanol-amended stream from the mill wastewater plant, and one methanol-only enrichment. Enrichment reactors were operated aerobically in sequencing batch mode at neutral pH and 25DG degrees C with a hydraulic residence time and a solid's retention time of four days. Non-enriched waste activated sludge did not consume methanol or reduce chemical oxygen demand. With enrichment, however, the chemical oxygen demand reduction over 24 hour feed/decant cycles ranged from 79 to 89%, and methanol concentrations dropped below method detection limits. Neither the non-enriched waste activated sludge nor any of the enrichment cultures accumulated polyhydroxyalkanoates (PHAs) under conditions of nitrogen sufficiency.
NTIS
Air Pollution; Biotechnology; Conferences; Enrichment; Fuels; Industries; Methyl Alcohol; Organizations; Pollution Control; Streams; Waste Management

20090030428 METRANS Transportation Center, Los Angeles, CA, USA; California State Univ., Long Beach, CA, USA
Incentivizing Truck Retrofitting in Port Drayage: A Study of Drivers at the Ports of Los Angeles and Long Beach
Monaco, K.; Feb. 2008; 45 pp.; In English
Report No.(s): PB2008-107162; No Copyright; Avail.: CASI: A03, Hardcopy

Using data from detailed surveys of truck drivers, we analyze the wages and working conditions of drivers involved in port drayage. We also focus on drivers' willingness to pay for retrofitting and their preferences regarding different truck replacement programs. We find that drivers are willing to pay a portion of truck retrofitting costs. Drivers with high annual incomes are willing to pay more for retrofitting. We also find that though a grant-based truck replacement program was ranked highest among drivers, drivers were somewhat polarized on this program; many drivers also ranked this program as their least favorite. A subsidized interest rate program had the most cumulative first and second rankings.
NTIS
Retrofitting; Trucks

20090030433 North Dakota Univ., Grand Forks, ND, USA
Mercury Oxidation via Catalytic Barrier Filters Phase II
Seames, W.; Mann, M.; Muggli, D.; Hrdlicka, J.; Horabik, C.; Oct. 2007; 103 pp.; In English
Contract(s)/Grant(s): DE-FG26-04NT41288
Report No.(s): DE2008-924875; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2004, the Department of Energy National Energy Technology Laboratory awarded the University of North Dakota a Phase II University Coal Research grant to explore the feasibility of using barrier filters coated with a catalyst to oxidize elemental mercury in coal combustion flue gas streams. Oxidized mercury is substantially easier to remove than elemental mercury. If successful, this technique has the potential to substantially reduce mercury control costs for those installations that already utilize baghouse barrier filters for particulate removal. Completed in 2004, Phase I of this project successfully met its objectives of screening and assessing the possible feasibility of using catalyst coated barrier filters for the oxidation of vapor phase elemental mercury in coal combustion generated flue gas streams. Completed in September 2007, Phase II of this project successfully met its three objectives. First, an effective coating method for a catalytic barrier filter was found. Second, the effects of a simulated flue gas on the catalysts in a bench-scale reactor were determined. Finally, the performance of the best catalyst was assessed using real flue gas generated by a 19 kW research combustor firing each of three separate coal types.
NTIS
Air Pollution; Flue Gases; Gas Streams; Oxidation; Pollution Control

20090030436 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Helsinki Univ., Finland
Providing Better Indoor Environmental Quality Brings Economic Benefits
Fisk, W.; Seppanen, O.; Jan. 2007; 17 pp.; In English
Report No.(s): DE2008-924794; No Copyright; Avail.: Department of Energy Information Bridge

This paper summarizes the current scientific evidence that improved indoor environmental quality can improve work performance and health. The review indicates that work and school work performance is affected by indoor temperature and ventilation rate. Pollutant source removal can sometimes improve work performance. Based on formal statistical analyses of

existing research results, quantitative relationships are provided for the linkages of work performance with indoor temperature and outdoor air ventilation rate. The review also indicates that improved health and related financial savings are obtainable from reduced indoor tobacco smoking, prevention and remediation of building dampness, and increased ventilation. Example cost-benefit analyses indicate that many measures to improve indoor temperature control and increase ventilation rates will be highly cost effective, with benefit-cost ratios as high as 80 and annual economic benefits as high as $700 per person.
NTIS
Economics; Environmental Quality; Health; Cost Effectiveness; Indoor Air Pollution; Human Performance

20090030525 Westinghouse Savannah River Co., Aiken, SC, USA; Washington Safety Management Solutions, LLC, Aiken, SC, USA
Criticality Safety of Processing Salt Solution at SRS
Eghbali, D. A.; Abney, L. M.; Jan. 2008; 3 pp.; In English
Report No.(s): DE2008-923438; WSRC-MS-2008-00001; No Copyright; Avail.: Department of Energy Information Bridge
High level radioactive liquid waste generated as a result of the production of nuclear material for the USA defense program at the Savannah River Site has been stored as 36 million gallons in underground tanks. About ten percent of the waste volume is sludge, composed of insoluble metal hydroxides primarily hydroxides of Mn, Fe, Al, Hg, and most radionuclides including fission products. The remaining ninety percent of the waste volume is saltcake, composed of primarily sodium (nitrites, nitrates, and aluminates) and hydroxides. Saltcakes account for 30% of the radioactivity while the sludge accounts for 70% of the radioactivity. A pilot plant salt disposition processing system has been designed at the Savannah River Site for interim processing of salt solution and is composed of two facilities: the Actinide Removal Process Facility (ARPF) and the Modular Caustic Side Solvent Extraction Unit (MCU). Data from the pilot plant salt processing system will be used for future processing salt at a much higher rate in a new salt processing facility. Saltcake contains significant amounts of actinides, and other long-lived radioactive nuclides such as strontium and cesium that must be extracted prior to disposal as low level waste. The extracted radioactive nuclides will be mixed with the sludge from waste tanks and vitrified in another facility. Because of the presence of highly enriched uranium in the saltcake, there is a criticality concern associated with concentration and/or accumulation of fissionable material in the ARP and MCU.
NTIS
Actinide Series; Radioactive Wastes; Safety; Fission Products; Radiochemistry; Radioactive Materials; Radioactivity

20090030698
Development of Performance Data for Common Building Air Cleaning Devices
Hecker, R.; Hofacre, K. C.; Jan. 2008; 200 pp.; In English
Contract(s)/Grant(s): EPA-GS-10F-0275K
Report No.(s): PB2008-108872; No Copyright; Avail.: National Technical Information Service (NTIS)
Recent events have shown that buildings are vulnerable to terrorist attacks involving biological agents. The most serious effects of such an attack are on the health of the occupants of the buildings. Building occupants may suffer health effects ranging from irritation to severe sickness to death. An attack may also have long-term economic and other impacts due to contamination of the building. Several organizations, including the Army Corps of Engineers, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and the Centers for Disease Control and Prevention (CDC), recognize this terrorist threat and have issued guidance documents on how to deal with it. These documents, while useful, suffer from the fact that the scientific, engineering, and economic information needed to determine optimum courses of action is inadequate. The tools and technologies required to implement optimum courses of action are often not available, are too expensive to use, or are inadequate.
NTIS
Air Filters; Air Pollution; Air Purification; Buildings; Indoor Air Pollution; Pollution Control

20090030699 Battelle, Columbus, OH, USA
Evaluation of In-Room Air Cleaners for Building Protection
Kogan, V.; Harto, C.; Hesse, D. J.; Hofacre, K. C.; Jan. 2008; 54 pp.; In English
Contract(s)/Grant(s): EPA-GS-10F-0275K
Report No.(s): PB2008-108871; No Copyright; Avail.: National Technical Information Service (NTIS)
This report describes the experiments and modeling conducted to determine the effectiveness of commercially available in-room air cleaners (i.e., particulate matter (PM) filtration devices) in mitigating the impact of an aerosolized biological threat

agent attack on a building. In one set of experiments, two air cleaners were evaluated for their single-pass filtration efficiency as a function of airflow rate, particle diameter (ranging from 0.03 im to 10 im), and type of particle (an inert aerosol and a bioaerosol). One of the air cleaners tested was a high-efficiency particulate air (HEPA) filtration device, and the other was an electrostatic precipitator (ESP) air cleaner. Following the single-pass experiments, the HEPA filter was further evaluated to verify its effectiveness in reducing in-room PM levels.
NTIS
Air Filters; Air Pollution; Air Purification; Air Quality; Buildings; Indoor Air Pollution; Pollution Control; Protection

20090030701 Texas Univ., Austin, TX, USA; Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Determination of Sorption Parameters for 36 VOC/Material Combinations
Corsi, R. L.; Crain, N.; Fardal, J.; Little, J.; Xu, Y.; Oct. 2007; 70 pp.; In English
Report No.(s): PB2008-108846; No Copyright; Avail.: CASI: A04, Hardcopy

Sorptive interactions between gaseous pollutants and materials can be beneficial in terms of lowering pollutant concentrations and, thus, human exposure to those pollutants in buildings. However, the sorption process also leads to contamination of indoor materials and prolonged desorption of pollutants from materials. Scenarios for which sorptive interactions affect indoor air quality range from routine activities in buildings, e.g., use of cleaners or fragrances in homes to cigarette smoking in bars, to infrequent and extreme events, e.g., chemical spills in laboratories or terrorist releases of chemical warfare agents. A critical need in modeling indoor air quality during either routine or extreme events is the ability to model sorptive interactions between gaseous pollutants and indoor materials. However, the existing database is sparse with respect to model parameters for a wide range of chemicals and indoor materials. We address that need in this study through the use of seven chemicals with a wide range of physico-chemical properties and six different test materials that are commonly found in buildings. The purpose of this study is to provide data to the USA Environmental Protection Agency (USEPA) for the evaluation of mathematical models that are best suited for analysis of the fate of chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) that could be employed during acts of terror on buildings.
NTIS
Sorption; Volatile Organic Compounds

20090030708 Fluor Daniel Hanford, Inc., Richland, WA, USA
Plutonium Finishing Plant 241-Z Liquid Waste Treatment Facility Deactivation and Demolition. Submittal for 2008 Project of the Year
Jan. 2007; 38 pp.; In English
Report No.(s): DE2008-922692; HNF-36313; No Copyright; Avail.: National Technical Information Service (NTIS)

Fluor Hanford, Inc. (FH) is proud to submit the Plutonium Finishing Plant (PFP) 241-Z liquid Waste Treatment Facility Deactivation and Demolition (D&D) Project for consideration by the Project Management Institute as Project of the Year for 2008. The decommissioning of the 241-Z Facility presented numerous challenges, many of which were unique with in the Department of Energy (DOE) Complex. The majority of the project budget and schedule was allocated for cleaning out five below-grade tank vaults. These highly contaminated, confined spaces also presented significant industrial safety hazards that presented some of the most hazardous work environments on the Hanford Site. The 241-Z D&D Project encompassed diverse tasks: cleaning out and stabilizing five below-grade tank vaults (also called cells), manually size-reducing and removing over three tons of process piping from the vaults, permanently isolating service utilities, removing a large contaminated chemical supply tank, stabilizing and removing plutonium-contaminated ventilation ducts, demolishing three structures to grade, and installing an environmental barrier on the demolition site . All of this work was performed safely, on schedule, and under budget. During the deactivation phase of the project between November 2005 and February 2007, workers entered the highly contaminated confined-space tank vaults 428 times. Each entry (or 'dive') involved an average of three workers, thus equaling approximately 1,300 individual confined -space entries. Over the course of the entire deactivation and demolition period, there were no recordable injuries and only one minor reportable skin contamination. The 241-Z D&D Project was decommissioned under the provisions of the 'Hanford Federal Facility Agreement and Consent Order' (the Tri-Party Agreement or TPA), the 'Resource Conservation and Recovery Act of 1976' (RCRA), and the 'Comprehensive Environmental Response, Compensation, and Liability Act of 1980' (CERCLA). The project completed TPA Milestone M-083-032 to 'Complete those activities required by the 241-Z Treatment and Storage Unit's RCRA Closure Plan' four years and seven months ahead of this legally enforceable milestone.
NTIS
Deactivation; Hazardous Materials; Liquid Wastes; Plutonium 241; Radioactive Wastes; Waste Treatment

20090030722 Delaware Univ., Newark, DE, USA
Vessel Operator Engine Emissions Measurement Guide
Corbett, J. J.; May 2003; 61 pp.; In English
Report No.(s): PB2008-108495; No Copyright; Avail.: National Technical Information Service (NTIS)

Exhaust emissions monitoring has become an increasingly important issue as the marine transportation community seeks to reduce air emissions. However, estimates of current and projected pollution from marine engines are based uargely on emissions calculations rather than onboard measurements. These calculations make standard assumptions about vessel operations, engine load profiles, and emissions characteristics in the same way that emissions estimates are calculated for other air pollution sources. While this approach has been proven effective for large-scale inventories of emissions from well-understood sources like factories and cars, these methods may be less accurate when applied to sources that have not been extensively studied. It is widely acknowledged that in-service engines perform differently than the new engines tested and certified by manufacturers. Moreover, individual engines may not perform like the average engine described using composite industry profiles or international standards. The Maritime Administration (MARAD), in support of U.S. fleet technology development and modernization, has provided support for some of these tests and expects more operators will choose to test their marine engine emissions. As the principal advocate within Government for U.S. maritime interests, MARAD has initiated a Maritime Energy and Clean Emissions Program. The Program seeks to investigate and demonstrate the potential for new technologies and fuels to: (1) improve marine power plant efficiency and to reduce air emissions; (2) provide guidance and information on maritime energy and emissions regulatory and policy issues; and (3) protect the human and natural environment directly in contact with marine activity.
NTIS
Combustion Products; Diesel Engines; Exhaust Emission; Exhaust Gases

20090030723 West Virginia Univ., Morgantown, WV USA
SCX, Inc. Ferry Emissions Tests. Final Data Report
Thompson, G.; Tennant, C.; Sep. 05, 2003; 26 pp.; In English
Report No.(s): PB2008-108492; No Copyright; Avail.: CASI: A03, Hardcopy

In-use brake-specific mass exhaust emissions rates were determined for a high-speed hydrofoil ferryboat, the WaveRider. This vessel operates between Oceanside and San Diego, CA as a passenger ferrying service for commuters living north of San Diego. The ferry operates a single round-trip service during the weekday, departing from Oceanside in the morning to arrive in San Diego for the morning commute, and then leaving San Diego in the evening for a return trip to Oceanside. The vessel employs a retractable hydrofoil to achieve high speeds. A picture of the WaveRider is shown in Figure 1 with the hydrofoil deployed. The ferry is approximately 80 feet in length and is powered by four high-speed Detroit Diesel 12V92 compression ignition engines.
NTIS
Boats; Exhaust Emission

20090030727 Congressional Research Service, Washington, DC, USA
Air Quality Issues and Animal Agriculture: A Primer. (Updated January 28, 2008)
Copeland, C.; Jan. 28, 2008; 31 pp.; In English
Report No.(s): PB2008-108099; CRS-RL32948; No Copyright; Avail.: CASI: A03, Hardcopy

From an environmental quality standpoint, much of the public and policy interest in animal agriculture has focused on impacts on water resources, because animal waste, if not properly managed, can harm water quality through surface runoff, direct discharges, spills, and leaching into soil and groundwater. A more recent issue is the contribution of emissions from animal feeding operations (AFO), enterprises where animals are raised in confinement, to air pollution. This report provides background on the latter issue. It will be updated as warranted. AFOs can affect air quality through emissions of gases such as ammonia and hydrogen sulfide, particulate matter, volatile organic compounds, hazardous air pollutants, and odor. These pollutants and compounds have a number of environmental and human health effects.
NTIS
Agriculture; Air Pollution; Air Quality; Animals

20090030752 Geological Survey, Reston, VA USA

Ground Water Redox Zonation near La Pine, Oregon: Relation to River Position within the Aquifer-Riparian Zone Continuum

Hinkle, S. R.; Morgan, D. S.; Orzol, L. L.; Polette, D. J.; Jan. 2007; 39 pp.; In English

Report No.(s): PB2008-109260; USGS/SIR-2007-5239; No Copyright; Avail.: National Technical Information Service (NTIS)

Increasing residential development since in the 1960s has lead to increases in nitrate concentrations in shallow ground water in parts of the 247-square-mile study area near La Pine, Oregon. Denitrification is the dominant nitrate-removal process that occurs in suboxic ground water, and suboxic ground water serves as a barrier to transport of most nitrate in the aquifer. Oxic ground water, on the other hand, represents a potential pathway for nitrate transport from terrestrial recharge areas to the Deschutes and Little Deschutes Rivers. The effects of present and potential future discharge of ground-water nitrate into the nitrogen-limited Deschutes and Little Deschutes Rivers are not known. However, additions of nitrogen to nitrogen-limited rivers can lead to increases in primary productivity which, in turn, can increase the magnitudes of dissolved oxygen and pH swings in river water. An understanding of the distribution of oxic ground water in the near-river environment could facilitate understanding the vulnerability of these rivers and could be a useful tool for management of these rivers.

NTIS

Ground Water; Nitrates; Oxidation-Reduction Reactions; Rivers; Shorelines

20090030756 California State Univ., Long Beach, CA, USA

Development of an Exposure Model for Diesel Locomotive Emissions near the Alameda Corridor

Rahai, H. R.; Feb. 21, 2008; 21 pp.; In English

Contract(s)/Grant(s): METRANS-AR-05-03

Report No.(s): PB2008-109333; No Copyright; Avail.: CASI: A03, Hardcopy

The present investigation is part of a program of study at the Center for Energy and Environmental Research and Services (CEERS) at CSULB to assess the exposure risks of the particulate matter (PM) in the outdoor environment related to the seaport operations and goods movement. An approximation of PM2.5 concentration was obtained for the diesel locomotive emissions near the Alameda corridor railroad using a TSI DustTrak aerosol monitor. Measurements were carried out at different distances from the railroad from -4.6 m to 90 m, where the distance of -4.6 m denotes the distance from the other side of the railroad. For all measurements, local wind speed and direction were obtained using a Young model 85000 2-axis anemometer. The investigations were performed on different days. At each monitoring location, extended measurements were carried out to assess the effects of different locomotives on the local PM concentration. Results indicate between 10-15% increase in PM concentration from the passage of the diesel locomotives.

NTIS

Aerosols; Air Pollution; Combustion Products; Diesel Engines; Exhaust Emission; Exhaust Gases; Exposure; Locomotives; Models; Pollution Monitoring

20090030759 Forest Service, Syracuse, NY, USA; Massachusetts Univ., Amherst, MA, USA

Ozone Bioindicator Sampling and Estimation

Smith, G. C.; Smith, W. D.; Coulston, J. W.; Dec. 2007; 39 pp.; In English

Report No.(s): PB2008-109353; FSGTR-NRS-20; No Copyright; Avail.: National Technical Information Service (NTIS)

Ozone is an important forest stressor that has been measured at known phytotoxic levels at forest locations across the USA. The percent forest exhibiting negative impacts from ozone air pollution is one of the Montreal Process indicators of forest health and vitality. The ozone bioindicator data of the U.S. Forest Service Forest Inventory and Analysis Program (FIA) are the only source of information available that documents plant injury from air pollution using consistent protocols. This document introduces the FIA ozone indicator and describes the sampling and estimation procedures of the national biomonitoring program. We provide background material on ozone, examples of bioindicator summary statistics, a description of spatial interpolation, and methods to estimate status and change in forested areas with respect to the occurrence of ozone injury from ambient ozone concentrations. The goal is to provide guidance to analysts and researchers on ways to incorporate ozone bioindicator data into reports and research studies. Periodic recommendations to analysts on improved analytical techniques will be made. Analysts are encouraged to consult the companion user guide for additional guidance on interpreting the ozone biomonitoring data and reporting on the issue of ozone and forest health for the FIA program.

NTIS

Forests; Ozone; Sampling; Deterioration

20090030761 Environmental Protection Agency, Washington, DC USA
Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006
Apr. 15, 2008; 473 pp.; In English
Report No.(s): PB2008-109543; EPA/430/R-08/005; No Copyright; Avail.: National Technical Information Service (NTIS)

An emissions inventory that identifies and quantifies a country's primary anthropogenic sources and sinks of greenhouse gases is essential for addressing climate change. This inventory adheres to both (1) a comprehensive and detailed set of methodologies for estimating sources and sinks of anthropogenic greenhouse gases, and (2) a common and consistent mechanism that enables Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to compare the relative contribution of different emission sources and greenhouse gases to climate change. In 1992, the USA signed and ratified the UNFCCC. As stated in Article 2 of the UNFCCC, the ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. Parties to the Convention, by ratifying, shall develop, periodically update, publish and make available national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies. The USA views this report as an opportunity to fulfill these commitments. This chapter summarizes the latest information on U.S. anthropogenic greenhouse gas emission trends from 1990 through 2006. To ensure that the U.S. emissions inventory is comparable to those of other UNFCCC Parties, the estimates presented here were calculated using methodologies consistent with those recommended in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC/UNEP/OECD/IEA 1997), the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC 2000), and the IPCC Good Practice Guidance for Land Use, Land-Use Change, and Forestry (IPCC 2003). Additionally, the U.S. emission inventory has begun to incorporate new methodologies and data from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006). The structure of this report is consistent with the UNFCCC guidelines for inventory reporting. For most source categories, the Intergovernmental Panel on Climate Change (IPCC) methodologies were expanded, resulting in a more comprehensive and detailed estimate of emissions.
NTIS
Exhaust Emission; Exhaust Gases; Greenhouse Effect; Surveys; Air Pollution

20090030830 M.D.A. Marine Design Associates Ltd.., Victoria, British Columbia, Canada; Red and White Fleet, San Francisco, CA, USA
Proposed Conversion of M. V. Harbor Queen to Dual Fuel Operation
January 2008; 60 pp.; In English
Contract(s)/Grant(s): DTMA 1H01003
Report No.(s): PB2008-108512; No Copyright; Avail.: CASI: A04, Hardcopy

Over the past several months, the Red and White Fleet has worked closely with the Maritime Administration and Marine Design Associates Ltd. to assess the feasibility of converting one of our ferry vessels, the Harbor Queen, to dual fuel (CNG/diesel) as a pilot project. The Red and White Fleet believes that dual fuel technology offers an environmental and economical means of addressing marine vessel emissions and can be immediately applied to specific vessel operations. With this pilot project, we will further validate the findings of the Canadian Ministry of Transportation with their conversion of two, and a soon to be three, vessels. By partnering with Federal, State, and Local agencies to manage the initial capital costs of the conversion of the Harbor Queen, we will be able to demonstrate not only the environmental benefits of this fuel system but also its economic viability. A conservative estimate for NOx emissions savings for this pilot project is 2.5 tons per year (emissions reductions are addressed in greater detail in the attached report); however, it should be noted that with the success of this study, the Red and White Fleet will expand the application of dual fuel technology to its entire fleet of vessels, and the related environmental benefits will multiply. Additionally, as the recently appointed Bay Area Water Transit Authority moves forward with their implementation plan to expand ferry service on San Francisco Bay to include as many as 120 ferries serving 28 Bay Area terminals, it is reasonable to extrapolate the expected emissions savings even further to an annual savings of approximately 3,000 tons of NOx emissions, which is equivalent to 3.2 billion private vehicle passengers miles or removing 213,333 cars from the roads each year.
NTIS
Boats; Compressed Gas; Diesel Fuels; Feasibility; Harbors; Natural Gas; Substitutes

20090030831 Calstart, Inc., Burbank, CA, USA

Passenger Ferries, Air Quality, and Greenhouse Gases: Can System Expansion Result in Fewer Emissions in the San Francisco Bay Area. A CALSTART Study

Jul. 23, 2003; 90 pp.; In English

Report No.(s): PB2008-108511; No Copyright; Avail.: National Technical Information Service (NTIS)

Continued interest in improving air quality in the USA along with renewed interest in the expansion of urban passenger ferry service has created concern about air pollution from these vessels. This study shows, as others have before, that emissions from ferries are significant. However, it also shows that there are no serious technical impediments to the development of passenger ferries with much lower emissions than those currently in service, so that ferry commuting can become an environmentally sound choice. Achieving this outcome will require research and development of new technologies, followed by their widespread use. This study first analyzes air pollution (NOX, HC, PM, CO, SO2, and CO2) emissions from three passenger ferries in the San Francisco Bay Area with existing engines (providing the most accurate emissions estimate currently available). It then applies a number of new engine and emissions control technologies to the same level of service in order to evaluate the potential of these new technologies.

NTIS

Air Quality; Bays (Topographic Features); Boats; Fuels; Greenhouse Effect; Industries; Passengers; San Francisco Bay (CA)

20090030835 Walther Engineering Services, Inc., San Rafael, CA, USA

M/V Oski Emissions Tests Bio-Diesel and Inlet Air Water Injection. Final Report to MARAD

Jun. 26, 2002; 30 pp.; In English

Report No.(s): PB2008-108510; No Copyright; Avail.: National Technical Information Service (NTIS)

The M/V OSKI, a passenger only 12 knot ferry operated by Blue & Gold Fleet on San Francisco Bay, California, was tested for diesel engine emissions from August, 2001 until April, 2002 to determine the levels of engine emissions using normal off road diesel, 0.05% sulfur diesel, 20% and 100% soybean based biofuel. The tests were conducted on the starboard main engine underway, with and without water injection into the air inlet stream. At the conclusion of the waterborne tests a dynamometer test was conducted on the starboard engine, which had been recently removed and replaced with a low NOx engine. The following results were observed for engine operation at nearly full power. Partial RPMs produced similar results at a rate proportional to the percent of RPM except that CO was inversely proportional.

NTIS

Boats; Fuels; Gas Injection; Industries; Water Injection

20090030837 Maritime Administration, Washington, DC, USA; Naval Sea Systems Command, Bloomington, IN, USA; West Virginia Univ., Morgantown, WV, USA; Delaware Univ., Newark, DE, USA

Advocating the Development of Universal Onboard Marine Emission Measurement Protocols

Behr, R.; Gore, D.; DeHart, J.; Thompson, G.; Gautam, M.; Jan. 2008; 15 pp.; In English

Report No.(s): PB2008-108509; No Copyright; Avail.: CASI: A03, Hardcopy

This paper discusses the need for a set of widely accepted protocols, delineates the challenges presented by on-site testing in a marine environment, discusses testing approaches, and instrumentation and defines areas requiring further research. The paper also sets forth recommendations for future actions that could be undertaken to move the process of normalizing requirements forward. As a cumulative voluntary effort of the individual authors, this paper does not represent the position of their respective organizations. The pressure on the marine industry to reduce emissions continues to grow. Since requirements to reduce emissions can have significant impacts on operations and costs, it is important that the industry respond in an efficient and effective manner to present and future challenges. An important factor in most efforts to reduce marine emissions is the need for an accurate method to measure baseline and controlled emissions onboard vessels in operation. Testing protocols need to be developed that are well engineered, clearly documented and widely shared. These protocols may need to vary depending upon the end use of the data, but by developing a set of protocols that meet these requirements within best practices for accuracy and quality assurance, the cost and difficulty in achieving the ultimate goal of reducing emissions will be minimized.

NTIS

Boats; Industries; Protocol (Computers)

20090030838 Delaware Univ., Newark, DE, USA
Decision Framework for Emission Control Technology Selection. Final Report
Corbett, J. J.; Chapman, D. S.; Dec. 2003; 37 pp.; In English
Report No.(s): PB2008-108494; No Copyright; Avail.: National Technical Information Service (NTIS)

The marine transportation community has begun to consider technologies that reduce air emissions from marine engines. The Maritime Administration (MARAD), in support of U.S. fleet technology development and modernization, wants to accelerate the use of economical, low air emission marine power plants in the U.S. inland and coastal waters. As the principal advocate within Government for U.S. maritime interests, MARAD has initiated a Maritime Energy and Clean Emissions Program. The Program seeks to: (1) investigate and demonstrate the potential for new technologies and fuels to improve marine power plant efficiency and to reduce air emissions; (2) Provide guidance and information on maritime energy and emissions regulatory and policy issues; and (3) protect the human and natural environment directly in contact with marine activity. This document develops a decision framework applicable for considering emission control technologies on marine engines. The framework is informed by standard decision theory, and maintains an open structure so that it may be adapted by operators with specific vessel and technology attributes that may differ from those provided here.
NTIS
Marine Transportation; Exhaust Emission

20090030909 Congressional Research Service, Washington, DC, USA
Climate Change: Action by States to Address Greenhouse Gas Emissions. Updated November 23, 2007
Ramseur, J. L.; Nov. 23, 2007; 28 pp.; In English
Report No.(s): PB2008-108786; No Copyright; Avail.: CASI: A03, Hardcopy

In the absence of a federal climate change program, a number of states have taken actions that directly address greenhouse gases (GHGs). States efforts cover a wide range of policies. Although much of the early activity was largely symbolic, the more recent state actions have been more aggressive. Twenty-three states have joined one of the three regional partnerships that would require GHG (or just carbon dioxide) emission reductions. Set to take effect in 2009, the Regional Greenhouse Gas Initiative (RGGI) is a partnership of 10 Northeast and Mid-Atlantic states that creates up a cap-and-trade system aimed at limiting carbon dioxide emissions from power plants. Seven western states (and two Canadian provinces) have formed the Western Climate Initiative, which set an economy-wide GHG emissions target of 15% below 2005 levels by 2020. In addition, six states (and one Canadian province) signed the Midwestern Greenhouse Gas Reduction Accord, which would establish a multi-sector, GHG cap-and-trade program in the Midwest. The latter two programs are still in the early development stages, while many of RGGIs logistics have been decided by the participants. Three states California, Hawaii, and New Jersey have passed laws establishing mandatory, economy-wide GHG emission limits. However, the critical elements of these programs are still being developed. California has addressed GHG emissions on several fronts. To complement its statewide emissions reduction regime, California established GHG performance standards that would effectively limit the use of coal-generated electricity in California. In 2004, California issued regulations to reduce greenhouse gases from motor vehicles. At least 14 other states have indicated they intend to follow Californias new vehicle requirements. In addition, the state has also taken action to reduce the carbon intensity in its transportation fuels.
NTIS
Air Quality; Carbon Dioxide; Exhaust Emission; Exhaust Gases; Greenhouse Effect; Global Warming; Climate Change

20090030918 Pacific Northwest National Lab., Richland, WA, USA
Assessment of the HV-C2 Stack Sampling Probe Location
Glissmeyer, J. A.; Droppo, J. G.; Aug. 24, 2007; 209 pp.; In English
Contract(s)/Grant(s): AC05-76RL01830
Report No.(s): DE2008-919707; PNNL-16611; No Copyright; Avail.: National Technical Information Service (NTIS)

Tests were performed to evaluate the location of the air-sampling probe in the proposed design for the Waste Treatment Plants HV-C2 air exhaust stack. The evaluation criteria come from ANSI/HPS N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities. Pacific Northwest National Laboratory conducted the tests on a 3.67:1 scale model of the stack. Limited confirmatory tests on the actual stack will need to be conducted during cold startup of the High Level Waste Treatment Facility. The tests documented here assessed the capability of the air-monitoring probe to extract a sample representative of the effluent stream in accordance with criteria in ANSI/HPS N13.1. The test parameters covered the expected range of system flowrates with both one and two operating fans. The current stack design calls for the sampling probe to be located about 10 diameters downstream of the junction of the duct

from Fan A with the stack. In accordance with the statement of work and the test plan, the test measurements were made at that location and also at one point upstream and another downstream.
NTIS
Air Pollution; Air Sampling; Pollution Control; Position (Location); Radioactivity; Sampling; Stacks

20090030933 Environmental Protection Agency, Washington, DC, USA
Analysis of Costs to Abate International Ozone-Depleting Substance Substitute Emissions
Jun. 2004; 309 pp.; In English
Report No.(s): PB2008-108920; EPA/430/R-04/006; No Copyright; Avail.: National Technical Information Service (NTIS)

Since the introduction of the Montreal Protocol on Substances That Deplete the Ozone Layer, over a decade ago, international use of ozone-depleting substances (ODSs) has declined significantly. The key component of the Montreal Protocol is the stipulation that the production and consumption of all identified compounds that deplete the ozone layer are to be phased out by 2030 in developed countries and 2040 in developing countries. The use of hydrofluorocarbons (HFCs), and to a much lesser extent perfluorocarbons (PFCs), has allowed the rapid phaseout of chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and halons in the U.S. and other countries in applications for which other alternatives are not readily available. HFCs have generally been selected for applications where they provide superior technical (reliability) or safety (low toxicity and flammability) performance. In many cases, HFCs provide equal or better energy efficiency as compared to other available alternatives, thereby reducing long-term environmental impacts. HFCs are expected to replace a significant portion of past and current demand for ODSs in insulating foams, refrigeration and air-conditioning, propellants used in metered dose inhalers, specialized fire protection equipment, and in other applications.
NTIS
Air Law; Costs; International Law; Ozone; Ozone Depletion

20090030934 Sandia National Labs., Albuquerque, NM USA
Annual Groundwater Monitoring Report, Fiscal Year 2006, Groundwater Protection Program, Sandia National Laboratories, New Mexico
Lauffer, F.; Jackson, T.; Goering, T.; Skelly, M.; Griffith, S.; Mar. 2007; 338 pp.; In English
Contract(s)/Grant(s): DE-AC04-94A185000
Report No.(s): PB2008-108926; SAND2007-1199P; No Copyright; Avail.: National Technical Information Service (NTIS)

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned/ contractor-operated laboratory. Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, manages and operates the laboratory for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The DOE/NNSA Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2005. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention (P2), environmental restoration (ER), oil and chemical spill prevention, and the National Environmental Policy Act (NEPA). Environmental monitoring and surveillance programs are required by DOE Order 450.1, EnvironmentalProtection Program (DOE 2005) and DOE Order 231.1A, Environment, Safety,and Health Reporting (DOE 2004).
NTIS
Ground Water; Laboratories; Pollution Monitoring; Protection; Water Pollution

20090030938 Good Neighbor Environmental Board, Washington, DC, USA; Environmental Protection Agency, Washington, DC USA
U.S.-Mexico Border Environment. Air Quality and Transportation and Cultural and Natural Resources. Ninth Report of the Good Neighbor Environmental Board to the President and Congress of the USA
Mar. 2006; 78 pp.; In English
Report No.(s): PB2008-109298; EPA/130/R-06/002; No Copyright; Avail.: CASI: A05, Hardcopy

This years report, the Boards Ninth Report to the President and Congress, provides advice from two angles on maintaining healthy environmental quality along the U.S.-Mexico border. First, it examines the relationship between the regions air quality and the transportation activities upon which its economy indeed, the nations economy depends. The second topic, equally complex, is the interplay among ecosystem conditions, natural resources, and the state of the regions invaluable cultural resources such as its archaeological sites and its tribal sacred springs and mountains. For both topics, the Boards

recommendations reflect its continued call for action from strong partnerships, equipped with adequate resources, that span sectors and geographic boundaries.
NTIS
Air Pollution; Air Quality; Crossings; Cultural Resources; Earth Resources; Transportation; United States

20090031008 Brookhaven National Lab., Upton, NY USA
Photochemical CO2 Reduction by Rhenuim and Ruthenium Complexes
Fujita, E.; Muckerman, J. T.; Tanaka, K.; Nov. 2007; 4 pp.; In English
Report No.(s): DE2008-925820; BNL-79593-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Photochemical conversion of CO2 to fuels or useful chemicals using renewable solar energy is an attractive solution to both the world's need for fuels and the reduction of greenhouse gases. Rhenium(I) and ruthenium(II) diimine complexes have been shown to act as photocatalysts and/or electrocatalysts for CO2 reduction to CO. We have studied these photochemical systems focusing on the identification of intermediates and the bond formation/cleavage reactions between the metal center and CO2. For example, we have produced the one-electron-reduced monomer (i.e. Re(dmb)(CO)3S where dmb = 4,4'-dimethy-2,2'-bipyridine and S = solvent) either by reductive quenching of the excited states of fac-(Re(dmb)(CO)(sub 3)(CH(sub 3)CN))PF(sub 6) or by photo-induced homolysis of (Re(dmb)(CO)(sub 3))(sub 2). We previously found that: (1) the remarkably slow dimerization of Re(dmb)(CO)3S is due to the absence of a vacant coordination site for Re-Re bond formation, and the extra electron is located on the dmb ligand; (2) the reaction of Re(dmb)(CO)3S with CO2 forms a CO2-bridged binuclear species (CO)3(dmb)Re-CO(O)-Re(dmb)(CO)3 as an intermediate in CO formation; and (3) the kinetics and mechanism of reactions are consistent with the interaction of the CO(sub 2)-bridged binuclear species with CO2 to form CO and CO3(sup 2-).
NTIS
Air Pollution; Carbon Dioxide; Catalysts; Photochemical Reactions; Pollution Control; Ruthenium; Rhenium; Dimerization

20090031788 RTI International, Research Triangle Park, NC, USA
Resuspension and Tracking of Particulate Matter from Carpet Due to Human Activity
Thornburg, J.; Nov. 2007; 88 pp.; In English
Report No.(s): PB2008-108873; No Copyright; Avail.: National Technical Information Service (NTIS)

Each day adults and children are exposed to particulate matter (PM) from the flooring and other horizontal surfaces in their homes and offices. Potential health risks from inhalation and dermal exposure to this particulate matter exist. This particulate matter can include metals, pesticides, or terrorist-based materials such as anthrax, ricin or radiologics. The PM found on flooring stems primarily from dusts tracked in on shoes and ambient particle penetration from outside that deposits on the flooring and other horizontal surfaces. Once indoors, PM translocates throughout the residence. The major mechanisms of translocation are hypothesized to be resuspension and tracking, but the relative importance of these mechanisms is unknown. The goal of this research was to begin developing a fundamental understanding of generic PM movement within a residence. This project provided resuspension and tracking data to define the approach and scope of future research to determine primary routes of PM translocation within buildings. The resuspension research measured the magnitude of resuspended PM vertical and lateral concentration gradients within a room, confirmed that PM emission factors calculated from medium pile carpet agreed with laboratory-generated values, and determined whether residential vacuum cleaners were an effective remediation technique.
NTIS
Activity (Biology); Adults; Children; Human Reactions; Indoor Air Pollution; Particulates

20090031791 Georgia Inst. of Tech., Atlanta, GA, USA
Transit Bus Load-Based Modal Emission Rate Model Development
Feng, C.; Guensler, R.; Rodgers, M.; Jul. 2007; 319 pp.; In English
Contract(s)/Grant(s): EP-05C-000033
Report No.(s): PB2008-108876; No Copyright; Avail.: National Technical Information Service (NTIS)

Heavy-duty diesel vehicle (HDDVs) operations are a major source of oxides of nitrogen (NOx) and particulate matter (PM) emissions in metropolitan areas nationwide. Although HD-DVs constitute a small portion of the onroad fleet, they typically contribute more than 45% of NOx and 75% of PM onroad mobile source emissions (U.S. EPA 2003). HDDV emissions are a large source of global greenhouse gas and toxic air containment emissions. Over the last several decades, both government and private industry have made extensive efforts to regulate and control mobile source emissions. The relative

importance of emissions from HDDVs has increased significantly because today's gasoline powered vehicles are more than 95% cleaner than vehicles in 1968.
NTIS
Air Pollution; Industries; Loads (Forces)

20090031792 Environmental Protection Agency, Washington, DC USA
Kyoto Protocol: The Road to Ratification
January 2008; 8 pp.; In English
Report No.(s): PB2008-108881; No Copyright; Avail.: CASI: A02, Hardcopy

Climate change is the premier environmental challenge of the 21st century. The USA is committed to meeting this challenge, both through domestic actions to reduce greenhouse gas emissions and by helping shape an environmentally sound, cost-effective response under the United Nations Framework Convention on Climate Change (UNFCCC) and its 1997 Kyoto Protocol. Simply put: the USA is committed to completing work on the Kyoto Protocol and to its ratification and entry into force as soon as possible.
NTIS
Air Pollution; Environment Management; Pollution Control; Protocol (Computers); Roads

46
GEOPHYSICS

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

20090030032 Geophysical Observatory, Sodankyla, Finland; Geophysical Observatory, Sodankyla, Finland; Geophysical Observatory, Sodankyla, Finland
Magnetic Results: Sodankyla 2008
2009; 44 pp.; In English; Original contains black and white illustrations
Report No.(s): No. 104; Copyright; Avail.: Other Sources

The Sodankyla Geophysical Observatory was established in 1913; 1914 was the first year of magnetic recordings. The observatory is situated on the east bank of the river Kitinen, ca. 5 km south of Sodankyla village. Until 31.07.1997 it belonged to the Finnish Academy of Science and Letters. Since 01.08.1997 it has been the independent observatory of the University of Oulu. Three sets of variometers are used: a) FG (Danish) Fluxgate magnetometer; b) PSM (Polish) Photoelectric Torsion Magnetometer; and c) RM (Russian) Photoelectric Torsion Magnetometer. The base-line values of variometers were determined weekly with the following instruments: a) Overhauser magnetometer GSM-90; b) Fluxgate declinometer&inclinometer ('DI-flux') Elsec type 810. Observations during the year 2008 were made by Johannes Kultima and Tero Raita. The components recorded are X, Y and Z. The tabulated components are X, Y, Z, and the tabulations are based on FG digital recording. D (and Y) is positive eastwards, X northwards and Z downwards. The tabular unit of intensity components is 1 nT, that of D is 0.1'. Time used throughout is UT; hourly values are centered at half-hours. The values were controlled by comparing them with the other digital (PSM,RM) recordings. Monthly and annual tables were computed at the Observatory using a Macintosh computer. The K- and Ak-indices on the page 15 are determined from all components (HDZ) for historical reasons. The Bartels musical diagram on the page 37 is calculated using only components H and D.
Author
Geophysical Observatories; Magnetometers; Variometers; Magnetic Fields; Digital Systems; Data Recording

20090030388 California Univ., San Diego, La Jolla, CA, USA
Seismic Response of Precast Segmental Bridge Superstructures
Veletzos, M. J.; Restrepo, J. I.; Seible, F.; Dec. 2006; 109 pp.; In English
Contract(s)/Grant(s): UCSD-59A0337
Report No.(s): PB2008-105760; UCSD/SSRP-06/18; No Copyright; Avail.: National Technical Information Service (NTIS)

Precast segmental construction of bridges can accelerate construction and minimize the cost of bridges in highly congested urban environments and environmentally sensitive regions. Despite their proven benefits, the use of precast segmental bridges in seismic regions of the USA remains very limited. A main obstacle to their use is the concern about the seismic response of segment joints. Recent research has shown that segment joints can undergo very large rotations that open up gaps in the superstructure, without significant loss of strength. While the ultimate performance of segment joints was

investigated, the expected response during a significant seismic event remains uncertain. Using models of precast segmental bridges, similar to the Otay River Bridge and the San Francisco-Oakland Bay Bridge Skyway as case studies, this report will investigate the response of segment joints using detailed non-linear time-history analysis. A suite of ten near field earthquake records were used to determine the median joint response as well as to quantify the effect of vertical motion on the joint response.
NTIS
Bridges (Structures); Concretes

20090030792 Federal Emergency Management Agency, Washington, DC USA
Supplementary Environmental Assessment: Farm Shop Storage Building Project, California Polytechnic State University, FEMA-1505-DR-CA
Jul. 2007; 36 pp.; In English
Report No.(s): PB2008-106957; No Copyright; Avail.: National Technical Information Service (NTIS)

The California Polytechnic State University (Cal Poly) has applied to the Federal Emergency Management Agency (FEMA) through the State of California Governor's Office of Emergency Services (OES) for assistance with the repair and relocation of the farm shop storage building. The storage building was damaged during the San Simeon Earthquake of December 22, 2003 which resulted in the presidential disaster declaration FEMA-DR-1505-CA. FEMA intends to fund the proposed action under the Public Assistance (PA) Program that was implemented in response to the disaster.
NTIS
Buildings; Earthquakes

20090030797 Geological Survey, Reston, VA USA; New Jersey Dept. of Environmental Protection, Trenton, NJ USA
Development of the Hydroecological Integrity Assessment Process for Determining Environmental Flows for New Jersey Streams
Kennen, J. G.; Henriksen, J. A.; Nieswand, S. P.; January 2007; 65 pp.; In English
Report No.(s): PB2008-108765; USGS-SIR-2007-5206; No Copyright; Avail.: National Technical Information Service (NTIS)

The natural flow regime paradigm and parallel stream ecological concepts and theories have established the benefits of maintaining or restoring the full range of natural hydrologic variation for physiochemical processes, biodiversity, and the evolutionary potential of aquatic and riparian communities. A synthesis of recent advances in hydroecological research coupled with stream classification has resulted in a new process to determine environmental flows and assess hydrologic alteration. This process has national and international applicability. It allows classification of streams into hydrologic stream classes and identification of a set of non-redundant and ecologically relevant hydrologic indices for 10 critical sub-components of flow. Three computer programs have been developed for implementing the Hydroecological Integrity Assessment Process (HIP): (1) the Hydrologic Indices Tool (HIT), which calculates 171 ecologically relevant hydrologic indices on the basis of daily-flow and peak-flow stream-gage data; (2) the New Jersey Hydrologic Assessment Tool (NJHAT), which can be used to establish a hydrologic baseline period, provide options for setting baseline environmental-flow standards, and compare past and proposed streamflow alterations; and (3) the New Jersey Stream Classification Tool (NJSCT), designed for placing unclassified streams into pre-defined stream classes. Biological and multivariate response models including principal-component, cluster, and discriminant-function analyses aided in the development of software and implementation of the HIP for New Jersey. A pilot effort is currently underway by the New Jersey Department of Environmental Protection in which the HIP is being used to evaluate the effects of past and proposed surface-water use, ground-water extraction, and land-use changes on stream ecosystems while determining the most effective way to integrate the process into ongoing regulatory programs. Ultimately, this scientifically defensible process will help to quantify the effects of anthropogenic changes and development on hydrologic variability and help planners and resource managers balance current and future water requirements with ecological needs.
NTIS
Streams; Hydrology; Rivers; Classifications

Includes weather observation forecasting and modification.

20090030133 Geological Survey, Reston, VA USA; Environmental Protection Agency, Washington, DC USA
Water-Balance Model of a Wetland on the Fort Berthold Reservation, North Dakota
Vining, K. C.; Jan. 2007; 22 pp.; In English
Report No.(s): PB2008-107878; USGS-SIR-2007-5034; No Copyright; Avail.: National Technical Information Service (NTIS)

A numerical water-balance model was developed to simulate the responses of a wetland on the Fort Berthold Reservation, North Dakota, to historical and possible extreme hydrological inputs and to changes in hydrological inputs that might occur if a proposed refinery is built on the reservation. Results from model simulations indicated that the study wetland would likely contain water during most historical and extreme-precipitation events with the addition of maximum potential discharges of 0.6 acre-foot per day from proposed refinery holding ponds. Extended periods with little precipitation and above-normal temperatures may result in the wetland becoming nearly dry, especially if potential holding-pond discharges are near zero. Daily simulations based on the historical-enhanced climate data set for May and June 2005, which included holding-pond discharges of 0.6 acre-foot per day, indicated that the study-wetland maximum simulated water volume was about 16.2 acre-feet and the maximum simulated water level was about 1.2 feet at the outlet culvert. Daily simulations based on the extreme summer data set, created to represent an extreme event with excessive June precipitation and holding-pond discharges of 0.6 acre-foot per day, indicated that the study-wetland maximum simulated water volume was about 38.6 acre-feet and the maximum simulated water level was about 2.6 feet at the outlet culvert. A simulation performed using the extreme winter climate data set and an outlet culvert blocked with snow and ice resulted in the greatest simulated wetland water volume of about 132 acre-feet and the greatest simulated water level, which would have been about 6.2 feet at the outlet culvert, but water was not likely to overflow an adjacent highway.
NTIS
Hydrology; Water Balance; Water Tables; Wetlands

20090030141 URS Group, Inc., Gaithersburg, MD, USA
Hurricane Katrina Rapid Response Wind Water Line (WWL) Data Collection - Louisiana
Jun. 09, 2006; 66 pp.; In English
Report No.(s): PB2008-108304; No Copyright; Avail.: National Technical Information Service (NTIS)

After a hurricane impacts a coastal area with significant flooding, it is imperative that data be collected to document the event to assist in response, recovery, and mitigation efforts, and to improve disaster preparedness and prevention efforts for future disasters. Wind Water Line (WWL) data collection is an initial step in accurately documenting an event. These data help place the event in historical perspective and improve the ability to estimate current flood risk and future event prediction. Collection of site-specific flood inundation data along rivers, bays, and coasts has numerous applications. The purpose of this particular data collection effort was to document the extent of flooding caused by storm surge that occurred as a result of Hurricane Katrina in southeast Louisiana.
NTIS
Data Acquisition; Emergencies; Hurricanes; Management Methods; Water; Wind Measurement

20090030142 URS Group, Inc., Gaithersburg, MD, USA
Hurricane Katrina Rapid Response Wind Water Line (WWL) Data Collection - Mississippi
Jun. 09, 2006; 62 pp.; In English
Report No.(s): PB2008-108305; No Copyright; Avail.: National Technical Information Service (NTIS)

Collection of site-specific flood inundation data along rivers, bays, and coasts has numerous applications. The purpose of this particular data collection effort was to document the extent of flooding caused by storm surge that occurred as a result of Hurricane Katrina in coastal Mississippi. There are several potential uses for these data, including: (1) Estimating storm frequency and severity; (2) Assessing accuracy of Flood Insurance Rate Maps (FIRMs); (3) Providing information for use with other studies, including FEMA Building Performance Assessments; (4) Assisting with the prioritization of mitigation projects

and providing data for use in benefit/cost analyses; (5) Sharing information for calibrating models that simulate the storm (for example, HAZUS and other coastal storm surge models); and (6) When coupled with sufficient data density and observational information, the data can be used to help create flood recovery maps; building officials can use the maps to update guidance for both reconstruction and future construction by local citizens, developers, and contractors.
NTIS
Data Acquisition; Hurricanes; Water; Wind Measurement

20090030143 URS Group, Inc., Gaithersburg, MD, USA
Hurricane Katrina Rapid Response Wind Water Line (WWL) Data Collection - Alabama
Jun. 09, 2006; 52 pp.; In English
Report No.(s): PB2008-108306; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of WWL data collection is to determine the inland extent of damages caused by storm surge-induced flooding, and differentiate this area from those areas farther inland where damages were primarily the result of wind forces. By delineating the WWL, an approximate boundary is created to distinguish areas where both storm surge-induced flooding and wind forces caused damage to structures from those areas where wind forces were the primary cause of damages to structures and storm surge flooding did not have a significant impact. Sometimes, the WWL is located along the debris line, but in some cases, inundation and flood damages extend beyond the area where major debris was deposited.
NTIS
Data Acquisition; Hurricanes; Water; Wind Measurement

20090030168 Department of Energy, Washington, DC, USA
Status of the ACRF Millimeter Wave Cloud Radars (MMCRs), the Path Forward for Future MMCR Upgrades, the Concept of 3D Volume Imaging Radar and the UAV Radar
Kollias, P.; Mille, M. A.; Widener, K. B.; Marchandr, R. T.; Ackerman, T. P.; Dec. 30, 2005; 24 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2009-948524; DOE/SC-ARM/TR-085; No Copyright; Avail.: National Technical Information Service (NTIS)

The USA (U.S.) Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) operates millimeter wavelength cloud radars (MMCRs) in several climatological regimes. The MMCRs, are the primary observing tool for quantifying the properties of nearly all radiatively important clouds over the ACRF sites. The first MMCR was installed at the ACRF Southern Great Plains (SGP) site nine years ago and its original design can be traced to the early 90s. Since then, several MMCRs have been deployed at the ACRF sites, while no significant hardware upgrades have been performed. Recently, a two-stage upgrade (first C-40 Digital Signal Processors (DSP)-based, and later the PC-Integrated Radar AcQuisition System (PIRAQ-III) digital receiver) of the MMCR signal-processing units was completed.
NTIS
Imaging Radar; Millimeter Waves

20090030169 Department of Energy, Washington, DC, USA
Retrieving Temperature and Moisture Profiles from AERI Radiance Observations: AERIPROF Value-Added Product Technical Description Revision 1
Feltz, W. F.; Howell, H. B.; Knuteson, R. O.; Comstock, J. M.; Mahon, R.; Apr. 30, 2007; 35 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2009-948526; DOE/SC-ARM/TR-066.1; No Copyright; Avail.: National Technical Information Service (NTIS)

This document explains the procedure to retrieve temperature and moisture profiles from high-spectral resolution infrared radiance data measured by the U.S. Department of Energy (DOE) Atmospheric Radiation (ARM) Programs atmospheric emitted radiance interferometer (AERI) instrument. The technique has been named the AERIPROF thermodynamic retrieval algorithm. The software has been developed over the last decade at the University of Wisconsin-Madison and has matured into an ARM Value-Added Procedure. This document will describe the AERIPROF retrieval procedure, outline the algorithm routines, discuss the software heritage, and, finally, provide references with further documentation.
NTIS
Moisture; Radiance; Temperature Distribution; Temperature Profiles

20090030175 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1935
Gregg, W. R.; January 1935; 14 pp.; In English
Report No.(s): PB2009-112366; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorological Services; Weather Forecasting

20090030176 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1934
Gregg, W. G.; January 1934; 8 pp.; In English
Report No.(s): PB2009-112365; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030177 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1936
Gregg, W. R.; Jan. 1936; 16 pp.; In English
Report No.(s): PB2009-112367; No Copyright; Avail.: CASI: A03, Hardcopy

The meteorological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather service be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meteorological records, the State Weather

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NTIS
Meteorological Services; Meteorology; Weather Forecasting; Weather

20090030178 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1937
Gregg, W. R.; Jan. 1937; 17 pp.; In English
Report No.(s): PB2009-112368; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030179 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1938
Gregg, W. R.; Jan. 1938; 16 pp.; In English
Report No.(s): PB2009-112369; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030180 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1940
Reichelderfer, F. W.; Jan. 1940; 17 pp.; In English
Report No.(s): PB2009-112371; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from

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NTIS
Storms; Climate; Weather Forecasting

20090030181 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1939
Reichelderfer, F. W.; Jan. 1939; 22 pp.; In English
Report No.(s): PB2009-112370; No Copyright; Avail.: CASI: A03, Hardcopy

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NTIS
Storms; Climate; Weather Forecasting

20090030182 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1941
Reichelderfer, F. W.; Jan. 1941; 17 pp.; In English
Report No.(s): PB2009-112372; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030183 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1942
Reichelderfer, F. W.; Jan. 1942; 10 pp.; In English
Report No.(s): PB2009-112373; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030184 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1947
Reichelderfer, F. W.; Jan. 1947; 17 pp.; In English
Report No.(s): PB2009-112375; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030185 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1946
Reichelderfer, F. W.; Jan. 1946; 15 pp.; In English
Report No.(s): PB2009-112374; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather

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NTIS
Storms; Climate; Weather Forecasting

20090030186 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1949-1950
Reichelderfer, F. W.; Jan. 1949; 9 pp.; In English
Report No.(s): PB2009-112377; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Climate; Storms

20090030187 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1948
Reichelderfer, F. W.; Jan. 1948; 35 pp.; In English
Report No.(s): PB2009-112376; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting

20090030188 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1951
Reichelderfer, F. W.; Jan. 1951; 7 pp.; In English
Report No.(s): PB2009-112378; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from

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NTIS
Weather Forecasting; Storms; Climate

20090030240 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1933
Marvin, C. F.; Jan. 1933; 9 pp.; In English
Report No.(s): PB2009-112364; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Meteorology; Weather; Weather Forecasting

20090030241 Department of Energy, Germantown, MD, USA
SGP Cloud and Land Surface Interaction Campaign (CLASIC): Science and Implementation Plan
Miller, M. A.; Avissar, R.; Berg, L.; Edgerton, S.; Fischer, M.; Jun. 2007; 17 pp.; In English
Report No.(s): DE2009-948100; DOE/SC-ARM-0703; No Copyright; Avail.: Department of Energy Information Bridge

The Cloud and Land Surface Interaction Campaign is a field experiment designed to collect a comprehensive data set that can be used to quantify the interactions that occur between the atmosphere, biosphere, land surface, and subsurface. A particular focus will be on how these interactions modulate the abundance and characteristics of small and medium size cumuliform clouds that are generated by local convection. These interactions are not well understood and are responsible for large uncertainties in global climate models, which are used to forecast future climate states. The campaign will be conducted from June 8 to June 30, 2007, at the U.S. Department of Energys Atmospheric Radiation Measurement Climate Research Facility Southern Great Plains site. Data will be collected using eight aircraft equipped with a variety of specialized sensors, four specially instrumented surface sites, and two prototype surface radar systems. The architecture of Cloud and Land Surface Interaction Campaign includes a high-altitude surveillance aircraft and enhanced vertical thermodynamic and wind profile measurements that will characterize the synoptic scale structure of the clouds and the land surface within the Atmospheric Radiation Measurement Climate Research Facility Southern Great Plains site. Mesoscale and microscale structures will be sampled with a variety of aircraft, surface, and radar observations.
NTIS
Earth Surface; Great Plains Corridor (North America); Land Surface Temperature; Surface Reactions

20090030242 Department of Energy, Germantown, MD, USA
ACRF Ingest Software Status: New Current, and Future (February 2007)
Feb. 2007; 22 pp.; In English
Report No.(s): DE2009-948358; DOE/SC-ARM/P-07-004.1; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide status of the ingest software used to status of the ingest software used to process instrument data for the Atmospheric Radiation Measurement Program Climate Research Facility (ACRF). The report is divided into 4 sections: (1) for news about ingests currently under development, (2) for current production ingests, (3) for future ingest development plans, and (4) for information on retired ingests.
NTIS
Atmospheric Radiation; Climate; Radiation Measurement; Research Facilities

20090030252 Department of Energy, Washington, DC, USA
ACRF Instrumentation Status: New, Current, and Future (September 2008)
Sep. 2008; 22 pp.; In English
Report No.(s): DE2009-948098; DOE/SC-ARM/P-08-004.9; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide a concise but comprehensive overview of Atmospheric Radiation Measurement Climate Research Facility instrumentation status. The report is divided into the following four sections: (1) new instrumentation in the process of being acquired and deployed, (2) existing instrumentation and progress on improvements or upgrades, (3) proposed future instrumentation, and (4) Small Business Innovation Research instrument development.
NTIS
Atmospheric Radiation; Climate; Commerce; Radiation Measurement; Research Facilities

20090030263 Department of Energy, Germantown, MD, USA
ACRF Instrumentation Status: New, Current, and Future (November-December 2007)
Dec. 2007; 37 pp.; In English
Report No.(s): DE2009-948028; DOE/SC-ARM/P-07-002.10; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide a concise but comprehensive overview of Atmospheric Radiation Measurement Climate Research Facility instrumentation status. The report is divided into the following four sections: (1) new instrumentation in the process of being acquired and deployed, (2) existing instrumentation and progress on improvements or upgrades, (3) proposed future instrumentation, and (4) Small Business Innovation Research instrument development.
NTIS
Atmospheric Radiation; Climate; Commerce; Radiation Measurement; Research Facilities

20090030264 Department of Energy, Germantown, MD, USA
Atmospheric Properties from the 2006 Niamey Deployment and Climate Simulation with a Geodesic Grid Coupled Climate Model. First Quarter 2008
Mather, J.; Randall, D.; Dec. 2007; 13 pp.; In English
Report No.(s): DE2009-948094; DOE/SC-ARM/P-07-0017; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2008, the Atmospheric Radiation Measurement (ARM) program and the Climate Change Prediction Program (CCPP) have been asked to produce joint science metrics. For CCPP, the metrics will deal with a decade-long control simulation using geodesic grid-coupled climate model. For ARM, the metrics will deal with observations associated with the 2006 deployment of the ARM Mobile Facility (AMF) to Niamey, Niger. Specifically, ARM has been asked to deliver data products for Niamey that describe cloud, aerosol, and dust properties. The first quarter milestone is initial formulation of the algorithm to produce and make available, new continuous time series of retrieved cloud , aerosol and dust properties, based on results from the ARM Mobile Facility deployment in Niger, Africa.
NTIS
Atmospheric Chemistry; Atmospheric Radiation; Climate; Climate Models; Deployment; Meteorological Parameters; Niger; Radiation Measurement; Simulation

20090030265 Department of Energy, Washington, DC, USA
ACRF Instrumentation Status: New, Current, and Future (October-November 2007)
Oct. 2007; 41 pp.; In English
Report No.(s): DE2009-948095; DOE/SC-ARM/P-07-002.9; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide a concise but comprehensive overview of Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) instrumentation status. The report is divided into the following four sections: (1) new instrumentation in the process of being acquired and deployed, (2) existing instrumentation and progress on improvements or upgrades, (3) proposed future instrumentation, and (4) SBIR instrument development.
NTIS
Atmospheric Radiation; Climate; Radiation Measurement; Research Facilities

20090030266 Department of Energy, Washington, DC, USA
ACRF Instrumentation Status: New, Current, and Future (September-October 2007)
Oct. 2007; 39 pp.; In English
Report No.(s): DE2009-948096; DOE/SC-ARM/P-07-002.8; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide a concise but comprehensive overview of Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) instrumentation status. The report is divided into the following four sections: (1) new instrumentation in the process of being acquired and deployed, (2) existing instrumentation and progress on improvements or upgrades, (3) proposed future instrumentation, and (4) SBIR instrument development.
NTIS
Atmospheric Radiation; Climate; Radiation Measurement; Research Facilities

20090030267 Pacific Northwest National Lab., Richland, WA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Evaluation of A New Mixed-Phase Cloud Microphysics Parameterization with the NCAR Climate Atmospheric Model (CAM3) and ARM Observations. Fourth Quarter 2007 ARM Metric Report
Liu, X.; Ghan, S. J.; Sep. 2007; 10 pp.; In English
Report No.(s): DE2009-948097; DOE/SC-ARM/P-07-012; No Copyright; Avail.: National Technical Information Service (NTIS)

Mixed-phase clouds are composed of a mixture of cloud droplets and ice crystals. The cloud microphysics in mixed-phase clouds can significantly impact cloud optical depth, cloud radiative forcing, and cloud coverage. However, the treatment of mixed-phase clouds in most current climate models is crude and the partitioning of condensed water into liquid droplets and ice crystals is prescribed as temperature dependent functions. In our previous 2007 ARM metric reports a new mixed-phase cloud microphysics parameterization (for ice nucleation and water vapor deposition) was documented and implemented in the NCAR Community Atmospheric Model Version 3 (CAM3). The new scheme was tested against the Atmospheric Radiation Measurement (ARM) Mixed-phase Arctic Cloud Experiment (M-PACE) observations using the single column modeling and short-range weather forecast approaches. In this report this new parameterization is further tested with CAM3 in its climate simulations. It is shown that the predicted ice water content from CAM3 with the new parameterization is in better agreement with the ARM measurements at the Southern Great Plain (SGP) site for the mixed-phase clouds.
NTIS
Atmospheric Models; Climate Models; Cloud Physics; Parameterization; Water Vapor

20090030268 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1923
Marvin, C. F.; Jan. 1923; 29 pp.; In English
Report No.(s): PB2009-112176; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made

available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Storms (Meteorology); Meteorology

20090030269 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1924
Marvin, C. F.; Jan. 1924; 20 pp.; In English
Report No.(s): PB2009-112177; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Meteorology; Storms; Weather Forecasting; Climate

20090030270 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1925
Marvin, C. F.; 1925; 13 pp.; In English
Report No.(s): PB2009-112178; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Climate; Storms; Meteorology

20090030271 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1926
Marvin, C. F.; 1926; 4 pp.; In English
Report No.(s): PB2009-112179; No Copyright; Avail.: CASI: A01, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Climate; Weather Forecasting; Meteorology

20090030272 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1928
Marvin, C. F.; 1928; 9 pp.; In English
Report No.(s): PB2009-112180; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Meteorology; Weather Forecasting

20090030274 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1929
Marvin, C. F.; Jan. 1929; 4 pp.; In English
Report No.(s): PB2009-112361; No Copyright; Avail.: CASI: A01, Hardcopy

The meteorological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather service be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meteorological records, the State Weather

Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Storms; Meteorology

20090030275 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1930
Marvin, C. F.; Jan. 1930; 17 pp.; In English
Report No.(s): PB2009-112362; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Storms; Meteorology; Weather Forecasting

20090030276 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1931
Marvin, C. F.; Jan. 1931; 22 pp.; In English
Report No.(s): PB2009-112363; No Copyright; Avail.: CASI: A03, Hardcopy

The meteorological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather service be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meteorological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Storms; Meteorology

20090030305 Federal Emergency Management Agency, Washington, DC, USA
Hurricane Opal in Florida: A Building Performance Assessment
Aug. 1996; 46 pp.; In English
Report No.(s): PB2008-108326; FEMA-281; No Copyright; Avail.: CASI: A03, Hardcopy

On October 4, 1995, Hurricane Opal made landfall on Santa Rosa Island, Florida, near Navarre Beach at approximate 6:00 p.m. C.D.T. (central daylight time). As a Result of the damage caused by Hurricane Opal, President Clinton declared 15 counties in the Florida Panhandle and Lee County, on the southwest Florida coast, Federal disaster areas. The Federal

Emergency Management Agency (FEMA) deployed a Building Performance Assessment Team (BPAT) whose mission was to evaluate structural damage and recommend mitigation measures that will enhance the performance of buildings in future storms. The team was composed of engineers and building construction specialists from FEMA, the State of Florida, and the private sector (see the Appendix for a list of the team members). The BPAT conducted its evaluation in the area where most of the severe damage was concentrated: along a 200-mile stretch of Florida's Gulf of Mexico shoreline, between Pensacola Beach, in Escambia County, and St. Joseph Spit, in Gulf County. The BPAT's observations focused on the performance of buildings during the hurricane, including both successes and failures. These observations and the BPAT's recommendations are documented in this report.
NTIS
Buildings; Damage; Hurricanes; Structural Analysis

20090030385 Geological Survey, Reston, VA USA; Cambridge Water Dept., MA, USA
Hydrologic, Water-Quality, and Meteorological Data for the Cambridge, Massachusetts, Drinking-Water Source Area, Water Year 2005
Smith, K. P.; January 2005; 129 pp.; In English
Report No.(s): PB2008-105254; USGS-OFR-2007-1049; No Copyright; Avail.: National Technical Information Service (NTIS)

Records of water quantity, water quality, and meteorological parameters were continuously collected from three reservoirs, two primary streams, and four subbasin tributaries in the Cambridge, Massachusetts, drinking-water source area during water year 2005 (October 2004 through September 2005). Water samples were collected during base-flow conditions and storms in the subbasins of the Cambridge Reservoir and Stony Brook Reservoir drainage areas and analyzed for selected elements, organic constituents, suspended sediment, and Escherichia coli bacteria. These data were collected to assist watershed administrators in managing the drinking water source area and to identify potential sources of contaminants and trends in contaminant loading to the water supply. Monthly reservoir capacities for the Cambridge Reservoir varied from about 59 to 98 percent during water year 2005, while monthly reservoir capacities for the Stony Brook Reservoir and the Fresh Pond Reservoir were maintained at capacities greater than 84 and 96 percent, respectively. Assuming a water demand of 15 million gallons per day by the city of Cambridge, the volume of water released from the Stony Brook Reservoir to the Charles River during the 2005 water year is equivalent to an annual water surplus of about 119 percent. Recorded precipitation in the source area for the 2005 water year was within 2 inches of the total annual precipitation for the previous 2 water years.
NTIS
Massachusetts; Meteorological Parameters; Pollution Monitoring; Potable Water; Water; Water Pollution; Water Quality

20090030392 Department of Homeland Security, Washington, DC, USA
Hurricane Katrina Control Assistance. US-CERT Informational Paper
Sep. 16, 2005; 7 pp.; In English
Report No.(s): PB2008-108192; No Copyright; Avail.: CASI: A02, Hardcopy

Department of Homeland Security recognizes many critical infrastructure control systems were shutdown, damaged, or destroyed as a result of Hurricane Katrina. This document provides assistance to owners and operators in rebuilding and securely restarting those sensitive control systems.
NTIS
Emergencies; Hurricanes; Management Methods

20090030437 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Argonne National Lab., IL USA; Brookhaven National Lab., Upton, NY USA; Oak Ridge National Lab., TN USA
BER Science Network Requirements: Report of the Biological and Environmental Research Network Requirements Workshop Conducted July 26 and 27, 2007
Jan. 2007; 35 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-924773; LBNL/PUB-988; No Copyright; Avail.: National Technical Information Service (NTIS)

The Energy Sciences Network (ESnet) is the primary provider of network connectivity for the US Department of Energy Office of Science, the single largest supporter of basic research in the physical sciences in the USA of America. In support of the Office of Science programs, ESnet regularly updates and refreshes its understanding of the networking requirements of the instruments, facilities, scientists, and science programs that it serves. This focus has helped ESnet to be a highly successful

enabler of scientific discovery for over 20 years. In July 2007, ESnet and the Biological and Environmental Research (BER) Program Office of the DOE Office of Science organized a workshop to characterize the networking requirements of the science programs funded by the BER Program Office. These included several large programs and facilities, including Atmospheric Radiation Measurement (ARM) Program and the ARM Climate Research Facility (ACRF), Bioinformatics and Life Sciences Programs, Climate Sciences Programs, the Environmental Molecular Sciences Laboratory at PNNL, the Joint Genome Institute (JGI). National Center for Atmospheric Research (NCAR) also participated in the workshop and contributed a section to this report due to the fact that a large distributed data repository for climate data will be established at NERSC, ORNL and NCAR, and this will have an effect on ESnet.
NTIS
Physical Sciences; Research Facilities; Environmental Laboratories; Computer Networks

20090030513 NASA Wallops Flight Center, Wallops Island, VA USA
A Relationship Between Atmospheric Rain Reflectivity and Elevation Variance Due to Drop Impact on the Sea Surface
Craeye, C.; Sobieski, P.; Bliven, L.F.; Sep. 2003; 5 pp.; In English; Oceans 2003, 22 - 26 Sep. 2003, San Diego, CA, USA; Original contains color illustrations
Report No.(s): AD-A499777; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADA499777; http://dx.doi.org/10.1109/OCEANS.2003.178634

The additional surface roughness created by drops impacting the sea surface can bias wind speed estimates obtained from satellite scatterometric measurements. The additional roughness essentially depends on the rain content in very large drops. The estimate of this contribution will be highly dependent on the model chosen for the drop size distribution. However, it has been observed that the reflectivity of the drops falling in the atmosphere has a drop size dependence that is very similar to that of the surface roughness induced by rain. This paper shows how reflectivity data can be used to improve the estimate of the elevation variance resulting from drop impact.
Author
Drop Size; Elevation; Estimates; Ocean Surface; Rain; Raindrops; Reflectance; Size Distribution; Surface Roughness; Wind Velocity; Satellite Observation; Remote Sensing

20090030651 Air Force Research Lab., Kirkland AFB, NM USA
The Balloon Ring: A High-Performance Low-Cost Instrumentation Platform for Measuring Atmospheric Turbulence Profiles
Kyrazis, Demos T.; Eaton, Frank D.; Black, Don G.; Black, Wiley; Black, Alastair; Proceedings of the Society of Photo-Optical Instrumentation Engineers (SPIE) Optics and Photonics Conference; 22 Jun. 2009; 16 pp.; In English; Society of Photo-Optical Instrumentation Engineers (SPIE) Optics and Photonics Conference, 2 - 6 Aug. 2009, San Diego, CA, USA
Report No.(s): AD-A502790; AFRL-RD-PS-TP-2009-1011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Balloons, similar to those used for meteorological observations, are commonly used to carry a small instrumentation package for measuring optical turbulence in the atmosphere as a function of altitude. Two temperature sensors, one meter apart, measure a single point of the temperature structure function. The raw data is processed to provide the value of cr2, and the results transmitted to a ground receiving site. These data are converted to the index of refraction structure constant, Cn2. The validity of these measurements depend on the correctness of a number of assumptions. These include local isotropy of the turbulence and the existence of the Kolmogorov inertial sub range, and that the data is not contaminated by the wake of these ascending balloons. A variety of experiments on other platforms, and in the laboratory, demonstrate that the assumptions upon which these balloon measurements are made are not valid for a large percentage of the flights. In order to collect data whose interpretation did not require preconceived assumptions, the balloon ring instrumentation system was developed. The ring is 28.5 meters in diameter, with a crosssectional diameter is 14 cm. The ring is hung just below the balloon, so that the wake goes through the center of the ring, and the sensors are mounted tangent to the circumference of the ring.
DTIC
Atmospheric Circulation; Atmospheric Turbulence; Balloon Sounding; Kolmogorov Theory; Low Cost; Meteorological Balloons; Meteorological Instruments; Performance Tests; Refractivity; Turbulence

20090030696 Geological Survey, Reston, VA USA
Effects of Climatic Extremes on Ground Water in Western Utah, 1930-2005
Gates, J. S.; January 2007; 19 pp.; In English
Report No.(s): PB2008-109246; USGS/SIR-2007-5045; No Copyright; Avail.: National Technical Information Service (NTIS)

Climatic extremes affect ground-water levels and quality in the basins of western Utah. The five droughts since 1930: 1930-36, 1953-65, 1974-78, 1988-93, and 1999-2004resulted in much-less-than-average recharge, and the pronounced wet period of 1982-86 resulted in much-greater-than-average recharge. Decreased recharge lowered the ground-water level, and increased recharge raised it. These changes were largest in recharge areasin discharge areas the water level is relatively constant and the primary effect is a change in the discharge areasmaller during a drought and larger during a pronounced wet period. The largest part of water-level change during climatic extremes, however, is not a result of changes in recharge but is related to changes in ground-water withdrawal. During a drought withdrawals increase to satisfy increased demand for ground water, especially in irrigated areas, and water levels decline. During a pronounced wet period, withdrawals decrease because of less demand and water levels rise. The amount of water-level change in representative observation wells in a basin is generally proportional to the basins withdrawal. In undeveloped Tule Valley, water-level changes related to climatic extremes during 1981-2005 are less than 2 feet. In Snake Valley (small withdrawal), Tooele Valley (moderate withdrawal), and Pahvant Valley (large withdrawal), water-level declines in representative wells from 1985-86 to 2005 were 13.4, 23.8, and 63.8 feet, respectively.
NTIS
Climatology; Ground Water; Utah; Drought; Irrigation

20090030700 Environmental Protection Agency, Washington, DC, USA
Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow (CSO) Mitigation in the Great Lakes and New England Regions
Feb. 2008; 50 pp.; In English
Report No.(s): PB2008-108866; EPA/600/R-07/033F; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Environmental Protection Agency's Global Change Research Program (GCRP) is an assessment-oriented program within the Office of Research and Development that focuses on assessing how potential changes in climate and other global environmental stressors may impact water quality, air quality, aquatic ecosystems, and human health in the USA. The Program's focus on water quality is consistent with the Research Strategy of the U.S. Climate Change Research Program--the federal umbrella organization for climate change science in the U.S. government and is responsive to U.S. EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act. The GCRP's water quality assessments also address an important research gap. In the 2001 National Assessment of the Potential Consequences of Climate Change in the USA (Gleick, 2000), water quality was addressed only in the context of the health risks associated with contaminated drinking water. A comprehensive assessment of the potential impacts of global change on water quality was not included. This report is a screening-level assessment of the potential implications of future climate change on combined sewer overflows (CSOs) in the New England and the Great Lakes Regions.
NTIS
Climate Change; Great Lakes (North America); New England (US); Sewers

20090030711 Pacific Northwest National Lab., Richland, WA, USA
Climate Change and the Long-Term Evolution of the U.S. Buildings Sector
Rong, F.; Clarke, L. E.; Smith, S. J.; Apr. 01, 2007; 43 pp.; In English
Contract(s)/Grant(s): AC05-76RL01830
Report No.(s): DE2008-921267; PNNL-16869; No Copyright; Avail.: Department of Energy Information Bridge

This paper discusses a new U.S. building module in the MiniCAM integrated assessment model, and it presents a scenario based on that module.
NTIS
Buildings; Climate Change; Industries; Models

20090030786 Federal Emergency Management Agency, Washington, DC USA
Building Performance Assessment Report Preliminary Report: Oklahoma and Kansas. Midwest Tornadoes of May 3, 1999. Observations, Recommendations, and Technical Guidance
Jul. 13, 1999; 200 pp.; In English
Report No.(s): PB2008-106954; No Copyright; Avail.: National Technical Information Service (NTIS)

The number of tornadoes that occurred on May 3, 1999, in Oklahoma and Kansas, their severity, and the level of devastation they caused have not been seen in a generation within the USA. One of the missions of the Federal Emergency Management Agency (FEMA) that directly supports the National Mitigation Strategy is: to significantly reduce the risk of loss of life, injuries, economic costs and destruction of natural and cultural resources that result from natural hazards. In response to the disasters caused by the May 3 tornadoes, FEMA deployed a Building Performance Assessment Team (BPAT), composed of national experts in engineering, architecture, meteorology, and planning, to Oklahoma and Kansas. The mission of the BPAT was to assess the performance of buildings affected by the tornadoes, investigate losses, and describe the lessons learned. This report presents the BPAT's observations, conclusions, and recommendations, which are intended to help communities, businesses, and individuals reduce future injuries and the loss of life and property resulting from tornadoes and other high-wind events.
NTIS
Buildings; Tornadoes

20090030794 Geological Survey, Washington, DC, USA
Facing Tomorrow's Challenges: U.S. Geological Survey Science in the Decade 2007-2017
Jan. 2007; 81 pp.; In English
Report No.(s): PB2008-106955; CIRC-1309; No Copyright; Avail.: National Technical Information Service (NTIS)

In order for the U.S. Geological Survey (USGS) to respond to evolving national and global priorities, it must periodically reflect on, and optimize, its strategic directions. This report is the first comprehensive science strategy since the early 1990s to examine critically major USGS science goals and priorities. The development of this science strategy comes at a time of global trends and rapidly evolving societal needs that pose important natural-science challenges. The emergence of a global economy affects the demand for all resources. The last decade has witnessed the emergence of a new model for managing Federal lands--ecosystem-based management. The U.S. Climate Change Science Program predicts that the next few decades will see rapid changes in the Nation's and the Earth's environment. Finally, the natural environment continues to pose risks to society in the form of volcanoes, earthquakes, wildland fires, floods, droughts, invasive species, variable and changing climate, and natural and anthropogenic toxins, as well as animal-borne diseases that affect humans. The use of, and competition for, natural resources on the global scale, and natural threats to those resources, has the potential to impact the Nation's ability to sustain its economy, national security, quality of life, and natural environment.
NTIS
Geological Surveys; Research Management; Surveys

20090030926 Geological Survey, Reston, VA USA
Relation Between Precipitation and the 25th Percentile of June and September Flows in Streams in the Great Lakes, Ohio, and Upper Mississippi River Basins
Winterstein, T. A.; Lorenz, D. L.; Jan. 2007; 30 pp.; In English
Report No.(s): PB2008-108749; USGS-SIR-2007-5129; No Copyright; Avail.: CASI: A03, Hardcopy

Regression models were developed for the 25th percentile of June and September flows (first quartile of flow) for 47 streamflow-gaging stations (gaging stations) in the Upper Mississippi, Ohio, and Great Lakes drainage basins. The gaging stations that were selected for this analysis are on unregulated rivers, have at least 40 years of record, and have a nearby weather station with at least 70 years of precipitation record. Regression models were developed for each gaging station relating annual 25th percentile of June and September flows to selected precipitation variables. The explanatory variables are monthly precipitation (AprilJune, JulySeptember) for each year of record, precipitation for the previous year, and average precipitation for the preceding 5-, 10-, 15-, 20-, 25-, and 30-year periods. Short-term precipitation (AprilJune or JulySeptember monthly precipitation) variables are the most common significant variables in the regression equations for the 25th percentile of June and September streamflows. May and June monthly precipitation are the most common significant variables among the regression models of the 25th percentile of June flows. August and September monthly precipitation are the most common significant variables in the regression models of the 25th percentile of September streamflow. July precipitation also is a significant explanatory variable in regression models of September streamflow. The 25th-percentile flows in this study also are related to intermediate- and long-term precipitation variables. The intermediate-term precipitation

variable (previous-years precipitation) has a more distinct spatial pattern than the long-term precipitation variable (multiyear running averages of annual precipitation) and is more likely to be significant in the western part than in the eastern part of the study area.
NTIS
Great Lakes (North America); Mississippi; Ohio; River Basins; Streams

20090030927 Geological Survey, Reston, VA USA
Historical Changes in Precipitation and Streamflow in the U.S. Great Lakes Basin, 1915-2004
Hodgkins, G. A.; Dudley, R. W.; Aichele, S. S.; Jan. 2007; 37 pp.; In English
Report No.(s): PB2008-108743; USGS-SIR-2007-5118; No Copyright; Avail.: National Technical Information Service (NTIS)

The total amount of water in the Great Lakes Basin is important in the long-term allocation of water to human use and to riparian and aquatic ecosystems. The water available during low-flow periods is particularly important because the short-term demands for the water can exceed the supply. Precipitation increased over the last 90 years in the U.S. Great Lakes Basin.
NTIS
Great Lakes (North America); Histories

20090030931 State Dept., Washington, DC, USA
U.S. Actions to Address: Energy Security, Clean Development, and Climate Change
Jan. 2008; 48 pp.; In English
Report No.(s): PB2008-108917; No Copyright; Avail.: CASI: A03, Hardcopy

The USA is taking action on a comprehensive and dynamic strategy to address climate change at home and abroad. This approach is designed to foster breakthroughs in clean energy technologies and encourages coordinated global activities that help meet the ultimate objective of the United Nations Framework Convention on Climate Change: stabilizing atmospheric greenhouse gas (GHG) concentrations at a level that prevents dangerous human interference with the climate system while enabling sustainable economic development. We recognize that recent reports by the Intergovernmental Panel on Climate Change (IPCC) have substantially improved the science that guides policy decisions. The recent IPCC conclusions highlight the need to set wise and effective policies to confront the challenges of energy security and climate change.
NTIS
Climate Change; Security

20090030932 Environmental Protection Agency, Washington, DC, USA
Global Climate Change: What Does It Mean for the Midwest and the Great Lakes. EPA Regional Conference Held in Chicago, Illinois on September 10, 1997
January 1997; 8 pp.; In English; Global Climate Change: What Does It Mean for the Midwest and the Great Lakes. EPA Regional Conference, September 10, 1997, Chicago, Illinois
Report No.(s): PB2008-108919; No Copyright; Avail.: CASI: A02, Hardcopy

Global climate change could have serious consequences for Midwesterners. At the same time, an international agreement to slow climate change might affect the region's economy. These two viewpoints arose repeatedly during a public conference convened by the U.S. Environmental Protection Agency in Chicago on September 10, 1997.
NTIS
Agreements; Climate Change; Climatology; Environment Protection; Great Lakes (North America); International Cooperation

20090030936 North Carolina State Univ., Raleigh, NC USA
Multi-Sensor Precipitation Estimates in Support of NC DOT's Stormwater Quality Monitoring
Brooks, M.; Boyles, R.; Sims, A.; Raman, S.; May 01, 2006; 16 pp.; In English
Report No.(s): PB2008-108944; No Copyright; Avail.: National Technical Information Service (NTIS)

This project was undertaken to develop an Internet resource to monitor local precipitation at DOT work sites. A website

was developed for NCDOT staff to login, define locations of interest and be notified if precipitation at those locations exceeds a defined threshold. The website also enables the user to view precipitation estimates spatially and in tabular format.
NTIS
Estimates; Internets; Multisensor Applications

20090030943 Geological Survey, Reston, VA USA; Air Force Aeronautical Systems Center, Marietta, GA, USA
Graphical Method for Estimation of Barometric Efficiency from Continuous Data: Concepts and Application to a Site in the Piedmont, Air Force Plant 6, Marietta, Georgia
Gonthier, G. J.; Jan. 2007; 30 pp.; In English
Report No.(s): PB2008-108741; USGS-SIR-2007-5111; No Copyright; Avail.: CASI: A03, Hardcopy

A graphical method that uses continuous water-level and barometric-pressure data was developed to estimate barometric efficiency. A plot of nearly continuous water level (on the y-axis), as a function of nearly continuous barometric pressure (on the x-axis), will plot as a line curved into a series of connected elliptical loops. Each loop represents a barometric-pressure fluctuation. The negative of the slope of the major axis of an elliptical loop will be the ratio of water-level change to barometric-pressure change, which is the sum of the barometric efficiency plus the error. The negative of the slope of the preferred orientation of many elliptical loops is an estimate of the barometric efficiency. The slope of the preferred orientation of many elliptical loops is approximately the median of the slopes of the major axes of the elliptical loops. If water-level change that is not caused by barometric-pressure change does not correlate with barometric-pressure change, the probability that the error will be greater than zero will be the same as the probability that it will be less than zero. As a result, the negative of the median of the slopes for many loops will be close to the barometric efficiency. The graphical method provided a rapid assessment of whether a well was affected by barometric-pressure change and also provided a rapid estimate of barometric efficiency. The graphical method was used to assess which wells at Air Force Plant 6, Marietta, Georgia, had water levels affected by barometric-pressure changes during a 2003 constant-discharge aquifer test. The graphical method was also used to estimate barometric efficiency. Barometric-efficiency estimates from the graphical method were compared to those of four other methods: average of ratios, median of ratios, Clark, and slope.
NTIS
Atmospheric Pressure; Piedmonts; Water

20090030991 Colorado State Univ., Fort Collins, CO, USA
CIRA: Exploring how Improved Hurricane Forecasts Benefit Society, Volume 31, Spring 2009
leinen, Laura, Editor; March 2009; 24 pp.; In English; See also 20090030992 - 20090030995; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

The topics covered include: 1) Evaluation and Comparison of Microphysical Algorithms in WRF-ARW Model Simulations of Atmospheric River Events Affecting the California Coast; 2) Effect of Aerosol and Model Resolution on Small Cumulus Clouds; 3) NextGen Network Enabled (NNEW) Program; and 4) Exploring how Improved Hurricane Forecasts can Benefit Society.
CASI
Weather Forecasting; Hurricanes; Cloud Physics; Atmospheric Models

20090030992 Colorado State Univ., Fort Collins, CO, USA
NextGen Network Enabled (NNEW) Program
MacDermaid, Chris; Schultz, Mary Sue; Frimel, James; Hamer, Paul; Hildreth, Patrick; Pankow, Glen; CIRA: Exploring how Improved Hurricane Forecasts Benefit Society, Volume 31, Spring 2009; March 2009, pp. 13-17; In English; See also 20090030991; Copyright; Avail.: Other Sources

CIRA researchers at NOAA's Earth System Research Laboratory (ESRL) Global Systems Division (GSD) are playing a key role in developing the capability to provide weather information to tomorrow's aviation system using state-of-the-art technology. Funding for this work is provided by the Federal Aviation Administration (FAA) as part of the Next Generation Air Transportation System (NextGen), a Congressionally-mandated (Vision 100 - Century of Aviation Reauthorization Act, December 2003) multi-agency and public-private initiative. 'NextGen is focusing on a new direction in aviation weather-information capabilities to help stakeholders at all levels make better decisions during weather situations. Safe and efficient Next-Gen operations will be dependent on enhanced weather capabilities based on three major tenets: 1) A common picture of the weather for all aviation decision makers and aviations system users; 2) Weather integrated directly into sophisticated decision-support capabilities to assist decision makers; 3) Utilization of Internet-like information dissemination

to realize flexible and cost-efficient access to all necessary weather information.' The NextGen Network Enabled Weather program (NNEW) ... will serve as the core of the NextGen weather support services and provide a common weather picture across the national airspace system. These services will, in turn, be integrated into other key components of Next-Gen required to enable better air transportation decision-making.'
Derived from text
Air Transportation; National Airspace System; Computer Networks; Weather

20090030993 National Oceanic and Atmospheric Administraion, Fort Collins, CO, USA
Exploring how Improved Hurricane Forecasts can Benefit Society
Schumacher, Andrea; DeMaria, Mark; Knaff, John; CIRA: Exploring how Improved Hurricane Forecasts Benefit Society, Volume 31, Spring 2009; March 2009, pp. 18-20; In English; See also 20090030991; Copyright; Avail.: Other Sources

Over the last five years (2004-2008), 10 hurricanes have made landfall along the U.S. mainland, reuslting in more than 1,600 deaths and close to $170 billion in damages in the U.S. alone. These recent, immense losses have highlighted the need for improvements in tropical cyclone forecasting and how society prepares for and responds to hurricanes. As the official national source of tropical cyclone forecasts, the National Oceanographic and Atmospheric Association (NOAA) has made improving tropical cyclone track, intensity, and storm surge forecasts a high priority. Scientists at the Cooperative Institute for Research in the Atmosphere (CIRA) have a long history of research in tropical cyclones, with an emphasis on developing forecast guidance products. Many of these products, such as the National Hurricane Center (NHC) Tropical Cyclone Wind Speed Probability product (DeMaria et al. 2009) and the NESDIS Tropical Cyclone Formation Probability product (Schumacher et al. 2009), have been transitioned to operational products used routinely by tropical cyclone forecast agencies around the world. It is generally accepted that improvements to hurricane forecasts will benefit society. Longer lead times will allow people more time to adequately prepare. Better track and structure forecasts could lead to more precise hurricane warning areas, which may reduce the costs of unnecessary evacuations. Quantifying these benefits, however, is a difficult task. How much money will a given forecast improvement save us? How many lives will be saved? These are tough questions to answer, but new project underway at CIRA provides hope for making direct connections between forecast improvements and socioeceonomic factors. This project involves two main steps; 1) develop an objective scheme that simulates official hurricane warnings based on real-time hurricane track and intensity forecasts and 2) use this objective scheme to determine the changes in warning length and duration that result from artificially 'improving' the real-time track and intensity forecasts.
Derived from text
Hurricanes; Weather Forecasting; Storm Surges; Tropical Storms

20090030994 Colorado State Univ., Fort Collins, CO, USA
Evaluation and Comparison of Microphysical Algorithms in WRF-ARW Model Simulations of Atmospheric River Events Affecting the California Coast
Jankov, Isidora; Bao, Jian-Wen; Neiman, Paul J.; Schultz, Paul J.; Yuan, Huiling; White, Allen B.; CIRA: Exploring how Improved Hurricane Forecasts Benefit Society, Volume 31, Spring 2009; March 2009, pp. 1-9; In English; See also 20090030991; Copyright; Avail.: Other Sources

The main goal of the present study was to evaluate the performance of a high-resolution, numerical model using four different microphysics schemes for five significant precipitation events during a winter season in California associated with atmospheric river settings. In addition, these cases were chosen to examine the models ability to discriminate bright band (BB) from nonbright band (NBB) precipitation regimes. Simulations of the five atmospheric river events were performed using 3-km grid spacing in the WRF-ARW model and four different microphysical options: Lin, WSM6, Thompson, and Schultz, Eta model forecasts were used for specifying initial and lateral boundary conditions. The evaluation involved comparisoins of the flow and cloud structure against special observations from the HMT project. The models'ability to depict relevant mesoscale attributes was evaluated against the 915-MHz wind profiler. S-band radar reflectivity data were used for classification of the assessed events to BB and NBB categories and to evaluate the model's ability to discriminate between the two precipitation regimes. Tipping bucket rain gauges were used for verification of simulated precipitation accumulations.
Derived from text
Algorithms; Atmospheric Models; Cloud Physics; Mathematical Models; Simulation; California

20090030995 Colorado State Univ., Fort Collins, CO, USA

Effect of Aerosol and Model Resolution on Small Cumulus Clouds

Jiang, Hongli; Feingold, Graham; CIRA: Exploring how Improved Hurricane Forecasts Benefit Society, Volume 31, Spring 2009; March 2009, pp. 10-12; In English; See also 20090030991; Copyright; Avail.: Other Sources

Photographs of cumulus clouds taken from high flying aircraft (Plank, 1969) reveal that cumulus clouds have sizes ranging from 30 m to 10 km. Satellite imagery from Landsat (30 m resolution) and ASTER (15 m resolution) indicate the existence of small clouds down to the instrument detection limit. Because small clouds exist in much higher numbers than large clouds, they have been found to dominate mass flux transport, contributions to cloud fraction, and possibly to cloud reflectance. Given their importance, it is of interest to consider their response to aerosol perturbations and how this response varies with grid resolution. Cumulus clouds exhibit a great deal of variability in size and depth. There is considerable disagreement about their response to aerosol. The change of cloud fraction cf in response to an increase in aerosol concentration No can be either greater or less than zero. The sign of the change in liquid water path (LWP) in response to aerosol changes may or may'not have the same sign as cloud fraction responses, in contrast to typical assumptions that an increase in aerosol will reduce the ability of a cloud to precipitate, increase cloud liquid water, and extend cloud coverage (the 'second indirect effect' of aerosol on clouds).

Derived from text

Aerosols; Atmospheric Models; Cumulus Clouds; Cloud Physics; Satellite Imagery

20090031793 Environmental Protection Agency, Washington, DC USA

USA: Taking Action on Climate Change

Oct. 1999; 36 pp.; In English

Report No.(s): PB2008-108882; No Copyright; Avail.: CASI: A03, Hardcopy

Climate change threatens the USA and all nations. To help address this threat, the USA is taking significant new steps to reduce greenhouse gas emissions. During the past year, President Clinton launched initiatives on bioenergy, wind and solar energy, and Federal energy efficiency. In addition, a growing number of state and local governments and private companies are stepping forward to address climate change with prudent, creative, cost-effective strategies to reduce greenhouse gas emissions. At the same time, the USA continues to invest more than $1 billion per year in research and development on technologies that will help reduce greenhouse gas emissions. In short, from city council chambers to corporate board-rooms, the USA is mobilizing against global warming--the greatest environmental challenge of the 21st century.

NTIS

Air Pollution; Climate Change; Pollution Control; Global Warming; Man Environment Interactions

20090031794 Environmental Protection Agency, Washington, DC USA

Global Climate Change: What Does It Mean for South Florida and the Florida Keys. A Report of the Florida Coastal Cities Tour Activities.

January 1999; 12 pp.; In English; Global Climate Change: What Does It Mean for South Florida and the Florida Keys. A Report of the Florida Coastal Cities Tour Activities., 24-28 May 1999, Key West, Florida, USA

Report No.(s): PB2008-108883; No Copyright; Avail.: CASI: A03, Hardcopy

South Florida residents--hailing from the hustle and bustle of downtown Miami to the quiet and charm of Key West--gathered to learn about the potential impacts that sea level rise from global warming could have on their coastal way of life. Increased shoreline erosion, coral bleaching, saltwater inundation, and public health threats were just a few of the impacts discussed during the U.S. Environmental Protection Agency's (EPA) Coastal Cities Tour held the week of May 24, 1999.

NTIS

Air Pollution; Climate Change; Climatology; Coasts; Global Warming

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*.

20090030012 NASA Johnson Space Center, Houston, TX, USA
Basics of Biosafety
Wong, Willy; [2009]; 65 pp.; In English; Original contains color illustrations
Report No.(s): JSC-CN-18741; Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030012

This slide presentation reviews the basics of biosafety and the importance of assuring proper biosafety practices. The objectives of the presentation are to review regulations about biosafety, and the different biosafety levels; the biosafety facilities at Johnson Space Center; the usage and maintenance of the biosafety cabinet, the proper methods to handle biologically hazardous materials upon exposure, and the methods of cleanup in the event of a spill, and the training requirements that are mandated for personnel handling biologically hazardous materials.
CASI
Exposure; Hazardous Materials; Biological Hazards; Contamination; Safety; Laboratories; Research Facilities

20090030372 Joint Special Operations Univ., Hurlburt Field, FL USA
Journal of Special Operations Medicine, Volume 5, Edition 3, Summer 2005
Jan. 2005; 115 pp.; In English
Report No.(s): AD-A502593; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Journal of Special Operations Medicine is a peer review journal for SOF medical professionals. Articles in this issue include: South American Military Working Horses Positive for Equine Infectious Anemia, Army Range Casualty, Attrition, and Surgery Rates for Airborne Operations in Afghanistan and Iraq, Prehospital Management of Head Injuries for the Combat Medic, Patient Care: Care of the Muslim Patient, Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report, Medical Contributions to Unconventional Warfare, Antibiotics Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock or Inability to Tolerate Oral Agent, Painless Wound Care: Preventive Medicine in the Austere Environment, New Topic After Thoughts Regarding 2005 Apr 04 E Company Suspected Land Mine Incident, Upcoming SOF Related Medical Conferences and CME courses, and also book reviews, a medical quiz, and upcoming events.
DTIC
Medical Personnel; Medical Services; Military Operations; Military Personnel; Summer

20090030373 Joint Special Operations Univ., Hurlburt Field, FL USA
Journal of Special Operations Medicine, Volume 6, Edition 2
Jan. 2006; 89 pp.; In English
Report No.(s): AD-A502590; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Journal of Special Operations Forces Medicine is a peer reviewed journal for SOF Medical Professionals. Articles in this publication include: Compartment Syndrome of the Lower Extremity: Blast Injuries in a Ranger Battalion Don't Miss the Diagnosis, American Guerrilla Warfare Medical Doctrine--The First Manuals: Lessons Learned, Combat Ophthalmology When There Isn't an Assigned Ophthalmologist as well as book reviews, upcoming events and conferences, education and training issues, persona reports and a medical quiz.
DTIC
Medical Services; Military Operations; Military Personnel

20090030434 Department of Energy, Washington, DC USA
Drug Test Information for HRP-Certified Individuals and HRP Candidates
Jan. 2007; 10 pp.; In English
Report No.(s): DE2008-924810; No Copyright; Avail.: Department of Energy Information Bridge

The Department of Energy (DOE) Human Reliability Program (HRP) is a security and safety reliability program designed to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability. A system of continuous evaluation helps

to identify individuals whose judgment and reliability may be impaired by physical or mental/personality disorders, alcohol abuse, use of illegal drugs or the abuse of legal drugs or other substances, or any other condition or circumstance that may be of a security or safety concern. The drug testing requirements are integral to the HRP. They serve to identify those who use illegal drugs or abuse other medications and also help to deter the use of these substances. The regulations that govern HRP drug testing are Executive Order 12564 and DOE Order 3792.3, Drug-Free Federal Workplace Testing Implementation Program, for federal employees, and 10 CFR Part 707 for contractor employees. The tests are conducted under the Mandatory Guidelines for Federal Workplace Drug Testing Programs promulgated by the Substance Abuse and Mental Health Services Administration (SAMHSA) of the Department of Health and Human Services (HHS). These guidelines establish scientific and technical requirements for drug testing programs and standards for certification of laboratories that process the samples and report the results. They also stipulate the responsibilities and qualifications of the medical review officer (MRO) who reviews the results of the drug test and reports them to the agency or contractor. The information provided in this booklet is based on the SAMHSA guidelines.
NTIS
Drugs; Reliability; Safety; Security

20090030591 Joint Special Operations Univ., Hurlburt Field, FL USA
Journal of Special Operations Medicine, Volume 6, Edition 1
Winter 2006; 99 pp.; In English
Report No.(s): AD-A502581; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Journal of Special Operations Medicine is a peer reviewed journal for SOF Medical Professionals. Articles in this journal include: Walking Donor Transfusion in a Gar Forward Environment, Guerrilla Warfare Medicine: A Review of the Literature and the Problem, Stress Fracture and Attrition in Basic Underwater Demolition SEAL Trainees, Post-Exposure Prophylaxis for HIV in the SOF Environment, Trauma Care Using Explosive Ordinance Disposal Radiographic Capabilities, A Prototype for SOF Medic OCONUS Training, Upcoming SOF Related Medical Conference and CME courses as well as book reviews, puzzles and a medical quiz.
DTIC
Medical Personnel; Medical Services; Military Operations; Military Personnel; Winter

20090030592 Joint Special Operations Univ., Hurlburt Field, FL USA
Journal of Special Operations Medicine, Volume 6, Edition 3
Jan. 2006; 109 pp.; In English
Report No.(s): AD-A502578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Journal of Special Operations Medicine is a peer reviewed journal for Special Operations Forces medical professionals. Articles in this publication include: Care Coalition Grows for SOF Wounded Warriors, USUHS Online Preparedness Education Program, Initial Wound Management of Improvised Explosive Device or Land Mine Blast Injuries Treated at U.S. Forward Operating Base in Afghanistan, Differentiating Causes of Hypoxemia in Special Operations Trainees, Stand-by Treatment of Malaria: Is It An Option for Special Operations Forces?, Hypotensive Resuscitation, Satellite Imagery/GPS Technology: Implications and Applications for Humanitarian and Relief Operations, Stand-by Treatment of Malaria: Is It an Option for Special Operations Forces?, Foreign Bodies in the Ear Canal: An Odd but Possible Injury Downrange, Simple Respiratory Mask, Care of the Battle Casualty in Advance of the Aid Station, Special Operations Forces - Combat Medicine, Medical Support of Guerrilla Forces, Upcoming SOF Related Medical Conference and Courses, Logistical Support and Insurgency, Sustainment and Applied Lessons of Soviet Insurgent Warfare: Why it Should Still Be Still be Studied and book reviews, medical quiz, special events and articles.
DTIC
Medical Personnel; Medical Services; Military Operations; Military Personnel

20090030593 Joint Special Operations Univ., Hurlburt Field, FL USA
Journal of Special Operations Medicine. Volume 5, Edition 4
Fall 2005; 113 pp.; In English
Report No.(s): AD-A502573; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Journal of Special Operations Medicine is a peer reviewed journal for SOF medical professionals. Articles in this journal include: Dengue Fever, Guide to Prevention of Infectious Diseases during Military Deployments, the Ten Commandments of Nutrition: 2005, Issues Related to the Use of Tourniquets on the Battlefield, the Anatomy and Pictorial

View of a Vetrete, USSOCOM Care Coalition Takes Care of the SOF Warrior for Life, and Upcoming SOF Related Medical Conferences and CME Courses as well as book reviews, upcoming events and a medical quiz.
DTIC
Medical Personnel; Medical Services; Military Operations; Military Personnel

20090030655 Armed Forces Health Surveillance Center, Silver Spring, MD USA
DoD Global Emerging Infections Surveillance & Response System (DoD-GEIS). Global Influenza Surveillance Efforts
Sanchez, Jose L.; Jan 8, 2007; 43 pp.; In English
Report No.(s): AD-A502546; No Copyright; Avail.: Defense Technical Information Center (DTIC)
These briefing charts concern global influenza surveillance throughout the world by a DoD surveillance and response system.
DTIC
Infectious Diseases; Influenza; Medical Science; Surveillance

20090030753 Geological Survey, Reston, VA USA
Relations of Principal Components Analysis Site Scores to Algal-Biomass, Habitat, Basin-Characteristics, Nutrient, and Biological-Community Data in the Upper Wabash River Basin, Indiana, 2003
Leer, D. R.; Caskey, B. J.; Frey, J. W.; Lowe, B. S.; Jan. 2007; 35 pp.; In English
Report No.(s): PB2008-109261; USGS/SIR-2007-5231; No Copyright; Avail.: CASI: A03, Hardcopy
Data were gathered from May through October 2003 at 38 randomly selected sites in the Upper Wabash River Basin, Indiana, for algal biomass, habitat, nutrients, and biological communities (fish and invertebrates).Basin characteristics (drainage area and land use) and biological-community attributes and metric scores were determined for each sampling site's basin. Yearly Principal Components Analysis site scores were calculated for algal biomass (periphyton and seston). The yearly Principal Components Analysis site scores for the first axis (PC1) were related, using Spearman's rho, to the seasonal algal-biomass, basin-characteristics, habitat, seasonal nutrient, biological-community attribute and metric score data.
NTIS
Algae; Biomass; Habitats; Principal Components Analysis; Wabash River Basin (IL-IN-OH)

20090030757 Missouri Water Resources Research Center, Rolla, MO USA
Development of Microbial and Enzymatic Fuel Cells for Bio-Inspired Power Sources
Dogan, Fatih; Minteer, Shelley; Mar. 2009; 31 pp.; In English
Contract(s)/Grant(s): FA8651-07-1-0005; MNK-BAA-04-0003; Proj-2502
Report No.(s): AD-A502131; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502131
This report is based on some of the revolutionary concepts described in the Road Map on Bioinspired Power Systems within the AFRL/RW Campus Challenge II. Development of biofuel cell concepts integrated with fuel regeneration and energy storage capabilities are proposed to create a compact and self sustaining power system. The first part of this work identified a sediment based microbial fuel cell that could power small electronics and maintain electrical activity over long periods of time. AFRL/RW does not feel that this work adequately addresses the original scope nor does it provide a basis on which to continue work. The second part of this work focused on the evaluation of the oxidation and photolytic regeneration properties of fuels for enzymatic fuel cells. The top three fuels (glycerol, formaldehyde, and methanol) were electrochemically evaluated in working bioanodes. Despite the high viscosity of glycerol, the energy dense compound can be used in high concentrations making it a better fuel source than the organic alcohols for the enzymatic fuel cells.
DTIC
Bioconversion; Biomass Energy Production; Enzyme Activity; Fuel Cells; Fuels; Microorganisms

20090030863 Armed Forces Health Surveillance Center, Silver Spring, MD USA
Medical Surveillance Monthly Report. Volume 16, Number 6, June 2009
Jun. 2009; 29 pp.; In English
Report No.(s): AD-A502415; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502415
The Medical Surveillance Monthly Report (MSMR) is prepared by the Armed Forces Health Surveillance Center (AFHSC). Data in the MSMR are provisional, based on reports and other sources of data available to AFHSC. This issue is

the Summer Safety Issue. Topics discussed are: Motorcycle accidents, active component, U.S. Armed Forces, 1998-2008; Lightning strike injuries, active component, U.S. Armed Forces, 1999-2008; Accidental drownings, active component, U.S. Armed Forces, 2004-2008; Surveillance Snaphot: Envenomations; Deployment health assessments update; Sentinel reportable medical events, service members and beneficiaries, U.S. Armed Forces, cumulative numbers through May 2008 through May 2009; Acute respiratory disease, basic training centers, U.S. Army, June 2007-June 2009; and Deployment-related conditions of special surveillance interest.
DTIC
Health; Medical Services; Military Operations; Military Personnel; Safety; Surveillance

20090030902 Armed Forces Health Surveillance Center, Silver Spring, MD USA
DoD Global Emerging Infections Surveillance and Response System -- Partnering in the Fight Against Emerging Infections
Feb. 2007; 99 pp.; In English
Report No.(s): AD-A502387; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502387

The Department of Defense Global Emerging Infections Surveillance and Response System (DoD-GEIS) was created in 1996 by Presidential Decision Directive NSTC-7, which expanded the role of the DoD to address threats to the USA and other nations posed by emerging and reemerging infectious diseases. In an external review of GEIS five years later in 2001, the Institute of Medicine of the National Academy of Sciences described GEIS as a critical and unique resource of the USA in the context of global affairs. It is the only U.S. entity that is devoted to infectious diseases globally and that has broad-based laboratory capacities in overseas settings. A National Intelligence Estimate at that time noted that emerging infectious diseases are a global security issue because they have the capacity to harm US interests abroad through destabilizing key institutions, obstructing trade and human migration, slowing or reversing economic growth, fomenting social unrest, and complicating US response to refugee situations by increasing the demand for humanitarian intervention and through their association with biological terrorism and warfare. The validity of this estimate was supported by the swift appearance of the deadly severe acute respiratory syndrome in 2003 and highly pathogenic avian influenza in 2005.
DTIC
Defense Program; Health; Infectious Diseases; Medical Services; Military Operations; Responses; Surveillance

20090031826 NASA Johnson Space Center, Houston, TX, USA
Study of the Genes and Mechanism Involved in the Radioadaptive Response
Dasgupta, Pushan R.; August 28, 2009; 1 pp.; In English; SK Student Presentations, 28 Aug. 2009, Houston, TX, USA
Report No.(s): JSC-CN-18807; Copyright; Avail.: Other Sources; Abstract Only

The radioadaptive response is a phenomenon where exposure to a prior low dose of radiation reduces the level of damage induced by a subsequent high radiation dose. The molecular mechanism behind this is still not well understood. Learning more about the radioadaptive response is critical for long duration spaceflight since astronauts are exposed to low levels of cosmic radiation. The micronucleus assay was used to measure the level of damage caused by radiation. Although cells which were not washed with phosphate buffered saline (PBS) after a low priming dose of 5cGy did not show adaptation to the challenge dose, washing the cells with PBS and giving the cells fresh media after the low dose did allow radioadaptation to occur. This is consistent with the results of a previous publication by another research group. In the present study, genes involved in DNA damage signaling and the oxidative stress response were studied using RT PCR techniques in order to look at changes in expression level after the low dose with or without washing. Our preliminary results indicate that upregulation of oxidative stress response genes ANGPTL7, NCF2, TTN, and SRXN1 may be involved in the radioadaptive response. The low dose of radiation alone was found to activate the oxidative stress response genes GPR156 and MTL5, whereas, washing the cells alone caused relatively robust upregulation of the oxidative stress response genes DUSP1 and PTGS2. Washing after the priming dose showed some changes in the expression level of several DNA damage signaling genes. In addition, we studied whether washing the cells after the priming dose has an effect on the level of nitric oxide in both the media and cells, since nitric oxide levels are known to increase in the media of the cells after a high dose of radiation only if the cells were already exposed to a low priming dose. Based on this preliminary study, we propose that washing the cells after priming exposure actually eliminates some factor secreted by the cells that inhibits radioadaptation leading to the upregulation of some genes which initiates the response.
Author
Assaying; Genes; Radiation Damage; Deoxyribonucleic Acid; Cosmic Rays; Exposure; Dosage

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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*.

20090029952 NASA Johnson Space Center, Houston, TX, USA
Stability of Pharmaceuticals in Space
Nguyen, Y-Uyen; August 13, 2009; 1 pp.; In English; SK Student Presentations, 13 Aug. 2009
Report No.(s): JSC-CN-18668; No Copyright; Avail.: Other Sources; Abstract Only

Stability testing is a tool used to access shelf life and effects of storage conditions for pharmaceutical formulations. Early research from the International Space Station (ISS) revealed that some medications may have degraded while in space. This potential loss of medication efficacy would be very dangerous to Crew health. The aim of this research project, Stability of Pharmacotherapeutic Compounds, is to study how the stability of pharmaceutical compounds is affected by environmental conditions in space. Four identical pharmaceutical payload kits containing medications in different dosage forms (liquid for injection, tablet, capsule, ointment and suppository) were transported to the ISS aboard a Space Shuttle. One of the four kits was stored on that Shuttle and the other three were stored on the ISS for return to Earth at various time intervals aboard a pre-designated Shuttle flight. The Pharmacotherapeutics laboratory used stability test as defined by the USA Pharmacopeia (USP), to access the degree of degradation to the Payload kit medications that may have occurred during space flight. Once these medications returned, the results of stability test performed on them were compared to those from the matching ground controls stored on Earth. Analyses of the results obtained from physical and chemical stability assessments on these payload medications will provide researchers additional tools to promote safe and efficacious medications for space exploration.
Author
Aerospace Medicine; Drugs; Degradation; Service Life; Pharmacology; Storage Stability; Space Transportation System Flights

20090029986 NASA Johnson Space Center, Houston, TX, USA
Functional Task Test (FTT)
Bloomberg, Jacob J.; Mulavara, Ajitkumar; Peters, Brian T.; Rescheke, Millard F.; Wood, Scott; Lawrence, Emily; Koffman, Igor; Ploutz-Snyder, Lori; Spiering, Barry A.; Feeback, Daniel L.; Platts, Steven H.; Stenger, Michael B.; Lee, Stuart M.C.; Arzeno, Natalia; Feiveson, Alan H.; Ryder, Jeffrey; Garcia, Yamil; Guilliams, Mark E.; September 02, 2009; 17 pp.; In English; Increment 21/22 Science Symposium, 2-3 Sept. 2009, Houston, TX, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18704; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029986

This slide presentation reviews the Functional Task Test (FTT), an interdisciplinary testing regimen that has been developed to evaluate astronaut postflight functional performance and related physiological changes. The objectives of the project are: (1) to develop a set of functional tasks that represent critical mission tasks for the Constellation Program, (2) determine the ability to perform these tasks after space flight, (3) Identify the key physiological factors that contribute to functional decrements and (4) Use this information to develop targeted countermeasures.
CASI
Astronaut Performance; Countermeasures; Physiological Factors; Physiological Tests; Psychomotor Performance; Sensorimotor Performance

20090029987 NASA Johnson Space Center, Houston, TX, USA
A Biomechanical Approach to Assessing Hip Fracture Risk
Ellman, Rachel; August 12, 2009; 2 pp.; In English; SK Student Presentations, 12 Aug. 2009, Houston, TX, USA
Report No.(s): JSC-CN-18725; No Copyright; Avail.: Other Sources; Abstract Only

Bone loss in microgravity is well documented, but it is difficult to quantify how declines in bone mineral density (BMD) contribute to an astronaut's overall risk of fracture upon return. This study uses a biomechanical approach to assessing hip fracture risk, or Factor of Risk (Phi), which is defined as the ratio of applied load to bone strength. All long-duration NASA astronauts from Expeditions 1-18 were included in this study (n=25), while crewmembers who flew twice (n=2) were treated as separate subjects. Bone strength was estimated based on an empirical relationship between areal BMD at the hip, as measured by DXA, and failure load, as determined by mechanical testing of cadaver femora. Fall load during a sideways fall

was calculated from a previously developed biomechanical model, which takes into account body weight, height, gender, and soft tissue thickness overlying the lateral aspect of the hip that serves to attenuate the impact force. While no statistical analyses have been performed yet, preliminary results show that males in this population have a higher FOR than females, with a post- flight Phi of 0.87 and 0.36, respectively. FOR increases 5.1% from preflight to postflight, while only one subject crossed the fracture 'threshold' of Phi = 1, for a total of 2 subjects with a postflight Phi > 1. These results suggest that men may be at greater risk for hip fracture due largely in part to their relatively thin soft tissue padding as compared to women, since soft tissue thickness has the highest correlation (R(exp 2)= .53) with FOR of all subject-specific parameters. Future work will investigate changes in FOR during recovery to see if baseline risk levels are restored upon return to 1-g activity. While dual x-ray absorptiometry (DXA) is the most commonly used clinical measure of bone health, it fails to provide compartment-specific information that is useful in assessing changes to bone quality as a result of microgravity exposure. Peripheral quantitative computed tomography (pQCT) accomplishes this by imaging transverse 'slices' of the long bones. This project was a re-analysis of a 90 day bed rest study to determine if changes to cortical and trabecular compartments could be detected in the distal tibia with statistical significance using a new pQCT image analysis method. Nearly all changes in bone mineral density (BMD) and cross sectional area (CSA) measures were seen with statistical significance, with the exception of a change in cortical BMD. Total bone CSA increased by 1.1 % (p =0.01), cortical CSA decreased by - 5.6% (p<0.001) and trabecular CSA increased by 1.76% (p=0.007); the combination of which suggests bone resorption occurred at the endocortical surface in response to mechanical unloading by bed rest. Furthermore, total BMD and trabecular BMD decreased (-3.8%, p=0.001 and -2.8%, p =0.007, respectively), while decreases in cortical BMD failed to reach significance (-1.2%, p=0.07). Given that compartment-specific changes are seen with significance and are likely to influence bone strength, it is recommended that pQCT remain a standard measure used in bed rest because it provides a unique measure by which to better evaluate the efficacy of countermeasures to microgravity-induced bone loss.
Author
Bone Demineralization; Bone Mineral Content; Bones; Fracturing; Physiological Effects; Osteoporosis

20090030014 NASA Johnson Space Center, Houston, TX, USA
Orion Crew Injury Prediction: Landing Conditions and Vehicle Interface Elements
Danelson, Kerry; Gernhardt, Michael; August 04, 2009; In English; Advances in Injury Biomechanics, 4 Aug. 2009, Washington, DC, USA; Original contains color illustrations
Report No.(s): JSC-CN-18665; Copyright; Avail.: CASI: C01, CD-ROM

This presentation reviews the work being done to research the possibility of injuries from landing the Orion Crew Exploration Vehicle in either water or land contingencies This was done using the Total Human Model for Safety (THUMS) finite element model. The purpose of the simulations was to compare variations of a Vehicle Interface Element (VIE) and to evaluate the potential for injury. The presentation is accompanied by several animations from the model runs, showing the projected motion, with and without the various suggested types of VIEs. There are charts showing the injury metrics with the various types of VIEs. The ultimate use of this analysis was to assist in a selection of possible VIE designs
CASI
Crew Exploration Vehicle; Finite Element Method; Injuries; Mathematical Models; Simulation

20090030549 NTI, Inc., Fairborn, OH USA
24/7 Operational Effectiveness Toolset: Mishap Investigation Interface
Eddy, Douglas R.; Miller, James C.; Welch, Cory; Smith, Richard; Moise, Samuel L.; Oct. 2008; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-06-C-6606; Proj-5020
Report No.(s): AD-A502510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the Mishap Investigation Interface of the 24/7 Operational Toolset, a World Wide Web-based fatigue analysis software product. The toolset was based upon the Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE(Trademarked) Hursh et al., 2004). The SAFTE(Trademarked) model predicts cognitive performance level based upon sleep, circadian rhythm, and sleep inertia. This specific interface of the toolset was designed to aid in the determination of whether aviation and ground mishaps may have causes rooted in or exacerbated by mental fatigue. The interface design approach was iterative, involving several meetings among subject matter experts (SMEs), interface software designers and evaluators. The first meeting was for the purpose of requirements analysis, in which the designers elicited task information from the SMEs. The second meeting included a walk-through of storyboarded and preliminary software, in which the SMEs provided feedback to the designers and evaluators. The final meeting was for the purpose of an inspection evaluation of the interface by the SMEs and evaluators. This interface was based upon task analyses of mishap investigators who also served

as our SMEs. The requirements analysis revealed how fatigue related information is entered into the report of an Air Force Safety Investigation Board. A task analysis revealed how safety investigators accomplish their investigation. The report begins with a general review of mishap investigation and proceeds to the roles played by our SMEs in determining the effects of fatigue. The walk-through and inspection evaluation processes indicated that most of the requirements of potential users were met reasonably well and that potential users were able to operate the interface reasonably easily. The report ends with recommendations and suggestions for incorporating a fatigue-assessment decision aid into the mishap investigation process.
DTIC
Accident Investigation; Computer Programs; Decision Support Systems; Sleep; System Effectiveness

20090030974 NTI, Inc., Fairborn, OH USA
Operational Risk Management of Fatigue Effects II
Miller, James C.; Eddy, Douglas R.; Aug. 2008; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-06-C-6606; Proj-5020
Report No.(s): AD-A501985; AFRL-RH-BR-TR-2009-0030; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501985

This report describes our second attempt to use a quantitative, applied model of fatigue and well-accepted fatigue countermeasures in the context of operational risk management (ORM). The report discusses ORM in terms of the identification of fatigue hazards, assessment of fatigue risks, analysis of fatigue-risk control measures, possible fatigue-risk control decisions, implementation of fatigue risk controls, and the supervision and review of the fatigue ORM process. It builds upon and extends a previous fatigue ORM effort (2005) by combining the occurrence of five specific fatigue indicators with fatigue model predictions of cognitive performance effectiveness (PE). The five indicators were the amount of sleep in the last 24 hours, the cumulative sleep debt, the number of hours awake since the last major sleep period, time of day, and the amount of jet lag or shift lag. In the standard Air Force ORM method, the risk associated with a potential mishap is measured in terms of the probability that a mishap will occur and the potential severity of that mishap. The Fatigue-Performance Assessment System software should automate this process in such a manner as to augment other, required AF ORM documents.
DTIC
Risk Management; Sleep Deprivation

20090031757 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Evaluation of Next-Generation Vision Testers for Aeromedical Certification of Aviation Personnel
Nakagawara, Van B.; Montgomery, Ron W.; Wood, Kathryn J.; July 2009; 29 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 07-CRDA-0231; 07-CRDA-0232
Report No.(s): DOT/FAA/AM-09/13; OK-09-0434-JAH; Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) allows the use of a variety of vision screening devices to evaluate a pilot

applicant's vision performance for medical certification purposes. This study compares human subject test scores obtained using two new vision testing instruments (Optec 5000 and Titmus i400) with those from previously approved counterparts (Optec 2000 and Titmus 2A), which have been discontinued by their manufacturers. Method. Testing included near, intermediate, and distant visual acuity, when appropriate, as well as heterophoria and color perception. Aside from color vision deficiencies, visual performance for all subjects was within the minimum Federal Aviation Regulations (FAR) vision requirements for Class II airmen. The test subject population included 36 individuals who ranged in age from 18 to 66 (34.4 +/- 14.2). Six subjects were 50 years of age or over, requiring intermediate vision testing and 12 were color deficient. Analysis was designed to detect statistically significant differences between the test scores obtained with the new instruments vs. the older models. Results. The results of this study indicate that both new instruments provided visual acuity and heterophoria scores that are statistically equivalent to the older models. Color vision test scores for the Titmus i400 were found to be statistically equivalent to those of the Titmus 2A, with little or no change in failure rate. Although the color vision scores of the Optec 5000 were statistically equivalent to those of the Optec 2000, it failed 50% of the color normal subjects in the study. Conclusion. FAA approval is recommended for the Titmus i400 for use in all applicable aviation vision tests. Conditional approval is recommended for the Optec 5000, provided the Aviation Medical Examiner has an appropriate alternate color vision test should individuals be identified as color deficient during the certification exam.
Author
Visual Perception; Visual Acuity; Certification; Aerospace Medicine; Flying Personnel; Pilot Performance; Regulations; Color Vision

20090031807 Institute of Space Medico-Engineering, Beijing, China
Space Medicine and Medical Engineering, Volume 22, No. 1
Chen, Shan-quang, Editor; Wang, Xian-min, Editor; Bai, Jing, Editor; Bai, Yan-qiang, Editor; Sun, Xi-qing, Editor; Hong, Feng, Editor; Su, Hong-yu, Editor; Jiang, Shi-zhong, Editor; February 2009; ISSN 1002-0837; 84 pp.; In Chinese; In English; See also 20090031808 - 20090031821; Original contains black and white illustrations
Report No.(s): CN 11-2774/R; Copyright; Avail.: Other Sources

Topics covered include: Research of Modeling and Simulation for Light-algae Bioreactor in BLSS; Effects of Different Doses of Sijunzi Decoction on Soleus Atrophy in Tail-suspended Rats; Effect of K(ATP) Channel Regulators on the Expression of K(ATP) Subunits on the Cerebral Ischemia Reperfusion Injury in Gerbil; Design on Bionic Myocardial Tissue Engineering Bioreactor; Numerical Simulation Analysis of Single-phase Flow Field in Micro-flow-channels of the Small Square Cylinders in the Electrolysis Oxygen Generation; Asymmetrical Perception of Facial Recognition on Race and Gender Judgment; Study of Transcutaneous Wireless Bidirectional Communication System Based on Pulse Position Modulation; Research on Analyzing Approach of Mapping Plots of Heart Rate Variability Based on the First Order Difference Sequence; A Least Square Based Parameter Identification of the Mesic Respiratory System Model; Method Based on Self-adaptive Selection of Block Image Content for Digital Subtraction Angiography Image Registration; Investigation on the Cytotoxicity of Synthetic D,L-lactic and Glycolic Acid/poly (Ethylene Glycol) (PELGE) Nanoparticles; Degradation of Chitosan in Vitro and Effects of Degradation Products on Proliferation of Endothelial Cells; Research Progress of Portable Life Support System for Extravehicular Activity Space Suit; and Research Progress on the Animal Protein Production in the Bioregenerative Life Support System.
Author
Aerospace Medicine; Tissue Engineering; Regeneration (Physiology); Life Support Systems; In Vitro Methods and Tests; Parameter Identification; Pattern Registration; Angiography; Bionics; Bioreactors; Cells (Biology)

20090031808 Institute of Space Medico-Engineering, Beijing, China
Design on Bionic Myocardial Tissue Engineering Bioreactor
Guo, Xin; Zhang, Xi-zheng; Zhang, Yong-hong; Wang, Ji-hu; Xu, Xiao-ying; Chen, Ming-dong; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 18-21; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To develope a kind of bionic myocardial tissue bioreactor. Methods: According to the requirements of cardiac cell cultivation, several circuits for measuring and controlling parameters such as temperature, pH value, CO2 concentration, O2, saturation degree, cell stretched equipment and electrical stimulating device were designed. Results: The bioreactor was able to measure all parameters, and provide electrical stimulation and stretch load to cells with proper strain and frequency. Conclusion: This developed bioreactor can simulate internal working circumstance of human myocardial tissue in a certain degree.
Author
Tissue Engineering; Bioreactors; Myocardium; Bionics

20090031809 Institute of Space Medico-Engineering, Beijing, China

Method Based on Self-adaptive Selection of Block Image Content for Digital Subtraction Angiography Image Registration

Chen, Fang; Zhang, Jian-qiu; Hu, Bo; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 49-55; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To study a robust, accurate and effective processing method for digital subtraction angiography (DSA) image registration. Methods: An image registration method was proposed based on the similarity measurement of block image content with self-adaptive selection. In the process of digital subtraction angiography image registration, block image content was classified with blood flow character and for different block image content different similarity measurement was selected with self-adaptation. Results: The analyses and experimental results demonstrated that our method could decrease the influences of the image blurring and vessels on the accuracy of the DSA image registration. Conclusion: The proposed method can effectively improve the robustness and accuracy of DSA image registration.

Author

Image Processing; Angiography; Robustness (Mathematics); Blood Flow; Pattern Registration

20090031810 Institute of Space Medico-Engineering, Beijing, China

Investigation on the Cytotoxicity of Synthetic D,L-lactic and Glycolic Acid/poly (Ethylene Glycol) (PELGE) Nanoparticles

Nie, Yu; Duan, You-rong; Shi, San-jun; Zhang, Zhi-rong; Li, Xiu-qun; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To test the cytotoxicity of synthetic poly (ethylene glycol) -D, L-lactic and glycolic acid-poly (ethylene glycol) (mPEG-PLGA-mPEG, PELGE) and the nanoparticles made of it in our lab for intravenous injection. Methods: MTT-assay was used to evaluate cell relative proliferation rate (RGR) and cytoxicity of PELGE eluent. Not only US pharmacopoeia (USP) was consulted with L-929 mouse fibroblasts, but also according to the fields of these materials could be applied other kinds of cell lines or primary cells, such as Chang's normal hepatic cell lines, human primary renal vascular endothelial cells, human embryonic primary osteoblast and primary human embryonic primary myoblast were investigated. Results It was indicated that some RGR induced by PELGE was high, and the cytotoxicity was 0 or I grade according to the USP for L929 during 24 h and vascular endothelial cells during 48 h , meaning that the nanoparticles had no cytotoxicity. However, these kinds of nanoparticles had different effect on the proliferation of the other cells. Conclusion The nanoparticles have potential to be used in vein. And this research is of great help for the further animal experiment and provides an effective testing means for the practice use of PELGE.

Author

Nanoparticles; Glycols; Ethylene Compounds; Toxicity; Cells (Biology); Intravenous Procedures; Regeneration (Physiology); Lactic Acid; Fibroblasts; Osteoblasts

20090031811 Institute of Space Medico-Engineering, Beijing, China

Asymmetrical Perception of Facial Recognition on Race and Gender Judgment

Hu, Feng-pei; Li, Ting; Ge, Lie-zhong; Bao, Xiao-an; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 27-32; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To study face recognition rule of Chinese subjects during judging the differences of facial recognition of race, gender and their joint property. Methods: Eye tracking technique and moving window experimental method were used. Results: The present results showed that, in facial race recognition , gender recognition and joint property recognition, the key area of face recognition was eyebrow and eye. In face recognition process, the dominant area in face of information acquired was right facial area, The key brain area of facial cognition was right brain area. Conclusion: The recognition performance of face racial recognition is the best than face gender recognition and joint property recognition. Asymmetrical perception effect in human face area is appeared in facial recognition. Key words : eye movement ; perception deviation ;facial recognition ; race ;gender

Author

Eye Movements; Asymmetry; Cognition; Eye (Anatomy); Judgments; Brain

20090031812 Institute of Space Medico-Engineering, Beijing, China

Research on Analyzing Approach of Mapping Plots of Heart Rate Variability Based on the First Order Difference Sequence

Wen, Feng; Chen, Hang; Wei, Ming; Li, Yan; Xing, Lei; Yan, Hong; Ye, Shu-ming; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 39-43; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective To establish a new approach of mapping plots for analyzing heart rate variability (HRV) and detecting various premature beats, with the first order difference sequence of heart beat intervals (RR) based on the mapping approach of pioncare plots. Methods As the natural RR interval of heart beats varies slowly and there is a complete compensation of RR interval after the premature beat, it has been proved with academic logic that the plots have especial characteristic of mapping and also have some peculiar isolated areas of mapping. This approach of mapping plots was proved to be correct by test using MIT-BIH Arrhythmia Database. Results It indicated that our new approach of dot map had a good advantage to distinguish premature beats of isolated, bigeminy, and trigeminy from normal beats, especially from ECG data contained different kinds of premature beats. Conclusion It is suggested that for detecting premature beats our approach is much better than Poincare Plots, so it could be a good complement to non-linear analysis of HRV.

Author

Heart Function; Heart Rate; Electrocardiography; Arrhythmia; Synchronism

20090031813 Beijing Univ. of Aeronautics and Astronautics, Beijing, China

Research of Modeling and Simulation for Light-algae Bioreactor in BLSS

Hu, Da-wei; Liu, Hong; Hu, En-zhu; Li, Ming; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 1-8; In English; See also 20090031807

Contract(s)/Grant(s): 2006DFB81140; Copyright; Avail.: Other Sources

Objective: To study mathematical model and to perform computer simulation for an important subsystem in the bioregenerative life support system (BLSS), i. e., light-algae bioreactor (LABR) for continuously cultivating green microalgae and significantly maintaining life support function of BLSS. Methods Based on the theories of system dynamics and stoichiometry , the mathematical model and simulation model of LABR were respectively established with experimental data, and then computer experiments were conducted to simulate dynamic responses of LABR under different parameters as well as their combinations. Results It was shown that the kinetic model of LABR was valid for its real-life counterpart by a series of verification tests. It could reliably and beneficially provide technical and methodological helps for further investigations of LABR, such as theoretical analysis, design, control and optimization, and so on. Conclusion With computer experiments based on mathematical model and simulation model, it decreases much more in time and money consumption for investigations than with real experiment. This method can also be extended to use in other subsystems studies of BLSS.

Author

Bioreactors; Regeneration (Physiology); Life Support Systems; Algae; Computerized Simulation; Dynamic Response; Microorganisms

20090031814 Institute of Space Medico-Engineering, Beijing, China

Research Progress on the Animal Protein Production in the Bioregenerative Life Support System

Tong, Ling; Liu, Hong; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 72-77; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

To realize long-term long distance space exploring flight, the bioregenerative life support system has to be applied. Producing animal protein in this system could increase its closure ability and stability. In this paper, researches and developments on the animal protein production in the bioregenerative life support system from various countries including our research results were introduced in detail through information analyses. The prospects in the future studies were also predicted. It has important references for our country to carry out related investigations.

Author

Life Support Systems; Regeneration (Physiology); Proteins; Animals

20090031815 Kunming Medical Univ., Kunming, China

A Least Square Based Parameter Identification of the Mesic Respiratory System Model

Liu, Ya-jie; Feng, Ji-hua; Shi, Xin-ling; Chen, Jian-hua; Zhu, Ling; Xiao, Qi; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 43-48; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To study a Mesic respiratory system parameter identification for providing the useful theory and data support

in the improvement of human respiratory model accuracy, respiratory disease diagnosis and design of the new ventilator. Methods: The Mesic respiratory system model was established based on Simulink platform. The least-square algorithm was then used to do the static and dynamic parameter identification with theoretical data, clinical data and clinical fitting data. Finally, the validation of the parameter identification was performed by the clinical data. Results: The parameters got by clinical fitting data could reach the physiological characteristics well. The pressure, volume and flow curve was the most similar compared with clinical data. Conclusion: This method provides an efficient way for the identification research of relative models. It is also a consummation of Mesic respiratory system.
Author
Parameter Identification; Respiratory System; Respiratory Diseases; System Identification; Physiology; Diagnosis

20090031816 Institute of Space Medico-Engineering, Beijing, China
Study of Transcutaneous Wireless Bidirectional Communication System Based on Pulse Position Modulation
Wang, Wei-ming; Ma, Bo-zhi; Hao, Hong-wei; Li, Lu-ming; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 33-38; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To find out a PPM-based transcutaneous wireless bidirectional communication system for implantable medical device. Methods: The wireless communication system included device implanted in the body, controller and PDA outside the body. Pulse position modulation (PPM) was used for the wireless bidirectional communication between device implanted in the body and controller outside the body. Results: A PPM-based transcutaneous wireless communication system was realized. Its wireless bidirectional communication distance between device implanted in the body with titanium container and controller outside the body was over two inches. This system was with good position availability. Conclusion: Pulse position modulation is successfully used for transcutaneous wireless communication system, and average power consumption for communication device implanted in the body is lowered greatly compared with ASK modulation method. At the same time, the volume of communication device implanted in the body is decreased for antenna common-using idea. Key words : implantable ; transcutaneous wireless communication ; pulse position modulation ; low power consumption
Author
Wireless Communication; Pulse Position Modulation; Communication Equipment; Energy Consumption

20090031817 BeiHang Univ., Beijing, China
Research Progress of Portable Life Support System for Extravehicular Activity Space Suit
Wang, Jing; Yuan, Wei-xing; Yuan, Xiu-gan; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 67-71; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

With the development of space exploration, high performance extravehicular activity (EVA) space suit portable life support system (PLSS) is expected. In this paper, the research progress of PLSS for EVA is introduced. The techniques of CO, removal system and H,O removal system are key parts of PLSS. These concepts are compared and analyzed. Prospects of development of PLSS are proposed. Those mature, reliable techniques should be adopted for our country. Regenerative PLSS facilities should be investigated simultaneously.
Author
Portable Life Support Systems; Water; Carbon Dioxide Removal; Extravehicular Activity; Life Support Systems

20090031818 Institute of Space Medico-Engineering, Beijing, China
Degradation of Chitosan in Vitro and Effects of Degradation Products on Proliferation of Endothelial Cells
Shi, Guo-qi; Chen, Uan-wei; Ding, Yu-long; Zhang, Xiao-hua; Wan, Chang-xiu; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 62-66; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective To study the degradation of chitosan in physiological saline and the effect of degradation products on proliferation of endothelial cells, as well as to provide the reference for exploring the potential application of chitosan to promote angiogenesis in tissue engineering. Methods The degradation was prepared by immersing the films of chitosan in physiological saline under aseptic condition. The weight loss rate and molecular weight were measured. On the other hand, the pH value and glucosamine concentration of degradation products were measured with Morgan-Elson method. ECV-304, a human umbilical vein endothelial cell line, was used and cultured with the degradation fluid. Cell proliferation was detected with MTT assay. The fluids of glucosamine with different concentrations also were cultured and compared with ECV-304. Results The degradation of chitosan went along by destroyed the Beta-(1, 4) bond. The weight loss of chitosan was 19.48% in 120 d. The molecular weight decreased with the increasing of degradation time. The pH value increased slightly and the concentration of glucosamine increased always with the increasing of degradation time. The degradation products of 21 to

approx. 90 d inhibited the cell proliferation, but promoted the cell proliferation on other degradation time. When the concentration of glucosamine was 10 micro-mol/L approx 1 mmol/L, the fluid promoted the cell proliferation. The glucosamine concentration of degradation fluid was > or = 10 mmol/L the cell proliferation was inhibited. Conclusion The degradation of chitosan goes along by destroyed the Beta-(1 , 4) bond. The degradation products of 21 to approx. 90 d inhibit the cell proliferation, but promote the cell proliferation on other degradation time. The glucosamine concentration is not the only factor which influenced the endothelial cells proliferation. Key words : chitosan ; degradation in vitro ; degradation products ; endothelial cells

Author

Degradation; Cells (Biology); Assaying; Physiological Effects; Regeneration (Physiology); Tissue Engineering; Molecular Weight; In Vitro Methods and Tests

20090031819 Institute of Space Medico-Engineering, Beijing, China

Numerical Simulation Analysis of Single-phase Flow Field in Micro-flow-channels of the Small Square Cylinders in the Electrolysis Oxygen Generation

Li, Lin-lin; Zhang, Ji-li; Zhou, Kang-han; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 22-26; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To study the flow fields of electrolysis oxygen generation with micro-flow-channels of small square cylinders and the key structure factors impacting on the uniform distribution of the water flow in the micro-flow-channels. Methods: The low Renault k-Epsilon model was used to represent the characteristics of the flow field in the micro-flow-channels. And the simulation results of the flow fields by CFD were calibrated by comparing with that of the particle image velocimetry(PIV) experiments, which showed that the low Renault k-Epsilon model was suitable to describe the flow field of the micro-flow-channels. Results: The flow fields of variable flow were obtained. Conclusion: The flow fields of variable flow rates distribute non-uniformly. The velocity magnitude is 10(exp -3)m/s, and the inlet structure of the electrolysis oxygen generation is a key factor impacting on the uniform distribution of the water flow.

Author

Computational Fluid Dynamics; Oxygen Production; K-Epsilon Turbulence Model; Single-Phase Flow; Flow Distribution; Particle Image Velocimetry; Water Flow; Electrolysis

20090031820 Institute of Space Medico-Engineering, Beijing, China

Effects of Different Doses of Sijunzi Decoction on Soleus Atrophy in Tail-suspended Rats

Hu, Qing-zhao; Gao, Yun-fang; Cao, Jin; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 9-12; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To observe the effects of different doses of Sijunzi decoction (SJZD) on soleus(SOL) atrophy in tail-suspended rats. Methods Weightlessness was simulated by tail suspension in female Sprague-Dawley rats. Six rats in each group were assigned to a 5-group design randomly: control (CON); hind limb unloading (HLU) plus intragastric water instillation (HLU-W), as well as plus intragastric high dose (HLUH), middle dose (HLU-M) and low dose (HLU-L) SJZD instillation respectively. Immunohistochemical method was used to observe the effects of them on expression of myosin heavy chain (MHC) isoforms in soleus muscle. Results: Compared with HLU-W, muscle wet weight (MWW) of SOL in high and middle dose group increased by 33.11% and 37.57% respectively, as well as no significant difference with CON; three doses of SJZD groups increased the percentage of type 1 myosin by 34.04% - 54.90% and its cross sectional area (CSA) by 8.50% - 36.86% , moreover SJZD of middle dose group showed no significant difference with that of CON group. Conclusion: Three doses of SJZD groups can significantly prevent soleus atrophy induced by simulated weightlessness, and middle dose is the more effective one than high and low dose.

Author

Weightlessness Simulation; Atrophy; Myosins; Muscles; Dosage; Weightlessness

20090031821 Institute of Space Medico-Engineering, Beijing, China

Effect of K(sub ATP) Channel Regulators on the Expression of K(sub ATP) Subunits on the Cerebral Ischemia Reperfusion Injury in Gerbil

Wang, Lin; Zhu, Qing-lei; Wang, Guo-zheng; Space Medicine and Medical Engineering, Volume 22, No. 1; February 2009, pp. 13-17; In Chinese; See also 20090031807; Copyright; Avail.: Other Sources

Objective: To investigate the effect of K(sub ATP) channel regulator on the expression of K(sub ATP) subunits on the cerebral ischemia reperfusion injury (I-R) in gerbil. Methods: The I-R models of gerbil were performed by occlusion common

carotid artery for 10 min and reperfusion for 60 min. Forty eight gerbils were randomly divided into 8 groups : sham-operated group, I-R group, I-R + diazoxide pretreatment group, I-R + 5-Hydroxydecanoate(5-HD) pretreatment group, I-R + diazoxide + 5-HD pretreatment group, I-R + pinacidil pretreatment group, I-R + glibenclamide pretreatment group, I-R + pinacidil + glibenclamide pretreatment group. Pre I-R, the gerbil of each group was injected with K(sub ATP) openers or blockers correspondingly, and the expressions of Kir6.1, SUR1, SUR2 mRNA in brain tissue were detected by reverse transcriptase-polymerase chain reaction (RT-PCR) . Results: Compared with sham-operated group, the expression of Kir6.1 mRNA in I-R group was increased significantly. Compared with I-R group, the expression of Kir6.1 mRNA in diazoxide pretreatment group was increased significantly, whereas that in glibenclamide treatment group was decreased significantly . Compared with sham-operated group, the expression of SUR2 mRNA was increased significantly both in I-R groups and pharmacologic pretreatment groups. However, there was no difference among K(sub ATP) opener and blocker groups. And the expression of SUR1 mRNA was no difference in sham-operated group, I-R group and pharmacologic pretreatment groups. Conclusion: Kir6.1 mRNA is increased significantly with diazoxide pretreatment. Kir6.1 subunit plays an important role in protection of cerebral ischemia reperfusion injury. However, SUR1 mRNA and SUR2 mRNA are not influenced by the K(sub ATP) regulators.
Author
Potassium; Adenosine Triphosphate; Ischemia; Brain; Neck (Anatomy); Pretreatment; Arteries; Occlusion

53
BEHAVIORAL SCIENCES

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

20090030230 Georgia Tech Research Inst., Atlanta, GA USA
Networked Electronic Warfare Training System (NEWTS)
Viney, Linda; McDermot, Tom; Eidman, Craig A.; McCall, Susan; Proceedings of the 2007 Interservice/Industry Training, Simulation and Education Conference (IITSEC); Nov. 2007; Paper No. 7130; 11 pp.; In English; Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC), 26 - 29 Nov. 2007, Orlando, FL, USA
Contract(s)/Grant(s): FA8650-06-M-6722; Proj-3005; 65505F
Report No.(s): AD-A501271; AFRL-RH-AZ-PR-2007-0005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501271

Several efforts are currently underway to enhance electronic warfare (EW) training on Air Force aircraft using onboard, rangeless EW training. On-board EW training provides closed-loop simulations of air-defense environments for realistic in-flight combat training of aircrews. The training capability can be an integral part of the aircraft operational flight program (OFP) or can be an external simulator carried onto the aircraft. An emerging requirement for embedded EW training is in support of live, virtual, constructive (LVC) threat simulations in multi-element training exercises like Red Flag. The LVC experience requires coordination of multiple air and ground threat systems with multiple aircraft players where some are simulated and some are real. This concept allows training against denser, more realistic threat arrays than are typically available on most live-fly EW ranges. This paper provides highlights of an investigation conducted to support a low-cost EW training system that meets current and future requirements of a ground-based threat simulation tool that can stimulate the aircraft EW subsystems and monitor aircraft and operator responses over existing aircraft data links. The investigation identified system architectures for an off-board training system that required minimum changes to the aircraft OFP while providing a centralized threat simulation for multiple aircraft in training exercises without the need for expensive training ranges or flight equipment. A primary feature of this concept is a ground-based threat simulator based on the Air Force Research Laboratory's Experimental Common Immersive Theater Environment simulation environment and the Georgia Tech Research Institute on-board embedded training system the Virtual Electronic Combat Training System.
DTIC
Education; Electronic Warfare

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*.

20090029953 NASA Johnson Space Center, Houston, TX, USA
Inflatable Habitat Health Monitoring: Implementation, Lessons Learned, and Application to Lunar or Martian Habitat Health Monitoring
Rojdev, Kristina; Hong, Todd; Hafermalz, Scott; Hunkins, Robert; Valle, Gerald; Toups, Larry; September 14, 2009; 15 pp.; In English; AIAA Space 2009, 14-17 Sept. 2009, Pasadena, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 736466.09.01.05.02.01.05
Report No.(s): JSC-CN-18707; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029953

NASA's exploration mission is to send humans to the Moon and Mars, in which the purpose is to learn how to live and work safely in those harsh environments. A critical aspect of living in an extreme environment is habitation, and within that habitation element there are key systems which monitor the habitation environment to provide a safe and comfortable living and working space for humans. Expandable habitats are one of the options currently being considered due to their potential mass and volume efficiencies. This paper discusses a joint project between the National Science Foundation (NSF), ILC Dover, and NASA in which an expandable habitat was deployed in the extreme environment of Antarctica to better understand the performance and operations over a one-year period. This project was conducted through the Innovative Partnership Program (IPP) where the NSF provided the location at McMurdo Station in Antarctica and support at the location, ILC Dover provided the inflatable habitat, and NASA provided the instrumentation and data system for monitoring the habitat. The outcome of this project provided lessons learned in the implementation of an inflatable habitat and the systems that support that habitat. These lessons learned will be used to improve current habitation capabilities and systems to meet the objectives of exploration missions to the moon and Mars.
Author
Habitats; Lessons Learned; Health; Deployment; Antarctic Regions; Efficiency

20090029954 NASA Johnson Space Center, Houston, TX, USA
Hatch Integration Testing of a NASA TransHab Derivative Woven Inflatable Module
Edgecombe, John; Valle, Gerald; [2009]; 3 pp.; In English; AIAA Structures, Structural Dynamics, and Materials Conference, 12-15 Apr. 2010, Orlando, FL, USA
Report No.(s): JSC-CN-18712; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029954

Current options for Lunar habitat architecture include inflatable habitats and airlocks. Inflatable structures can have mass and volume advantages over conventional structures. However, inflatable structures are also perceived to carry additional risk because they are at a lower Technical Readiness Level (TRL) than more conventional metallic structures. The use of inflatable structures for habitation will require large penetrations in the inflatable structure to accommodate hatches and/or windows The Hatch Integration Test is designed to study the structural integrity of an expandable structure with an integrated hatch, and to verify mathematical models of the structure. The TransHab project developed an experimental inflatable module at Johnson Space Center in the 1990's. The TransHab design was originally envisioned for use in Mars Transits but was also studied as a potential habitat for the International Space Station (ISS).
Author
Hatches; Inflatable Structures; Expandable Structures; Habitats; Air Locks

20090030120 Texas A&M Univ., College Station, TX USA
Investigating Pedestrian Components in Temporary Traffic Control
Ullman, B. R.; Brewer, M. A.; Fitzpatrick, K.; Ullman, G. L.; Jan. 2008; 182 pp.; In English
Report No.(s): PB2008-107644; REPT-0-5237-1; No Copyright; Avail.: National Technical Information Service (NTIS)

The report documents the research activities completed during the two years of this research project. The objectives of this research were: To examine how pedestrians with disabilities are being handled in temporary traffic control situations and identify if there are changes needed in this accommodation; To determine the information requirements of pedestrians (especially those with special needs) at temporary traffic control locations and gain input on how best to meet those

requirements; To develop recommended guidance documents to provide TxDOT with improved traffic control methods for pedestrians in temporary traffic control locations. Researchers approached this project from two different angles to accomplish these objectives. First was establishing the current state-of-the-practice with regard to handling pedestrians in temporary traffic control areas and the second was the administration of several human factors studies that addressed public perception of pedestrians in or near work areas. This report contains specific findings and recommendations regarding each of these activities.
NTIS
Air Traffic Control; Disabilities; Position (Location)

20090030121 Texas A&M Univ., College Station, TX USA
Driver Comprehension of Signing and Markings for Toll Facilities
Chrysler, S. T.; Williams, A. A.; Fitzpatrick, K.; Feb. 2008; 144 pp.; In English
Report No.(s): PB2008-107649; REPT-0-5446-2; No Copyright; Avail.: CASI: A07, Hardcopy

This report describes research activities regarding the comprehension of the signs and pavement markings for toll roads and managed lanes. Texas Transportation Institute researchers conducted seven focus groups, which explored driver understanding of toll road route markers, open road tolling payment options, pavement marking symbols, and preferential lane pavement markings in four Texas cities. Researchers also reviewed the ongoing development of revisions to the toll road chapter for the Texas Manual of Uniform Traffic Control Devices.
NTIS
Pavements; Roads

20090030147 Federal Emergency Management Agency, Washington, DC, USA
Mitigation Case Studies: Safe Rooms Save Lives. State of Oklahoma Safe Room Initiative
Jan. 2003; 17 pp.; In English
Report No.(s): PB2008-108325; No Copyright; Avail.: CASI: A03, Hardcopy

As a result of these tornadoes, in Oklahoma alone over 44 persons died and almost 800 were injured. How could Oklahomans feel safe in future tornadoes. To help answer this question, the State of Oklahoma launched an initiative to promote and support the construction of storm shelters in homes. These shelters, built to FEMA guidelines, are called safe rooms. The initiative was the first large-scale effort to build thousands of safe rooms through a rebate program, and its success is a direct result of the involvement and strong support of the Governor of Oklahoma and the participation of partners in industry, business, government, and the private sector. Thousands of safe rooms were built and, although funding for the rebate program has ended, the initiative continues to result in the construction of safe rooms throughout the state.
NTIS
Buildings; Oklahoma; Rooms; Shelters

20090030322 Air Force Research Lab., Wright-Patterson AFB, OH USA
Applications of Psychophysiological Measures in Uninhabited Air Vehicle Tasks
Thomas, Krystal; Wilson, Glenn; Christensen, James; Jun 2009; 68 pp.; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A501512; AFRL-RH-WP-TR-2009-0073; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501512

To enhance the performance of Air Force systems, we must keep the human operator in mind during our development and testing. The work performed has kept this thought at its forefront evidenced by the studies performed. Our objectives have included developing methodologies, tools, and algorithms for real-time psychophysiological assessments and application of operator functional state as well as applying muti-sensory and adaptive interfaces to improve total system performance.
DTIC
Aircraft; Electric Batteries; Human Factors Engineering; Military Technology; Moods; Operator Performance; Psychomotor Performance; Psychophysiology; Tasks

20090030350 TriService Nursing Research Program, Bethesda, MD, USA
Impact of Body Armor on Physical Work Performance
Ricciardi, R.; Dec. 31, 2006; 44 pp.; In English
Contract(s)/Grant(s): HU0001-05-1-TS10; USUHS-104213
Report No.(s): PB2008-108710; USUHS-N05-P20; Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this study is to identify the physiologic impact and health risks associated with wearing body armor and to develop strategies to prevent or mitigate negative health effects. Body armor is widely used by military, police, security, and first responder personnel for protection against fragmentation, handgun, and rifle projectile injuries. A within-subject, repeated-measures design was used. Thirty-four participants volunteered to undergo two experimental conditions while wearing or not wearing body armor. Subjects walked on a treadmill for 30 minutes at a slow and moderate pace and also completed a physical performance battery. Subjects wearing body armor, compared to not wearing it, had significantly greater increases in oxygen uptake at a slow and moderate pace; blood lactate at a moderate pace; heart rate at slow and moderate pace; and rating of perceived physical exertion at slow and moderate pace. Body armor significantly affected physical tasks: Under the body armor condition, men performed 61 percent fewer pull-ups, and body armor reduced womens hang time by 63 percent; stair stepping in men and women decreased by 16 percent. When examining gender differences, female and male subjects with body armor, as compared to those without body armor, had no significant differences in percentage increase in VO(sub 2), heart rate or respiratory rate at slow or moderate pace while walking and wearing body armor.
NTIS
Armor; Human Performance; Physical Work; Heart Rate

20090030367 Sandia Labs., Albuquerque, NM, USA
Recognition Using Gait
Koch, M. W.; Sep. 01, 2007; 14 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-922087; SAND2007-6215; No Copyright; Avail.: National Technical Information Service (NTIS)

Gait or an individuals manner of walking, is one approach for recognizing people at a distance. Studies in psychophysics and medicine indicate that humans can recognize people by their gait and have found twenty-four different components to gait that taken together make it a unique signature. Besides not requiring close sensor contact, gait also does not necessarily require a cooperative subject. Using video data of people walking in different scenarios and environmental conditions we develop and test an algorithm that uses shape and motion to identify people from their gait. The algorithm uses dynamic time warping to match stored templates against an unknown sequence of silhouettes extracted from a person walking. While results under similar constraints and conditions are very good, the algorithm quickly degrades with varying conditions such as surface and clothing.
NTIS
Gait; Imaging Techniques; Signatures; Walking

20090030415 Idaho National Lab., Idaho Falls, ID, USA
Influence of Emotional State and Pictorial Cues on Perceptual Judgements. Human Factors and Ergonomic Society
Raddatz, K. R.; Werth, A.; Tran, T. Q.; Oct. 2007; 6 pp.; In English
Report No.(s): DE2008-923508; INL/CON-07-12813; No Copyright; Avail.: National Technical Information Service (NTIS)

Perspective displays (e.g., CDTI) are commonly used as decision aids in environments characterized by periods of high emotional arousal (e.g., terrain enhanced primary flight displays). However, little attention has been devoted to understanding how emotional state, independently or in conjunction with other perceptual factors (e.g., pictorial depth cues), can impact perceptual judgments. Preliminary research suggests that induced emotional state (positive or negative) adversely impacts size comparisons in perspective displays (Tran & Raddatz, 2006). This study further investigated how size comparisons are affected by emotional state and pictorial depth cues while attenuating the limitations of the Tran & Raddatz (2006) study. Results confirmed that observers do make slower judgments under induced emotional state. However, observers under negative emotional state showed higher sensitivity (d) and required more evidence to respond that a size difference exists (response bias) than observers under positive emotional state. Implications for display design and human performance are discussed.
NTIS
Cues; Display Devices; Emotional Factors; Emotions; Graphic Arts; Human Factors Engineering

20090030427 Michigan Univ., Ann Arbor, MI USA

Benefits of Headlamp Leveling and Cleaning for Current U.S. Low Beams

Flannagan, M. J.; Sivak, M.; Schoettle, B.; Nov. 2007; 35 pp.; In English

Report No.(s): PB2008-107163; UMTRI-2007-46; No Copyright; Avail.: CASI: A03, Hardcopy

The goal of this study was to examine whether the recent changes in the sharpness of the vertical gradient in U.S. low beams have changed the importance of headlamp leveling and cleaning systems. The study consisted of three parts. In the first part, we collected new data on dynamic distributions of pitch angles for a passenger car, a minivan and an SUV in actual traffic. In the second part, we applied the new dynamic pitch data (combined with recent static pitch data) to representative low-beam patterns to estimate the changes in the benefits of leveling system. These estimates were made for a comprehensive combination of static and dynamic sources of misaim; additional analyses would be necessary to determine the relative benefits of leveling systems that address selected sources of misaim. Three sets of photometric data were used in the analysis; market-weighted 1997 and 2004 tungsten-halogen beam patterns, and a representative 2004 HID beam pattern. In the third part, we applied a previously derived model for the effects of dirt on the three beam patterns to estimate the changes in the benefits of cleaning systems. In both sets of analyses, the effects on both visibility and glare were considered. The results indicate that (1) the importance of headlamp leveling systems for U.S. low beams has recently increased substantially for tungsten-halogen and especially HID lamps; and (2) the importance of headlamp cleaning systems has stayed approximately the same.

NTIS

Cleaning; Leveling; Motor Vehicles; Glare; Luminaires

20090030687 Idaho National Lab., Idaho Falls, ID, USA

Analysis of Fundamental NIST Sphere Experiments Related to Criticality Safety

Kim, S. S.; Jun. 01, 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2008-912891; INL/CON-06-11913; No Copyright; Avail.: Department of Energy Information Bridge

A series of neutron transport experiments was performed in 1989 and 1990 at NIST (National Institute of Standards and Technology) using a spherical stainless steel container and fission chambers. These experiments were performed to help understand errors observed in criticality calculations for arrays of individually subcritical components, particularly solution arrays. They were supported by the U.S. Department of Energy, Environment and Health, Nuclear Criticality Technology and Safety Project. The intent was to evaluate the possibility that the criticality prediction errors stem from errors in the calculation of neutron leakage from individual components of the array. Thus, the explicit product of the experiments was the measurement of the leakage flux, as characterized by various Cd-shielded and unshielded fission rates. Because the various fission rates have different neutron-energy sensitivities, collectively they give an indication of the energy dependence of the leakage flux. Leakage and moderation were varied systematically through the use of different diameter spheres, with and without water. Some of these experiments with bare fission chambers have been evaluated by the International Criticality Safety Benchmark Evaluation Project (ICSBEP).

NTIS

Fission; Safety; Spheres

20090030904 Defence Research and Development Suffield, Suffield, Alberta Canada

The Effect of Standoff on Protection Systems - Experimental Trials with Frangible Surrogate Lower Legs

Mah, Jennifer M.; Braid, Matt P.; Fall, R. W.; Anderson, I. B.; Mar. 2007; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A502378; DRDC-TM-2007-059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA502378

Combat boot covered frangible surrogate lower legs (FSLLs) were tested at different standoffs against surrogate anti-personnel (AP) mines. The standoff had air gaps and Styrofoam gaps. The effect of standoff on lower limb injury was determined by examination of the FSLLs by a trauma surgeon. Differences in energy delivered were determined using a piston apparatus. In dry sand only, the greater the standoff, the less severe the injury. Standoff with air was more effective than standoff with Styrofoam.

DTIC

Protection; Protectors

20090031134 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Multinational Military Operations and Intercultural Factors
Febbraro, Angela R., Editor; McKee, Brian, Editor; Riedel, Sharon L., Editor; November 2008; 168 pp.; In English; See also 20090031135 - 20090031141; Original contains color and black and white illustrations
Report No.(s): RTO-TR-HFM-120; AC/323(HFM-120)TP/225; Copyright; Avail.: CASI: C01, CD-ROM; A08, Hardcopy

Since 1990, there has been a significant increase in the number of military operations requiring nations to contribute forces as part of a multinational alliance or coalition. Evidence suggests that differences in the organizational and national cultures of contributing countries can impact the operational effectiveness of the multinational force. The purpose of the NATO Human Factors and Medicine (HFM) Research Task Group (RTG) on Multinational Military Operations and Intercultural Factors (RTG-120) was to consider the intercultural factors that influence multinational military collaboration in the areas of organizational factors; leadership and command; teams; pre-dispositional and psychosocial factors; communication; technology; and societal factors. Throughout these areas, a common theme was the need to instill greater cultural sensitivity and awareness through pre-deployment programs and training for all military personnel. It is hoped that the knowledge generated on these topics will promote an understanding of diversity in the areas of human culture, organizations and technologies of relevance to multinational military operations, and ultimately contribute to the effectiveness of these collaborations.
Author
Human Factors Engineering; Military Operations; Education; Deployment; Leadership; System Effectiveness

20090031135 Institute for Human Factors TNO, Soesterberg, Netherlands
Multinational Military Teams, Chapter 4
vanVliet, A. J.; vanAmelsfoort, D.; Multinational Military Operations and Intercultural Factors; November 2008, pp. 4-1 - 4-15; In English; See also 20090031134; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This chapter focuses on the literature on cultural diversity in military teams. The introductory section will examine the notion of teams, particularly in relation to culture. Within this context, there will also be a discussion of some of the advantages and disadvantages of cultural diversity with respect to teams. The second section briefly describes the method that was used for a review of existing literature pertaining to military teams and multinational operations. In the final section, the literature will be discussed and some conclusions and recommendations will be made.
Author
Decision Making; Military Operations; International Relations; Problem Solving; Workloads (Psychophysiology); Ethnic Factors; Heterogeneity

20090031136 Institute of Aviation Medicine, Prague, Czechoslovakia
Cultural Predispositions and Psychosocial Aspects, Chapter 5
Dzvonik, Oliver; Multinational Military Operations and Intercultural Factors; November 2008, pp. 5-1 - 5-16; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This chapter addresses the cultural predispositions involved in culturally diverse multinational military operations. The core of cultural predispositions is composed of explicit and tacit assumptions and understandings, as well as other cognitive processes, including ways of thinking commonly held by a group of people, or a particular configuration of assumptions and understandings that is distinctive to a group. These assumptions and understandings serve as guides to acceptable and unacceptable perceptions, thoughts, feelings, and behaviors. They are learned and passed on to new members of the group through psychosocial processes and interactions. Cultural differences present barriers to successful coalition command and control. This challenge is compounded by the distributed decision making that characterizes many operations. If nations are to work effectively in multinational operations, then the complexities presented by differences in national cultural predispositions must be understood. These differences are reflected at the individual and psychosocial level of analysis in terms of differences in 'personality, cognitions, attitudes and values, power distance, dialectical reasoning, counterfactual thinking, risk assessment and uncertainty management, activity orientation, trust, and ethics' (Sachman, 1997, p. 25). Before looking specifically at cultural predispositions and psychosocial aspects of multinational military operations, it would be informative to take a look at the general literature on the relationship between culture and personality. Reviewed in the following section of this chapter are some of the key research studies conducted in this area at the theoretical and empirical level. This review will then provide the basis for a discussion of the implications of this literature on multinational military operations.
Author
Military Operations; Sensory Feedback; Decision Making; Cognition; Perception; Command and Control

20090031137 National Defence Headquarters, Ottawa, Ontario, Canada

Societal Factors, Chapter 8

Browne, Phyllis; Multinational Military Operations and Intercultural Factors; November 2008, pp. 8-1 - 8-15; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report has looked at important cultural dimensions of a wide range of factors that impact multinational military operations. A number of issues, however, do not fall neatly within the parameters of the other chapters. This chapter will examine some of these topics under the general heading of societal factors. In particular, this chapter will explore the extent to which societal factors, which are shaped by culture, may influence a national population s perceptions of military actions, which in turn may impact the participation and nature of involvement of some contingents in multinational military operations. Specifically, the chapter will address the following issues: a) The impact of conscripted as opposed to professional militaries within multinational, intercultural operations; b) Cross-national differences in casualty tolerance; and c) Differing public opinions across nations about military operations in general. It will be argued that any or all of these societal-cultural factors may pose a particular threat to multinational military operations in a multicultural context. It is asserted that due to the ideological shift of warfare since the end of the Cold War and the increasing multinational nature of the response, intercultural factors will play a significant role in operational effectiveness and mission success or failure. In a multinational military operation the societal factor of ideology is perhaps the lever that will drive the cohesiveness and sense of purpose among contingents. Ideology has been defined as a system of ideas or way of thinking relating to politics, society or to the conduct of a class or group (Barber, 2004). Ideology, often implicit, is used to justify actions, and tends to be maintained regardless of the course of events. To a large extent, nations that share the same ideology are able to function together, particularly in a multinational military context, and perhaps more so when they are driven by the same purpose. However, some areas of ideology may vary between nations and can become problematic in multinational military operations.

Author

System Effectiveness; International Relations; Military Operations; Perception; Warfare

20090031138 Defence Research and Development Canada, Toronto, Ontario, Canada

Leadership and Command, Chapter 3

Febbraro, Angela R.; Multinational Military Operations and Intercultural Factors; November 2008, pp. 3-1 - 3-28; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As history demonstrates, the challenge of leading a multinational coalition force or military alliance is not new (Plante, 1998). In fact, it may be as old as war itself. From the time of Troy to the Crusades to the Thirty Years Wars, from the Napoleonic Wars to the alliances of World Wars I and II, and from the Korean conflict to the war against terrorism in Afghanistan, nations have associated with each other in order to achieve a common purpose (Lescoutre, 2003; Elron, Shamir, & Ben-Ari, 1999). Increasingly, however, and particularly since the end of the Cold War in 1989, the employment of military forces in multinational operations demands a broader range of leadership competencies than previously required of military commanders (MacIsaac, 2000). Contemporary coalition operations often consist of new partners who typically have not trained together and who have very different military traditions and cultures (Marshall, Kaiser, & Kessmeier, 1997). Indeed, cultural bias, deep seated religious prejudices, and long historical memories have made the integration of a multinational force a significant leadership challenge in the post-Cold War era (Plante, 1998). Further, since the Cold War, multinationality occurs lower down in the chain of command, making it an issue for a broader range of personnel, whether at the strategic, operational, or tactical level (Stewart, Macklin, Proud, Verrall, & Widdowson, 2004). Proficiency in command or leadership at the operational level, for instance, requires the ability to integrate the operations of different forces (e.g., within an alliance or coalition) towards the achievement of mission objectives, despite sources of friction such as differences in goals, logistics, capabilities, training, equipment, doctrines, intelligence, language, leadership, and cultural practices (Plante, 1998; Stewart, Macklin, et al., 2004). In particular, McCann and Pigeau (2000) emphasize that building an effective coalition force in today s operations requires that a leader be able to weld together military personnel from different cultures, who have varying abilities and expectations. This ability to integrate diverse forces will become increasingly important as coalition operations become more prevalent and as such operations depend more and more upon effective teamwork among members of diverse cultural backgrounds, each with their own agenda, leadership expectations and style (Bisho, 2004; Bowman & Pierce, 2003; Klein, Pongonis, & Klein, 2000; Plante, 1998). In short, while multinational missions vary in goals, their participants vary in

their agendas, leadership and command structures, and cultures (Klein et al., 2000). Scholarly work on managing global change in the new security environment has been sporadic and scarce, with the exception of research conducted by military personnel or affiliates whose work is not widely published (Graen, & Hui, 1999). Cross-cultural leadership has not been a major topic of research or training in most militaries (Teo, 2005). Further, much of the work on interoperability in multinational military contexts has focused on technological issues and has neglected the role of human, and in particular, intercultural, factors. This chapter, therefore, will focus on three major aspects of leadership in the context of multinational military operations and intercultural factors, with a specific emphasis on the human, cultural dimension. The first aspect pertains to individual leadership characteristics (including traits, behaviors, and other attributes) that are important in the context of leading multinational, intercultural military operations. The second aspect concerns the leadership implications of cultural barriers to multinational teamwork. The third aspect pertains to leadership or command structures that may be used in the context of multinational, intercultural military operations. The final section of the chapter will focus on recommendations for leadership training and delopment in the context of multinational, intercultural military operations and teams, and will be followed by a few general concluding comments.
Author
Leadership; Military Operations; Politics; Military Personnel; International Relations; Culture (Social Sciences); Management Methods

20090031139 Army Research Inst., Fort Leavenworth, KS, USA
Communication, Chapter 6
Riedel, Sharon L.; Multinational Military Operations and Intercultural Factors; November 2008, pp. 6-1 - 6-19; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Military forces are increasingly being required to operate in multinational environments. This may be in multinational teams, such as North Atlantic Treaty Organisation (NATO) teams, where soldiers from different nations work together for common goals, or in non-traditional missions such as peacekeeping and disaster relief, where soldiers work closely with local populations. In these situations, people from different cultures are put into close contact. Such relationships can be problematic when the potential for miscommunication is considered. Having been socialized in different cultures, participants in multinational teams bring to interactions diverse ways of communicating and understanding communication. Different cultures have different values, communication styles, norms, and behaviors, all of which can lead to problems in communication. Communication is critical in any team setting but particularly within multinational military teams. The research on multinational teams (MNTs) indicates that communication is one of the most pressing difficulties affecting team efficiency and effectiveness. A study by Riedel and Karrasch (2002) found that soldiers in multinational collaborative teams in a NATO operation rated communication as the number one challenge to teamwork in their teams. Some argue that culturally diverse groups present more opportunities for problems than culturally homogeneous groups, including lower levels of trust (Adler, 1997; Triandis, 2000) and miscommunications (Li, 1999). Overall, while cultural diversity has the potential to produce better performance (Nemeth, 1986), it also increases the complexity of interactions and potential communication problems. However, since the use of multinational teams and group interactions is increasing and likely to continue to be the mode of operation in the future, it is important to understand how and why miscommunications arise and ways that they can be avoided. This chapter focuses on communication in groups engaged in multinational military operations. One important subset of these groups is the multinational team. A team can be defined as a set of two or more people who interact, interdependently and adaptively toward a common and valued goal or mission, who have been assigned specific roles or functions to perform, and who have a limited life span of membership (Salas, Dickinson, Converse, & Tannenbaum, 1992, p. 4). This definition emphasizes that the team members are interdependent and that they are working toward a common goal. This means that communication and coordination to keep teams on track is very important. Communication is at the heart of what teams do. If communication breaks down, then team functioning is weakened. It is important then, for teams in multinational military operations that have the potential for communication problems, to be alert to and deal with those communication problems. This chapter will discuss how cultural differences affect communication in multinational military operations; describe different cultural dimensions and how differences along these dimensions can affect communication in multinational military operations; and discuss the skills, knowledge, and attitudes that facilitate intercultural communication in those environments. While there is not a great deal of research specific to multinational military operations, academic research is clearly relevant and the focus in the paper will be on the academic literature. This chapter will not deal with technology and communication (see Masakowski, Chapter 7), but with the impact of culture on communication.
Author
Communicating; Military Operations; Operations Research; Coordination; Disasters; Group Dynamics

20090031140 Defence Research and Development Canada, Ottawa, Ontario, Canada

Organizational Factors, Chapter 2

McKee, Brian; Multinational Military Operations and Intercultural Factors; November 2008, pp. 2-1 - 2-10; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Between military contingents involved in multinational operations, there often exist basic organizational and cultural differences, such as the ways in which personnel are treated, the parameters within which people must work, and the very function and structure of the military organization. The management of human resources within each respective organization is often dependent on national norms and practices, as well as the unique history, tradition and modus operandi of the military forces themselves. These factors influence the way that things are done within any given national organization, the rules and regulations that are enforced, normal or expected patterns of behavior, and even the structure of the organization. The net result of these differences may be marked discrepancies between partners involved in international operations in terms of personnel policies, services and programs, doctrine, and operational functioning. Such differences could potentially hinder the success of the mission and directly or indirectly impact operational effectiveness. This chapter deals with what are generally referred to as organizational issues, that is, issues which relate to the structure and functioning of the institution. For ease of analysis, these can be broadly divided into two general areas: personnel issues and operational issues. The former corresponds to a wide range of people-related factors pertaining to the functioning and culture of a military organization. The latter subsumes a variety of procedural and structural processes and practices that are often so embedded in the organizational culture that they prove hard to change and can create inter-group tensions in a multinational setting

Author

Resources Management; System Effectiveness; Work Functions; Human Resources; Procedures; Regulations; Policies

20090031141 Naval Undersea Warfare Center, Newport, RI, USA

Technology, Chapter 7

Masakowski, Yvonne R.; Multinational Military Operations and Intercultural Factors; November 2008, pp. 7-1 - 7-12; In English; See also 20090031134; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This chapter will examine the impact of technology on multinational military operations, and the ways in which technology has helped to shape military missions in the 21st century. It will also discuss how culture influences the use and effectiveness of technology in multinational operations. The issues addressed in this chapter are complex and related to topics in all of the other chapters in this report. Many of these issues have been discussed earlier; thus, this chapter will highlight technology issues related to multinational military operations rather than discuss them in detail. The role of multinational military missions has changed over time within the context of globalization. Traditionally, military teams were called upon to provide support against threats to their nation s borders. Today, the military role has expanded to include global missions such as peacekeeping, humanitarian aid, and disaster relief. These operational changes have resulted in changes in each nation s strategic plans and have expanded military requirements to meet the demands of this wide range of missions, each of which incorporates technology to support its military objectives (Britt & Adler, 2003). In recent years, there has been a shift in the international security environment as a result of terrorist acts, warfare, and natural disasters. These have necessitated technologies to support the detection, prediction, and prevention of crises and humanitarian aid efforts. Through the rapid evolution of digital technologies has emerged a critical capability to shape the ways in which nations can work together to address both natural crises and potential threats. As military operational requirements evolve, technology continues to spiral to new levels that present both opportunities and challenges to conducting military operations within the global security environment. Since the end of the Cold War, attention has turned toward developing information management technologies that will enable the rapid transfer of information within a secure environment. This capability to rapidly transfer information is essential for ensuring effective international collaboration and cooperation in military operations. As a result, there is an ever-increasing demand for information and tools that will accelerate the distribution of information. Thus, in order to be effective in the future security environment, we must leverage technological advances in computing power to address requirements for rapid and secure transfer of information.

Author

Military Technology; Information Management; Warfare; Military Operations; International Relations; Politics; Emergencies; Disasters

20090031760 Oklahoma Univ., Norman, OK, USA; Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Validating Information Complexity Questionnaires Using Travel Web Sites
Ling, Chen; Lopez, Miguel; Xing, Jing; July 2009; 22 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): FAA 06-G-013; Proj. HRRD522
Report No.(s): DOT/FAA/AM-09/14; Copyright; Avail.: CASI: A03, Hardcopy

With the prevalent use of visual interfaces and the increasing demand to display more information, information complexity in human-computer interfaces becomes a major concern for technology designers. Complex interfaces affect the effectiveness, efficiency, and even the operational safety of a system. Previously, researchers at the Federal Aviation Administration developed two questionnaires to evaluate information complexity of air traffic control displays. This study adapted the questionnaires for commercial computer interfaces and validated them with two types of tasks on three travel Web sites. The results demonstrated that both questionnaires had acceptable reliability, validity, and sensitivity.
Author
Display Devices; Human-Computer Interface; Safety; Reliability; Air Traffic Control

20090031787 National Inst. for Occupational Safety and Health, Washington, DC, USA
Miners' Views About Personal Dust Monitors
Peters, R. H.; Vaught, C.; Hall, E. E.; Volkwein, J. C.; Feb. 2008; 53 pp.; In English
Report No.(s): PB2008-108289; DHHS/PUB/NIOSH-2008-110; No Copyright; Avail.: CASI: A04, Hardcopy

Coal workers pneumoconiosis is the leading cause of death due to occupational illness among U.S. coal miners. This disease is caused by miners exposure to excessive levels of respirable coal mine dust. A personal dust monitor (PDM) has recently been developed to provide near real-time feedback to miners regarding the level of respirable coal dust in the air they breathe. The main objective of this report is to document coal miners reactions to this device and how they make use of the information it provides. It summarizes a field study by the National Institute for Occupational Safety and Health that documented the opinions of 30 miners at 4 underground coal mines concerning the use of PDMs.
NTIS
Coal; Dust; Exposure; Human Factors Engineering; Mining; Monitors

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

20090030038 Helsinki Univ., Finland
Boundedness of Weakly Singular Integral Operators on Domains
Vaehaekangas, Antti V.; Annales Academie Scientairum Fennicae: Mathematica - Dissertationes (ISSN 1239-6303); June 08, 2009; Volume 153; 115 pp.; In English; ISSN 1239-6303; Copyright; Avail.: Other Sources

The foundations for the modern treatment of singular integrals were provided by Calderon and Zygmund in their seminal work [CZ52] and these operators have been studied extensively in various settings [Chr90, HS94, NTV03, Tor91]. The principal objective of this monograph is to explore certain weakly singular integral operators which are related to singular integrals and originate in pseudodifferential operators and PDE's.
Author
Domains; Integral Equations; Operators (Mathematics); Partial Differential Equations

20090030092 Geological Survey, Boulder, CO, USA; Environmental Protection Agency, Washington, DC USA; Colorado School of Mines, Golden, CO, USA
MMA, A Computer Code for Multi-Model Analysis. Chapter 3 of Book 6. Modeling Techniques. Section E. Model Analysis
Poeter, E. P.; Hill, M. C.; Jan. 2007; 125 pp.; In English
Report No.(s): DE2008-920086; No Copyright; Avail.: Department of Energy Information Bridge

This report documents the Multi-Model Analysis (MMA) computer code. MMA can be used to evaluate results from alternative models of a single system using the same set of observations for all models. As long as the observations, the observation weighting, and system being represented are the same, the models can differ in nearly any way imaginable. For example, they may include different processes, different simulation software, different temporal definitions (for example,

steady-state and transient models could be considered), and so on. The multiple models need to be calibrated by nonlinear regression. Calibration of the individual models needs to be completed before application of MMA.
NTIS
Computer Programs; Computerized Simulation; Models; Comparison

20090030095 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Comparison of the Asymptotic Stability Properties for Two Multirate Strategies
Savcenco, V.; Feb. 2007; 22 pp.; In English
Report No.(s): PB2008-108138; MAS-R0705; Copyright; Avail.: National Technical Information Service (NTIS)
This paper contains a comparison of the asymptotic stability properties for two multirate strategies. For each strategy, the asymptotic stability regions are presented for a 2 x 2 test problem and the differences between the results are discussed. The considered multirate schemes use Rosenbrock type methods as the main time integration method and have one level of temporal local refinement. Some remarks on the relevance of the results for 2 x 2 test problems are presented.
NTIS
Asymptotic Properties; Asymptotic Series

20090030099 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Everything You Always Wanted to Know about A-Posteriori Error Estimation in Finite Element Methods, But Were Afraid to Ask
Ferracina, L.; Oct. 2007; 24 pp.; In English
Report No.(s): PB2008-108142; MAS-R0707; Copyright; Avail.: National Technical Information Service (NTIS)
In this paper the basic concepts to obtain a-posteriori error estimates for the finite element method are reviewed. Explicit residual-based, implicit (namely subdomain and element) residual-based, hierarchical-based, recovery-base and functional-based error estimators as well as goal oriented error estimators are presented for a test elliptic boundary value problem. These notes are an introductory presentation, reviewing in a not-too-technical way the fundamental concepts involved in the subject and do not aim at being exhaustive or complete but rather simple and easy to follow.
NTIS
Error Analysis; Finite Element Method; Errors; Mathematical Models

20090030100 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Bilinear Forms for the Recovery-Based Discontinuous Galerkin Method for Diffusion
Van Raalte, M. H.; Van Leer, B.; May 2007; 16 pp.; In English
Report No.(s): PB2008-108143; MAS-E0707; Copyright; Avail.: National Technical Information Service (NTIS)
The present paper introduces bilinear forms that are equivalent to the recovery-based discontinuous Galerkin formulation introduced by Van Leer in 2005. The recovery method approximates the solution of the diffusion equation in a discontinuous function space, while inter-element coupling is achieved by a local L2 projection that recovers a smooth continuous function underlying the discontinuous approximation. Here we introduce the concept of a local recovery polynomial basis (smooth polynomials that are in the weak sense indistinguishable from the discontinuous basis polynomials) and show it allows us to eliminate the recovery procedure. The recovery method reproduces the symmetric discontinuous Galerkin formulation with additional penalty-like terms depending on the targeted accuracy of the method. We present the unique link between the recovery method and discontinuous Galerkin bilinear forms.
NTIS
Diffusion; Galerkin Method

20090030104 Department of Energy, Washington, DC, USA
Audit Report: The Department's Cyber Security Incident Management Program
Jan. 2008; 24 pp.; In English
Report No.(s): PB2008-108167; DOE/IG-0787; No Copyright; Avail.: CASI: A03, Hardcopy
Our review identified issues that could limit the efficiency and effectiveness of the Department's program and could adversely impact investigations by law enforcement or counterintelligence officials. In particular, we observed that: Program elements and facility contractors had established and operated as many as eight independent cyber security intrusion and analysis organizations whose missions and functions we found to be, at least partially, duplicative and not well coordinated. These organizations did not use a common incident reporting format and did not always ensure that essential attack-related

information needed for investigative or trending purposes was reported or retained. Sites could also choose whether to participate in network monitoring activities performed by these organizations. Further, some sites selectively disabled network sensors or 'opted out' of network monitoring activities. Even when facilities participated in monitoring activities, they did not always report network monitoring data--information needed to develop a complex-wide pattern of network traffic and attack patterns; and, The Department had not adequately addressed these and related issues through policy changes, even though it had identified and acknowledged weaknesses in its cyber security incident management and response program.
NTIS
Management Planning; Computer Information Security

20090030111 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Aspects of Goal-Oriented Model-Error Estimation in Convection-Diffusion Problems
Cnossen, J. M.; Bijl, H.; Gerritsma, M. I.; Koren, B.; Feb. 2007; 30 pp.; In English
Report No.(s): PB2008-108135; MAS-E0703; Copyright; Avail.: National Technical Information Service (NTIS)
For goal-oriented model adaptation a model-error estimator is required to drive the adaptation process. In recent years publications have appeared on the dual-weighted residual (DWR) method in the application of model-error estimation in output functionals. In this paper we study the application of the DWR method for convection-diffusion problems where hierarchical models are of different type. Omitting the diffusion operator often results in a singular perturbation problem considering the model residual in the limit of vanishing diffusion. This is caused by the change of mathematical type of the model equations and therefore the applied boundary conditions. In this work we show how a model error estimator is developed for steady and unsteady convection-diffusion problems. It is found that a weak formulation and weakly imposing boundary and initial conditions leads to a dual-weighted model-error estimator that also incorporates boundary residuals.
NTIS
Convection; Diffusion; Error Analysis; Mathematical Models

20090030128 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Time Staggering for Wave Equations
Verwer, J. G.; Jan. 2007; 20 pp.; In English
Report No.(s): PB2008-108133; MAS-E0702; Copyright; Avail.: National Technical Information Service (NTIS)
Grid staggering for wave equations is a validated approach for many applications as it generally enhances stability and accuracy. This paper is about time staggering. Our aim is to assess a fourth-order, explicit time-staggered integration method from the literature through a comparison with two alternative fourth-order, explicit methods. These are the classical Runge-Kutta method and a symmetric-composition method derived from symplectic Euler.
NTIS
Staggering; Wave Equations

20090030137 Economic Research Service, Washington, DC, USA
Equilibrium Displacement Mathematical Programming Models. Methodology and a Model of the U.S. Agricultural Sector
Harrington, D. H.; Dubman, R.; Feb. 2008; 61 pp.; In English
Report No.(s): PB2008-107934; USDA/TB-1918; No Copyright; Avail.: CASI: A04, Hardcopy
The objective of this research is to extend and generalize the equilibrium displacement methodology by combining it with mathematical programming methods and existing knowledge of farm sector relationships to develop sectoral adjustment models that can operate in pure competition, monopoly/monopsony, or mixed-competition. A model of the U.S. agricultural sector at the national aggregate level is presented to illustrate the methods. An appendix contains a users manual describing the operation of the model. Further appendices contain documentation of the structure of the spreadsheets, the programming tableau, and the SAS solution program.
NTIS
Agriculture; Displacement; Mathematical Programming

20090030223 Pacific Northwest National Lab., Richland, WA, USA
PNNL OS3300 Alpha/Beta Monitoring System Software and Hardware Operations Manual Rev. O
Barneet, J. M.; Duchsherer, C. J.; Jan. 2006; 62 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2009-951874; PNNL-15623; No Copyright; Avail.: National Technical Information Service (NTIS)
This Pacific Northwest National Laboratory (PNNL) OS3300 Alpha/Beta Monitoring System Software and Hardware

Operations Manual describes how to install and operate the software and hardware on a personal computer in conjunction with the EG&G Berthold LB150D continuous air monitor. Included are operational details for the software functions, how to read and use the drop-down menus, how to understand readings and calculations, and how to access the database tables.
NTIS
Computer Programs; Computers

20090030236 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Open Automated Demand Response Communications Specification (Version 1.0)
Piette, M. A.; Ghatikar, G.; Kiliccote, S.; Palensky, P.; McParland, C.; Jan. 2009; 209 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2009-951952; No Copyright; Avail.: Department of Energy Information Bridge

The development of the Open Automated Demand Response Communications Specification, also known as OpenADR or Open Auto-DR, began in 2002 following the California electricity crisis. The work has been carried out by the Demand Response Research Center (DRRC), which is managed by Lawrence Berkeley National Laboratory. This specification describes an open standards-based communications data model designed to facilitate sending and receiving demand response price and reliability signals from a utility or Independent System Operator to electric customers. OpenADR is one element of the Smart Grid information and communications technologies that are being developed to improve optimization between electric supply and demand. The intention of the open automated demand response communications data model is to provide interoperable signals to building and industrial control systems that are preprogrammed to take action based on a demand response signal, enabling a demand response event to be fully automated, with no manual intervention. The OpenADR specification is a flexible infrastructure to facilitate common information exchange between the utility or Independent System Operator and end-use participants. The concept of an open specification is intended to allow anyone to implement the signaling systems, the automation server or the automation clients.
NTIS
Electricity; Mathematical Models

20090030243 Sandia National Labs., Albuquerque, NM USA; New Mexico State Univ., Las Cruces, NM, USA
Relation of Validation Experiments to Applications
Hamilton, J. R.; Feb. 01, 2009; 60 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2009-949007; SAND2009-1091; No Copyright; Avail.: National Technical Information Service (NTIS)

Computational and mathematical models are developed in engineering to represent the behavior of physical systems to various system inputs and conditions. These models are often used to predict at other conditions, rather than to just reproduce the behavior of data obtained at the experimental conditions. For example, the boundary or initial conditions, time of prediction, geometry, material properties, and other model parameters can be different at test conditions than those for an anticipated application of a model. Situations for which the conditions may differ include those for which (1) one is in the design phase and a prototype of the system has not been constructed and tested under the anticipated conditions, (2) only one version of a final system can be built and destructive testing is not feasible, or (3) the anticipated design conditions are variable and one cannot easily reproduce the range of conditions with a limited number of carefully controlled experiments. Because data from these supporting experiments have value in model validation, even if the model was tested at different conditions than an anticipated application, methodology is required to evaluate the ability of the validation experiments to resolve the critical behavior for the anticipated application. The methodology presented uses models for the validation experiments and a model for the application to address how well the validation experiments resolve the application. More specifically, the methodology investigates the tradeoff that exists between the uncertainty (variability) in the behavior of the resolved critical variables for the anticipated application and the ability of the validation experiments to resolve this behavior. The important features of this approach are demonstrated through simple linear and non-linear heat conduction examples.
NTIS
Conductive Heat Transfer; Proving

20090030254 Government Accountability Office, Washington, DC, USA
Coast Guard: As Deepwater Systems Integrator, Coast Guard Is Reassessing Costs and Capabilities but Lags in Applying Its Disciplined Acquisition Approach
Jul. 2009; 39 pp.; In English
Report No.(s): PB2009-113245; GAO-09-682; No Copyright; Avail.: CASI: A03, Hardcopy

The Deepwater Program includes efforts to build or modernize ships and aircraft and to procure other capabilities. In

2002, the Coast Guard contracted with Integrated Coast Guard Systems (ICGS) to manage the acquisition as systems integrator. After a series of project failures, the Coast Guard announced in April 2007 that it would take over the lead role, with future work on individual assets bid competitively, and a program baseline of $24.2 billion was set. In June 2008, GAO reported on the Coast Guard's progress and made several recommendations, which the Coast Guard and the Department of Homeland Security (DHS) have addressed. In response to a Senate report accompanying the DHS Appropriations Bill, 2009, GAO addressed (1) efforts to manage Deepwater, (2) changes in cost and schedule of the assets, and (3) efforts to build an acquisition workforce. GAO reviewed Coast Guard and DHS documents and interviewed officials. The Coast Guard has assumed the role of systems integrator for the overall Deepwater Program by reducing the scope of the work on contract with ICGS and assigning these functions to Coast Guard stakeholders. As part of its systems integration responsibilities, the Coast Guard has undertaken a fundamental reassessment of the capabilities, number, and mix of assets it needs and expects to complete this analysis by the summer of 2009. At the individual Deepwater asset level, the Coast Guard has improved and begun to apply the disciplined management process contained in its Major Systems Acquisition Manual (MSAM), but did not meet its goal of complete adherence to this process for all Deepwater assets by the end of March 2009.
NTIS
Coasts; Systems Integration; Water Depth

20090030259 International Trade Commission, Washington, DC USA
Exploiting Long Run Cointegration Properties of a Quarterly U.S. System of Wheat-Related Products
Babula, R. A.; Rogowsky, R. A.; Romain, R. F. J.; Mar. 2006; 32 pp.; In English
Report No.(s): PB2009-113440; No Copyright; Avail.: CASI: A03, Hardcopy

The methods of the cointegrated vector autoregression/vector error correction (VAR/VEC) model are applied to quarterly U.S. markets for wheat and for wheat-using products of wheat flour, mixes and doughs, bread, wheat-based breakfast cereals, and cookies and crackers. This study extends the recent and earlier reduced-form VAR econometric work done on these same markets, by dichotomizing the system into a long run error-correction space of economic relationships and a short run/deterministic component. Results include an array of empirical estimates of the parameters (some structural) and relationships that drive the wheat-related markets and govern their inter-action. An array of empirical estimates of market impacts on policy, institutional, and trade events is also provided.
NTIS
Error Analysis; Market Research; Wheat

20090030341 Sandia National Labs., Albuquerque, NM USA; Colorado Univ., Denver, CO, USA; Santa Clara Univ., CA, USA
LDRD Final Report: Robust Analysis of Large-Scale Combinatorial Applications
Carr, R. D.; Morrison, T.; Hart, W. E.; Greenberg, H. J.; Watson, J. P.; Sep. 01, 2007; 63 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-921748; SAND2007-5983; No Copyright; Avail.: National Technical Information Service (NTIS)

Discrete models of large, complex systems like national infrastructures and complex logistics frameworks naturally incorporate many modeling uncertainties. Consequently, there is a clear need for optimization techniques that can robustly account for risks associated with modeling uncertainties. This report summarizes the progress of the Late-Start LDRD Robust Analysis of Largescale Combinatorial Applications. This project developed new heuristics for solving robust optimization models, and developed new robust optimization models for describing uncertainty scenarios.
NTIS
Combinatorial Analysis; Logistics

20090030351 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Identifying Minimal and Dominant Solutions for Kummer Recursions
Deano, A.; Segura, J.; Temme, N. M.; Nov. 2007; 28 pp.; In English
Report No.(s): PB2008-108713; MAS-R0709; Copyright; Avail.: National Technical Information Service (NTIS)

We identify minimal and dominant solutions of three-term recurrence relations for the confluent hypergeometric functions (sub 1)F(sub1)(a + E(sub 1)n; c + E(sub 2)n; z) and U(a + E(sub 1)n, c + E(sub 2)n, z), where E(sub i)=0, plus or minus 1 (not both equal to 0). The results are obtained by applying Perron's theorem, together with uniform asymptotic estimates

derived by T.M. Dunster for Whittaker functions with large parameter values. The approximations are valid for complex values of a, c and z, with (ph z) less than pi.
NTIS
Identifying; Estimates; Theorems; Asymptotic Series

20090030354 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Time Staggering for Wave Equations Revisited
Verwer, J. G.; Jun. 2007; 16 pp.; In English
Report No.(s): PB2008-108715; MAS-E0710; Copyright; Avail.: National Technical Information Service (NTIS)

Staggering in numerical methods for wave equations generally enhances accuracy and stability. This note is about time staggering. We assess a fourth-order, explicit, time-staggered method, while focussing on a class of second-order wave equations. Alternative explicit integration methods for this class belong to the Runge-Kutta-Nystrom (RKN) family and we have selected three explicit RKN methods for our assessment of the time-staggered method. Compared to these three explicit RKN methods, the time-staggered method possesses a substantially longer stability interval. Our aim is to examine whether this advantage can be expected to borne out in actual computation.
NTIS
Staggering; Wave Equations; Runge-Kutta Method

20090030356 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Numerical Aspects of Special Functions
Temme, N. M.; Jul. 2007; 106 pp.; In English
Report No.(s): PB2008-108716; MAS-E0711; Copyright; Avail.: National Technical Information Service (NTIS)

This paper describes methods that are important for the numerical evaluation of certain functions that frequently occur in applied mathematics, physics and mathematical statistics. This includes what we consider to be the basic methods, such as recurrence relations, series expansions (both convergent and asymptotic), and numerical quadrature. Several other methods are available and some of these will be discussed in less detail. Examples will be given on the use of special functions in certain problems from mathematical physics and mathematical statistics (integrals and series with special functions).
NTIS
Numerical Integration; Integrals; Convergence

20090030357 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Statistical Mechanics of Arakawa's Discretizations
Dubinkina, S. B.; Frank, J. E.; Jul. 2007; 28 pp.; In English
Report No.(s): PB2008-108717; MAS-E0712; Copyright; Avail.: National Technical Information Service (NTIS)

The results of statistical analysis of simulation data obtained from long-time integrations of geophysical fluid models greatly depend on the conservation properties of the numerical discretization chosen. Statistical mechanical theories are constructed for three discretizations of the quasi-geostrophic model due to Arakawa in 1966, each having different conservation properties. It is shown that the three statistical theories accurately explain the differences observed in statistics derived from the discretizations. The effect of the time discretization is also considered, and it is shown that projection is insufficient if the underlying spatial discretization is not conservative.
NTIS
Numerical Integration; Statistical Mechanics

20090030358 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Space-Mapping Techniques Applied to the Optimization of a Safety Isolating Transformer
Tran, T. V.; Brisset, S.; Echeverria, D.; Lahaye, D.; Brochet, P.; Aug. 2007; 10 pp.; In English
Report No.(s): PB2008-108723; MAS-E0714; Copyright; Avail.: National Technical Information Service (NTIS)

Space-mapping optimization techniques allow to align low-fidelity and high-fidelity models in order to reduce the computational time and increase the accuracy of the solution. The main idea is to build an approximate model from the difference of response between both models. Therefore the optimization process is computed on the surrogate model. In this paper, some recent approaches of space-mapping techniques such as agressive-space-mapping, output-mapping and manifold-mapping algorithms are applied to optimize a safety insulating transformer. The electric, magnetic and thermal

phenomena of the device are modeled by an analytical model and a 3D finite element model. It is considered as a benchmark for multi-level optimization to test different algorithms.
NTIS
Quadratic Programming; Safety; Transformers

20090030363 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Construction of High-Order Multirate Rosenbrock Methods for Stiff ODEs (Ordinary Differential Equations)
Savcenco, V.; Sep. 2007; 26 pp.; In English
Report No.(s): PB2008-108726; MAS-E0716; Copyright; Avail.: National Technical Information Service (NTIS)

Multirate time stepping is a numerical technique for efficiently solving large-scale ordinary differential equations (ODEs) with widely different time scales localized over the components. This technique enables one to use large time steps for slowly varying components, and small steps for rapidly varying ones. Multirate methods found in the literature are normally of low order, one or two. Focusing on stiff ODEs, in this paper we discuss multirate methods based on the higher-order, stiff Rosenbrock integrators. Special attention is paid to the treatment of the refinement interfaces with regard to the choice of the interpolant and the occurrence of order reduction. For stiff, linear systems containing a stiff source term, we propose modifications for the treatment of the source term which overcome order reduction originating from such terms and which we can implement in our multirate method.
NTIS
Differential Equations; Numerical Analysis

20090030425 Harper, Rains, Knight and Co., PA, Ridgeland, MS, USA
Independent Accountants' Report: Federal Information Security Management Act Evaluation for the Year Ending September 30, 2006
Jan. 2006; 20 pp.; In English
Report No.(s): PB2008-107735; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Information Security Management Act of 2002 (FISMA) requires agency program officials, Chief Information Officers (CIO), and Inspector Generals (IGs) to conduct annual reviews of the agencys information security program and report the results to the Office of Management and Budget (OMB). OMB issues annual reporting guidance in the form of a memorandum to the respective parties. Under contract with the Farm Credit Administrations (FCA or the Agency) Officer of Inspector General we performed an evaluation of the Agencys security program and practices, solely to assist the IG with the annual evaluation and reporting to OMB. This report includes the objective, scope, methodology, and results of our evaluation to assist with reporting requirements of the FISMA submitted to OMB.
NTIS
Information Management; Computer Information Security

20090030458 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Ethernet Based Embedded IOC for FEL Control System
Jordan, K.; Moore, S.; Yan, J.; Sexton, D.; Grippo, A.; Jan. 23, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922276; JLAB-ACE-07-765; DOE/OR/23177-0293; No Copyright; Avail.: Department of Energy Information Bridge

An Ethernet based embedded Input Output Controller (IOC) has been developed to upgrade the control system for the Free Electron Laser Project at Jefferson Lab. The embedded IOC, called the Single Board IOC (SBIOC), was integrated with a ColdFire embedded microprocessor and a Field Programmable Gate Array (FPGA) on a circuit board, which can be easily configured to control different kinds of I/O devices. The SBIOC provided features of a complete System-on-Module (SOM) as a stand alone system with abundant high speed I/O ports to couple with suitable devices. The software kits, Experimental Physics and Industrial Control System (EPICS) and Real Time Executive for Multiprocessor System (RTEMS), were chosen to work with our existing control system. The embedded IOC system has the features of a low cost IOC, free open source RTOS, plug-and-play-like ease of installation and flexibility.
NTIS
Controllers; Embedding; Ethernet; Free Electron Lasers

20090030506 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Performance Effect of Multi-core on Scientific Applications
Carter, J.; He, Y.; Shalf, J.; Shan, H.; Strohmaier, E.; Jan. 2008; 10 pp.; In English
Report No.(s): DE2008-923361; No Copyright; Avail.: National Technical Information Service (NTIS)

The historical trend of increasing single CPU performance has given way to roadmap of increasing core count. The challenge of effectively utilizing these multi-core chips is just starting to be explored by vendors and application developers alike. In this study, we present some performance measurements of several complete scientific applications on single and dual core Cray XT3 and XT4 systems with a view to characterizing the effects of switching to multi-core chips. We consider effects within a node by using applications run at low concurrencies, and also effects on node-interconnect interaction using higher concurrency results. Finally, we construct a simple performance model based on the principle on-chip shared resource--memory bandwidth--and use this to predict the performance of the forthcoming quad-core system.
NTIS
Computers; Supercomputers

20090030533 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Using IOR to Analyze the I/O Performance for HPC Platforms
Shan, H.; Shalf, J.; Jan. 2007; 15 pp.; In English
Report No.(s): DE2008-923356; No Copyright; Avail.: National Technical Information Service (NTIS)

The HPC community is preparing to deploy petaflop-scale computing platforms that may include hundreds of thousands to millions of computational cores over the next 3 years. Such explosive growth in concurrency creates daunting challenges for the design and implementation of the I/O system. In this work, we first analyzed the I/O practices and requirements of current HPC applications and used them as criteria to select a subset of microbenchmarks that reflect the workload requirements. Our analysis led to selection of IOR, an I/O benchmark developed by LLNL for the ASCI Purple procurement, as our tool to study the I/O performance on two HPC platforms. We selected parameterizations for IOR that match the requirements of key I/O intensive applications to assess its fidelity in reproducing their performance characteristics.
NTIS
Data Base Management Systems; Workloads (Psychophysiology); Parameterization

20090030534 Science Applications International Corp., McLean, VA, USA
Computer-Aided Dispatch Traffic Management Center Field Operation Test: State of Utah Final Report
Owens, N.; Carter, M.; Louisell, C.; Haas, R.; Mitchell, C.; Jul. 2006; 61 pp.; In English
Contract(s)/Grant(s): DTFH61-02-C-00061
Report No.(s): PB2008-107967; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides the final report for the evaluation of the USDOT-sponsored Computer-Aided Dispatch Traffic Management Center Integration Field Operations Test in the State of Utah. The document discusses evaluation findings in the following study areas: (1) System Functionality: An assessment of the performance of the system and how well the system met technical specifications and functional requirements. (2) System Impact: An assessment of the impact did the integration have on systems operations, in particular impacts on emergency response procedures and response times. (3) Institutional Issues: The identification of institutional issues that were encountered and how these were resolved. (4) Technical Issues: The identification of technical issues that were encountered and how these were resolved. (5) Lessons Learned: The documentation of all lessons learned. (6) Benefits: The identification of both qualitative and quantitative benefits. (7) Conclusions and Recommendations: Utah is one of the very best in the nation in responding to and managing traffic incidents. Utah is fortunate that it had such a positive program in place prior to this field test. A joint process for handling incidents had been developed and refined over several years and included access to 9-1-1/CAD information for all types of incidents. Many of the benefits of an integrated TMC-CAD system were realized well before the field test got underway. The recommendations developed are intended to serve as a general guideline that other states could consider when planning similar CAD-TMC integration projects. The intent was to help states proactively identify issues that may impact deployment cost, schedule, and technical performance, and reflect the lessons learned by Utah during the FOT.
NTIS
Computer Aided Design; Computer Techniques; Field Tests; Traffic; Utah

20090030558 Department of Energy, Washington, DC, USA
Designing and Testing Controls to Mitigate Dynamic Loads in the Controls Advanced Research Turbine: Preprint
Wright, A. D.; Stol, K. A.; Jan. 01, 2008; 21 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922543; NREL/CP-500-42490; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Renewable Energy Laboratory is designing, implementing, and testing advanced controls to maximize energy extraction and reduce structural dynamic loads of wind turbines. These control designs are based on a linear model of the turbine that is generated by specialized modeling software. In this paper, we show the design and simulation testing of a control algorithm to mitigate blade, tower, and drivetrain loads using advanced state-space control design methods.
NTIS
Dynamic Loads; Renewable Energy; Wind Turbines; Control Systems Design

20090030689 Purdue Univ., West Lafayette, IN, USA
Modern Technologies for Design Data Collection
Bethel, J. S.; Johson, S. D.; Shan, J.; van Gelder, B. H. W.; McCullouch, B.; Jan. 2003; 143 pp.; In English
Contract(s)/Grant(s): SPR-2450
Report No.(s): PB2008-107971; No Copyright; Avail.: National Technical Information Service (NTIS)

Design data collection involving the use of Lidar instrument, in conjunction with GPS proves to be very effective. Data required to model two bridges over the I-70 was collected on a single day, involving five and six sessions with Lidar equipment. Even though the data was collected on two bridges, it did not cause any disruption of the traffic, either on the Interstate or on the bridges. A major cause of concern during survey activities, particularly along interstates is safety, both for the motorists as well as the people involved in data collection. Lidar data collection was found to be extremely safe in both aspects. The whole process of collecting Lidar data and GPS coordinates for control was completed in 2 days for both bridges. Office work involved combining the GPS data with conventional survey data to bring control on six pre-selected points within the Lidar point cloud. This control information was later used to bring the point cloud into a geographic coordinate system. This survey provided the means to compare the 3D point cloud with bridge designs that were created using other methods of data collection. It was found that the 3D point cloud exhibits a very high degree of accuracy, both internally and also when georeferenced independently using GPS and conventional control survey. The Lidar model was compared to the MXRoad data model provided by INDOT. The discrepancies between the two models were not larger than 0.125 ft/3.81 cm horizontally and 0.05 ft/1.52 cm vertically. The data collected completely modeled the bridge and the accuracy of the data ensures that any model of the bridge, either as a whole or in part, will correctly reflect the current state of the bridge.
NTIS
Data Acquisition; Global Positioning System; Transportation

20090030691 Purdue Univ., West Lafayette, IN, USA
Family of Compaction Curves for Chemically Modified Soils
Krishna, R.; Daita, M.; Drnevich, V. P.; Kim, D.; Aug. 2005; 120 pp.; In English
Contract(s)/Grant(s): SPR-2850
Report No.(s): PB2008-107980; No Copyright; Avail.: National Technical Information Service (NTIS)

Lime and Lime Kiln Dust (LKD) are widely used for modifying/stabilizing pavement subgrades. The addition of lime or LKD involves chemical processes that are dependent on many parameters. For natural subgrades, quality control is based on moisture and unit weight requirements using manual interpolations of one-point test data on a family of curves. For modified soils, moisture and unit weight measurements are insufficient for quality control and other tests must be considered. Various possible quality control methods for LKD-modified subgrades were evaluated. This research produced an Excel-based program to automate the generation of a family of curves and one-point data interpolation. Families of curves for LKD-modified soils did not vary systematically, limiting their usefulness in quality control. Dynamic cone penetrometer (DCP) and Time domain reflectometry (TDR) tests were considered as alternative means to achieve field quality control. The DCP test although promising, requires supplementary tests for completely characterizing a modified subgrade. LKD modification of soil involves chemical reactions which can be indirectly studied by measuring the electrical properties. The dielectric constant and electrical conductivity of a LKD-modified soil were measured using the Purdue TDR apparatus. Preliminary test results show that with the knowledge of two calibration constants, the dielectric constant of a soil measured following the Two-Step TDR test (ASTM D 6780) can be used for water content and unit weight determinations. The electrical conductivity of a LKD-modified soil decreases with time in a manner that is similar to the one-dimensional consolidation of

a soil. The variation in electrical conductivity with time of a LKD-modified project soil was correlated to its strength and was also used to estimate the amount of LKD present in the soil. Future research should focus on extending these observations to other soils and to formulating a protocol for using the TDR test along with the DCP test for quality control of LKD-modified soils.
NTIS
Calcium Oxides; Compacting; Dust; Optical Measurement; Soils

20090030692 Purdue Univ., West Lafayette, IN, USA
Life Cycle Cost Analysis for INDOT Pavement Design Procedures
Lamptey, G.; Ahmad, M.; Labi, S.; Sinha, K. C.; Mar. 2005; 264 pp.; In English
Contract(s)/Grant(s): SPR-2712
Report No.(s): PB2008-107978; No Copyright; Avail.: National Technical Information Service (NTIS)

Given the aging of highway pavements, high traffic levels, and uncertainty of sustained preservation funding, there is a need for balanced decision-making tools such as LCCA to ensure long-term and cost-effective pavement investments. With driving forces such as ISTEA 1991, the NHS Act of 1995, and TEA-21, LCCA enables evaluation of overall long-term economic efficiency between competing alternative investments and consequently has important applications in pavement design and management. It has been shown in past research that more effective long-term pavement investment could be made at lower cost using LCCA. Current LCCA-based pavement design and preservation practice in Indiana could be further enhanced by due consideration of user costs. Also, the existing FHWA LCCA software could be further enhanced for increased versatility, flexibility, and more specific applicability to the needs of Indiana, particularly with regard to treatment cost estimation and development of alternative feasible preservation strategies (rehabilitation and maintenance types and timings). The study documented/developed several sets of alternative pavement design and preservation strategies consistent with existing and foreseen Indiana practice. The preservation strategies were developed using two alternative criteria trigger values (pavement condition thresholds) and predefined time intervals (based on treatment service lives) and are intended for further study before they can be used for practice. These strategies were developed on the basis of historical pavement management data, existing INDOT Design Manual standards, and a survey of experts. A User Manual was prepared to facilitate the use of the enhanced software, and a Technical Manual was prepared to provide for the user a theoretical basis for various concepts used in the software.
NTIS
Cost Analysis; Highways; Life Cycle Costs; Pavements; Transportation

20090030695 Geological Survey, Reston, VA USA; Indiana Dept. of Environmental Management, Indianapolis, IN, USA
Relations of Principal Components Analysis Site Scores to Algal-Biomass, Habitat, Basin-Characteristics, Nutrient, and Biological-Community Data in the West Fork White River Basin, Indiana, 2001
Frey, J. W.; Caskey, B. J.; Lowe, B. S.; Jan. 2007; 36 pp.; In English
Report No.(s): PB2008-108766; USGS-SIR-2007-5222; No Copyright; Avail.: National Technical Information Service (NTIS)

Data were gathered from July through September 2001 at 34 randomly selected sites in the West Fork White River Basin, Indiana for algal biomass, habitat, nutrients, and biological communities (fish and invertebrates). Basin characteristics (drainage area and land use) and biological-community attributes and metric scores were determined for the basin of each sampling site. Yearly Principal Components Analysis site scores were calculated for algal biomass (periphyton and seston). The yearly Principal Components Analysis site scores for the first axis (PC1) were related, using Spearmans rho, to the seasonal algal-biomass, basin-characteristics, habitat, seasonal nutrient, biological-community attribute and metric score data. The periphyton PC1 site score, which was most influenced by ash-free dry mass, was negatively related to one (percent closed canopy) of nine habitat variables examined. Of the 43 fish-community attributes and metric scores examined, the periphyton PC1 was positively related to one fish-community attribute (percent tolerant). Of the 21 invertebrate-community attributes and metric scores examined, the periphyton PC1 was positively related to one attribute (Ephemeroptera, Plecoptera, and Trichoptera (EPT) index) and one metric score (EPT index metric score). The periphyton PC1 was not related to the five basin-characteristic or 12 nutrient variables examined. The seston PC1 site score, which was most influenced by particulate organic carbon, was negatively related to two of the 12 nutrient variables examined: total Kjeldahl nitrogen (July) and total phosphorus (July). Of the 43 fish-community attributes and metric scores examined, the seston PC1 was negatively related to one attribute (large-river percent). Of the 21 invertebrate- community attributes and metric scores examined, the seston PC1

was negatively related to one attribute (EPT-to-total ratio). The seston PC1 was not related to the five basin-characteristics or nine habitat variables examined.
NTIS
Algae; Biomass; Forks; Principal Components Analysis; River Basins

20090030713 Sandia National Labs., Albuquerque, NM USA
Secure Portal
Nelson, C. L.; Sep. 01, 2007; 15 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-921125; SAND2007-5882; No Copyright; Avail.: National Technical Information Service (NTIS)

There is a need in security systems to rapidly and accurately grant access of authorized personnel to a secure facility while denying access to unauthorized personnel. In many cases this role is filled by security personnel, which can be very costly. Systems that can perform this role autonomously without sacrificing accuracy or speed of throughput are very appealing. To address the issue of autonomous facility access through the use of technology, the idea of a 'secure portal' is introduced. A secure portal is a defined zone where state-of-the-art technology can be implemented to grant secure area access or to allow special privileges for an individual. Biometric technologies are of interest because they are generally more difficult to defeat than technologies such as badge swipe and keypad entry. The biometric technologies selected for this concept were facial and gait recognition. They were chosen since they require less user cooperation than other biometrics such as fingerprint, iris, and hand geometry and because they have the most potential for flexibility in deployment. The secure portal concept could be implemented within the boundaries of an entry area to a facility. As a person is approaching a badge and/or PIN portal, face and gait information can be gathered and processed.
NTIS
Personnel; Security; Warning Systems

20090030717 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Realization Theory for Linear Hybrid Systems, Part 1, Existence of Realization
Petreczky, M.; Van Schuppen, J. H.; Feb. 2008; 36 pp.; In English
Report No.(s): PB2008-108732; MAS-R0802; Copyright; Avail.: National Technical Information Service (NTIS)

The paper is the first part of a series of papers which deal with realization theory for linear hybrid systems. Linear hybrid systems are hybrid systems in continuous-time without guards whose continuous dynamics is determined by linear control systems and whose the discrete dynamics is determined by a finite state automaton. In Part I of the current series of papers we will formulate necessary and sufficient conditions for the existence of a linear hybrid system realizing a specified set of input-output maps. We will also sketch a realization algorithm for computing a linear hybrid system from the input-output data. In Part II we will present conditions for observability and span-reachability of linear hybrid systems and we will show that minimality is equivalent to observability and span-reachability; we will also discuss algorithms for checking observability and span-reachability and for transforming a linear hybrid system to a minimal one.
NTIS
Linear Systems; Computers

20090030718 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Realization Theory for Rational Systems
Nemcova, J.; Van Schuppen, J. H.; Jan. 2008; 54 pp.; In English
Report No.(s): PB2008-108731; MAS-E0801; Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we solve the problem of realization of response maps for rational systems. Sufficient and necessary conditions for a response map to be realizable by a rational system are presented. The properties of rational realizations such as observability, controllability, and minimality are studied. Finally, we briefly discuss the procedures for checking observability and controllability of rational systems and minimality of rational realizations and the procedure for constructing a rational system realizing a response map.
NTIS
Rational Functions; Controllability

20090030719 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Semantics and Computability of the Evolution of Hybrid Systems
Collins, P. J.; Jan. 2008; 34 pp.; In English
Report No.(s): PB2008-108730; MAS-R0801; Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we consider the semantics for the evolution of hybrid systems, and the computability of the evolution with respect to these semantics. We show that with respect to lower semantics, the finite-time reachable sets are lower-semicomputable, and with respect to upper semantics, the finite-time reachable sets are upper-semicomputable. We use the framework of type-two Turing computability theory and computable analysis, which deal with obtaining approximation results with guaranteed error bounds from approximate data. We show that in general, we cannot find a semantics for which the evolution is both lower- and upper- semicomputable, unless the system is free from tangential and corner contact with the guard sets. We highlight the main points of the theory with simple examples illustrating the subtleties involved.
NTIS
Semantics; Errors

20090030732 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Parameter Estimation and Determinability for the Model of Pattern Formation in 'Drosophila Melanogaster'
Ashyraliyev, M.; Blom, J. G.; Jan. 2008; 22 pp.; In English
Report No.(s): PB2008-108733; MAS-E0802; Copyright; Avail.: National Technical Information Service (NTIS)

Mathematical modelling of real-life processes often requires the estimation of unknown parameters. Once the parameters are found by means of optimization, it is important to asses the quality of the parameter estimates. In this paper we describe how the quality of these estimates can be analyzed and this methodology is applied to study the model for the genetic regulatory network in the Drosophila embryo during the early developmental stages.
NTIS
Drosophila; Mathematical Models; Parameter Identification

20090030737 Geological Survey, Reston, VA USA; National Park Service, Washington, DC USA
Assessment of Historical Water-Quality Data for National Park Units in the Rocky Mountain Network, Colorado and Montana, through 2004
Mast, M. A.; Jan. 2007; 94 pp.; In English
Report No.(s): PB2008-108754; USGS-SIR-2007-5147; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes historical water-quality data for six National Park units that compose the Rocky Mountain Network. The park units in Colorado are Florissant Fossil Beds National Monument, Great Sand Dunes National Park and Preserve, and Rocky Mountain National Park; and in Montana, they are Glacier National Park, Grant-Kohrs Ranch National Historic Site, and Little Bighorn Battlefield National Monument. This study was conducted in cooperation with the Inventory and Monitoring Program of the National Park Service to aid in the design of an effective and efficient water-quality monitoring plan for each park. Data were retrieved from a number of sources for the period of record through 2004 and compiled into a relational database. Descriptions of the environmental setting of each park and an overview of the parks water resources are presented. Statistical summaries of water-quality constituents are presented and compared to aquatic-life and drinking-water standards. Spatial, seasonal, and temporal patterns in constituent concentrations also are described and suggestions for future water-quality monitoring are provided.
NTIS
Data Structures; Histories; Mountains; National Parks; Water Quality

20090030738 Science Applications International Corp., McLean, VA, USA
Computer-Aided Dispatch Traffic Management Center Field Operation Test: Washington State Final Report
Owens, N.; Carter, M.; Louisell, C.; Haas, R.; Michell, C.; Jul. 2006; 55 pp.; In English
Contract(s)/Grant(s): DTFH61-02-C-00061
Report No.(s): PB2008-107968; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides the final report for the evaluation of the USDOT-sponsored Computer-Aided Dispatch Traffic Management Center Integration Field Operations Test in the State of Washington. The document discusses evaluation findings in the following study areas: (1) System Functionality: An assessment of the performance of the system and how well the system met technical specifications and functional requirements. (2) System Impact: An assessment of the impact did the

integration have on systems operations, in particular impacts on emergency response procedures and response times. (3) Institutional Issues: The identification of institutional issues that were encountered and how these were resolved. (4) Technical Issues: The identification of technical issues that were encountered and how these were resolved. (5) Lessons Learned: The documentation of all lessons learned. (6) Benefits: The identification of both qualitative and quantitative benefits.
NTIS
Computer Aided Design; Computer Techniques; Field Tests; Traffic; Washington

20090030758 California State Univ., Long Beach, CA, USA
Formulation and Solution of an Emergency Routing Problem
Casse, J.; Goldstein, D.; Lin, H. C.; Shehab, T.; Jan. 2008; 29 pp.; In English
Report No.(s): PB2008-109341; No Copyright; Avail.: CASI: A03, Hardcopy

In this work, we will identify important variables that contribute to vehicular movement in an emergency environment. In particular, we formulate and pose the Convoy Routing Problem. We suggest a method for modeling the problem and formulate a precise problem statement that significantly reduces the number of variables under consideration. The difficulty of the proposed problem is examined, practical parameters are gathered via extensive literature search, and an algorithm using artificial intelligence techniques for its solution is presented and empirically analyzed via software simulation.
NTIS
Emergencies; Transportation; Computerized Simulation; Algorithms; Weather

20090030928 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Markovianity in Space and Time
Van Lieshout, M. N. M.; Feb. 2008; 20 pp.; In English
Report No.(s): PB2008-108738; PNA-R0501; Copyright; Avail.: National Technical Information Service (NTIS)

Markov chains in time, such as simple random walks, are at the heart of probability. In space, due to the absence of an obvious definition of past and future, a range of definitions of Markovianity have been proposed. In this paper, after a brief review, we introduce a new concept of Markovianity that aims to combine spatial and temporal conditional independence.
NTIS
Markov Chains; Time

20090030929 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Realization Theory for Linear Hybrid Systems, Part 2, Reachability, Observability and Minimality
Petreczky, M.; Van Schuppen, J. H.; Feb. 2008; 34 pp.; In English
Report No.(s): PB2008-108735; MAS-R0803; Copyright; Avail.: National Technical Information Service (NTIS)

The paper is the second part of the series of papers started in the report, MAS-R0802, PB2008-108732. The paper deals with observability, reachability and minimality of linear hybrid systems. Linear hybrid systems are continuous-time hybrid systems without guards, whose continuous dynamics is determined by time-invariant linear control systems. We will show that that if a set of input-output maps has a realization by a linear hybrid system, then it has a realization by a minimal linear hybrid system. We will present conditions for observability and span-reachability of linear hybrid systems and we will show that minimality is equivalent to observability and span-reachability. We will sketch algorithms for checking observability and span-reachability and for transforming a linear hybrid system to a minimal one.
NTIS
Linear Systems; Robustness (Mathematics); Uncertain Systems

20090030937 North Carolina State Univ., Raleigh, NC USA
Implementation Plan for the New Mechanistic-Empirical Pavement Design Guide
Kim, Y. R.; Muthadi, N. R.; Feb. 2007; 631 pp.; In English
Report No.(s): PB2008-108945; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents the research effort to develop an implementation plan for the NCHRP 1-37A Mechanistic- Empirical Pavement Design Guide (MEPDG). This research encompasses both flexible and rigid pavements in new and rehabilitation projects. The project includes the study of current design practices followed by the NCDOT and the design practices followed by the MEPDG. The MEPDG is a sophisticated tool used to predict the performance of pavements and requires more rigorous inputs than any other earlier design procedures. Because the distress prediction models included in the MEPDG were calibrated using limited national databases, it is critical to calibrate the design methods and models using locally available

input and performance data. The implementation plan developed during this project provides detailed recommendations for the steps necessary for the local calibration and validation of the MEPDG procedures. One important issue in the successful implementation of the MEPDG is the sensitivity analysis of the input data and the prediction using local databases. The Long-Term Pavement Performance (LTPP) database plays a significant role in this study.
NTIS
Data Bases; Mechanical Engineering; Pavements; Transportation

20090030939 Minnesota Univ., Minneapolis, MN, USA
Freight Performance Measure Systems (FPMS) System Evaluation and Data Analysis
Liao, C. F.; Jan. 2008; 24 pp.; In English
Report No.(s): PB2008-109328; CTS-08-01; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the key measures of freight performance along interstate corridors in the USA is the average speed of travel. This report documents the findings and analysis of the ATRI Freight Performance Measure (FPM) database systems and investigates a potential FPM system design that can efficiently and effectively process more and larger Automatic Vehicle Location (AVL) datasets collected from various trucking companies. The current FPM system at ATRI was evolved from its previous system based on GIS software. The averaged speed calculations resulting from the data process of each FPM system are somewhat different. Analysis of the average speed calculation and investigation of speed differences are discussed in chapter one. FPM database system analysis and comparison are included in chapter two. The final chapter presents an ideal FPM system and requirements needed for migration.
NTIS
Cargo; Motor Vehicles; Position (Location); Systems Analysis

20090030942 Southwest Region Univ. Transportation Center, College Station, TX, USA; Texas A&M Univ., College Station, TX USA
Real-Time Data for Hurricane Evacuation in Texas
Borchardt, D. W.; Puckett, D. D.; Feb. 2008; 46 pp.; In English
Report No.(s): PB2008-109367; No Copyright; Avail.: CASI: A03, Hardcopy

In September 2005, the threat of Hurricane Rita to the Houston-Galveston region resulted in the evacuation of more than one million persons from the Texas coastal and urban areas. This concentration of evacuees overloaded all routes leaving the Houston area, resulting in traffic queues on freeways as long as 36-hours. While traffic and emergency management personnel had access to real-time traffic information in the urban areas, no such information was available in rural areas where the roadways had restricted capacity. There was clearly a need to expand video and traffic monitoring capabilities beyond the urban areas to allow for better traffic management in response to evacuations as well as normal traffic operations. HURREVAC is a restricted-use Internet based computer program used by government emergency managers to track hurricanes and assist in evacuation-related decision making. The program includes an ETIS (Environment Transport Integrated planning System) module included which allows for inclusion and access to real-time traffic information by emergency managers. This report documents attempts to complete the integration of the module with traffic data for Texas coastal regions. It also provides for general equipment and installation guidelines for deployment of video and sensor detection stations along hurricane evacuation routes. In addition, a list of recommended additional deployments of such monitoring equipment to allow for improved monitoring and managing of traffic during evacuation events in Texas.
NTIS
Hurricanes; Real Time Operation

20090030944 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Duopoly Model with Heterogeneous Congestion-Sensitive Customers
Mandjes, M. R. H.; Timmer, J.; Feb. 2008; 34 pp.; In English
Report No.(s): PB2008-108739; PNA-E0501; Copyright; Avail.: National Technical Information Service (NTIS)

This paper analyzes a model with two firms (providers), and two classes of customers. These customers classes are characterized by their attitude towards 'congestion' (caused by other customers using the same resources); a firm is selected on the basis of both the prices charged by the firms, and the 'congestion levels'. The model can be represented by a two-stage game: in the first providers set their prices, whereas in the second the customers choose the provider (or to not use any service at all) for given prices. We explicitly allow the providers to split their resources, in order to serve more than just one market segment. This enables us to further analyze the Paris metro pricing (PMP) proposal for service differentiation in the Internet.

We prove that the stage-2 game (the customers' behavior for given prices, and a given division of the providers' resources) has a unique equilibrium. Insight is gained into the structural properties of the equilibrium. We also show that the objective functions in the stage-1 game are continuous (in the providers' decision variables), thus enabling an efficient search for its equilibrium. This report will comment on the viability of the PMP proposal.
NTIS
Congestion; Heterogeneity; Sensitivity

20090031742 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Dynamics of Personal Best Oriented Particle Swarm Optimizer
Chen, Chang-Huang; Yeh, Sheng-Nian; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 265-276; In English; See also 20090031741; Copyright; Avail.: Other Sources

Personal best oriented particle swam optimizer (PPSO), a variant of conventional particle swarm optimization (PSO), is a promising optimizer. It has been shown in a previous paper (Chen and Yeh, 2006) that PPSO performs better than PSO both in solution quality and convergent speed for some benchmark functions. This paper tries to figure out its behavior via the analysis of a first-order linear difference equation with time-varying coefficient, derived from PPSO. The analysis shows that a particle stochastically moves within a region in real space. The center of the region, similar to PSO, approximately equals the weighted mean of the best positions found by an individual and its neighbors. Comparison of the trajectories between PSO and PPSO is given to clarify the behavior of PPSO. The performances of PPSO tested on a suite of benchmark functions are also given. Furthermore, a case study on economic power dispatch problem with nonsmooth cost function verifies the feasibility of PPSO.
Author
Optimization; Convergence; Algorithms

20090031767 NASA Johnson Space Center, Houston, TX, USA; Triakis, Redmond, WA, USA
Automation for System Safety Analysis
Malin, Jane T.; Fleming, Land; Throop, David; Thronesbery, Carroll; Flores, Joshua; Bennett, Ted; Wennberg, Paul; [2009]; 29 pp.; In English; NASA OSMA SARP Software Assurance Symposium, 22-23 Sep. 2009, Fairmont, WV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 724297.50.56.05
Report No.(s): JSC-CN-18753; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090031767

This presentation describes work to integrate a set of tools to support early model-based analysis of failures and hazards due to system-software interactions. The tools perform and assist analysts in the following tasks: 1) extract model parts from text for architecture and safety/hazard models; 2) combine the parts with library information to develop the models for visualization and analysis; 3) perform graph analysis and simulation to identify and evaluate possible paths from hazard sources to vulnerable entities and functions, in nominal and anomalous system-software configurations and scenarios; and 4) identify resulting candidate scenarios for software integration testing. There has been significant technical progress in model extraction from Orion program text sources, architecture model derivation (components and connections) and documentation of extraction sources. Models have been derived from Internal Interface Requirements Documents (IIRDs) and FMEA documents. Linguistic text processing is used to extract model parts and relationships, and the Aerospace Ontology also aids automated model development from the extracted information. Visualizations of these models assist analysts in requirements overview and in checking consistency and completeness.
Author
Automatic Control; Safety Factors; Systems Engineering; Program Verification (Computers); Failure Analysis; Data Processing; Safety; Failure Modes

20090031789 North Carolina State Univ., Raleigh, NC, USA
Analysis of an Instrumented Jointless Bridge
Kowalsky, M. J.; Wing, M.; Jun. 2003; 111 pp.; In English
Report No.(s): PB2008-108292; No Copyright; Avail.: CASI: A06, Hardcopy

Through the use of remote data acquisition, the behavior of an instrumented jointless bridge is explored. The bridge structure, located in Haywood County North Carolina, was recently rehabilitated by the North Carolina Department of Transportation. As part of the rehabilitation, the superstructure was widened and a joint-less link-slab deck employed. The

goals of the research are to validate analysis and design assumptions, investigate limit-states design methods, and develop a strategy and guide for long-term monitoring of jointless link-slab bridges.
NTIS
Data Acquisition; North Carolina; Slabs

20090031831 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Automated Planning and Scheduling for Orbital Express (151)
Knight, Russell; February 26, 2008; 4 pp.; In English; 9th International Symposium on Artificial Intelligence, Robotics, and Automation in Space, 26 Feb. 2008, Los Angeles, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41378

The challenging timeline for DARPA's Orbital Express mission demanded a flexible, responsive, and (above all) safe approach to mission planning. Because the mission was a technology demonstration, pertinent planning information was learned during actual mission execution. This information led to amendments to procedures, which led to changes in the mission plan. In general, we used the ASPEN planner scheduler to generate and validate the mission plans. We enhanced ASPEN to enable it to reason about uncertainty. We also developed a model generator that would read the text of a procedure and translate it into an ASPEN model. These technologies had a significant impact on the success of the Orbital Express mission.
Author
Mission Planning; Scheduling; Computer Aided Design; Computerized Simulation

60
COMPUTER OPERATIONS AND HARDWARE

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

20090030818 Air Force Research Lab., Rome, NY USA
Accelerating Cogent Confabulation: An Exploration in the Architecture Design Space
Qiu, Qinru; Burns, Daniel; Moore, Michael; Linderman, Richard; Renz, Thomas; Wu, Qing; Jun. 2008; 10 pp.; In English; IEEE World Congress on Computational Intelligence (WCCI), 1-6 Jun. 2009, Hong Kong, Hong Kong; Original contains color illustrations
Contract(s)/Grant(s): Proj-231T
Report No.(s): AD-A502127; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502127

Cogent confabulation is a computation model that mimics the Hebbian learning, information storage, inter-relation of symbolic concepts, and the recall operations of the brain. The model has been applied to cognitive processing of language, audio and visual signals. This project focuses on how to accelerate the computation underlie confabulation based sentence completion through software and hardware optimization. Software implementation with appropriate data structures can improve the performance of the software by more than 5,000X. The cogent confabulation algorithm is an ideal candidate for parallel processing hardware and its performance can be significantly improved with the help of application specific, massively parallel computing platforms. However, as the complexity and parallelism of the hardware increases, cost also increases. Architectures with different performance-cost trade-offs are analyzed and compared. Our analysis shows that although increasing the number of processors or the size of memories per processor can increase performance, the hardware cost and performance improvements do not always exhibit a linear relation. Hardware configuration options must be carefully evaluated in order to achieve cost performance trade-offs.
DTIC
Architecture (Computers); Auditory Signals; Brain; Experiment Design; Visual Signals

61
COMPUTER PROGRAMMING AND SOFTWARE

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

20090030124 Bureau of Reclamation, Denver, CO, USA
Manual for Reclamation Fault-Based Probabilistic Seismic Hazard Analysis Software. Dam Safety Technology Development Program
LaForge, R.; Apr. 2007; 64 pp.; In English
Report No.(s): PB2008-107902; DSO-07-01; No Copyright; Avail.: CASI: A04, Hardcopy

Probabilistic Seismic Hazard Analysis (PSHA) is the preferred technique for translating seismic hazard into ground shaking characterizations that engineers can use for testing structures and incorporating into risk assessments. The results are presented in terms of the annual probability of exceedance (APE) of a ground motion parameter such as peak horizontal acceleration, damped peak spectral acceleration at some oscillator frequency, or peak horizontal velocity. A uniform hazard spectrum for a specified annual probability of exceedance or return period is often used to estimate the probability of damage determined from a dynamic analysis of the structure. Software developed at Reclamation for performing PSHA is described in this manual. The main categories are programs for generating APE data for fault and areal seismic sources, post-processing these results in a logic tree format, and programs for other, more general seismic hazard analysis.
NTIS
Dams; Earthquakes; Hazards; Manuals; Reclamation; Safety Devices

20090030210 Naval Research Lab., Washington, DC USA
Evaluation of the ShapeTape Tracker for Wearable, Mobile Interaction
Baillot, Yohan; Eliason, Joshua J; Schmidt, Greg S; Swan, II, J E; Brown, Dennis; Julier, Simon; Livingston, Mark A; Rosenblum, Lawrence; IEEE Virtual Reality Conference; Jan. 2003, pp. 285-286; In English; IEEE Virtual Reality Conference (VR-2003), 22-26 Mar. 2003, Los Angeles, CA, USA; Original contains color illustrations
Report No.(s): AD-A501572; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501572

In this paper we describe two engineering experiments designed to evaluate the effectiveness of Measurand's ShapeTape for wearable, mobile interaction. Our initial results suggest that the ShapeTape is not appropriate for interactions which require a high degree of accuracy. However, ShapeTape is capable of reproducing the qualitative motion the user is performing and thus could be used to support 3D gesture-based interaction.
DTIC
Motion; Virtual Reality

20090030215 Naval Research Lab., Washington, DC USA
Integration of a Commodity Cluster into an Existing 4-Wall Display System
Maxwell, Douglas B; Bryden, Aaron; Schmidt, Greg S; Roth, Ian; Swan, II, J E; Jan 2002; 5 pp.; In English; IEEE Visualization Conference, 27 Oct. 2002, Boston, Ma, USA; Original contains color illustrations
Report No.(s): AD-A501596; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501596

Not all virtual reality applications today require the power or expense of single large visualization supercomputers. Factors such as frame rate and polygon count have a major impact upon the performance of a VR application. Increasingly, low cost commodity consumer electronics and computing technology are becoming powerful enough to present an acceptable level of graphics performance. Already, commodity PCs are driving virtual reality workbenches with stereo and tracking options. The next step is to have them drive multi-screen environments. We present an experiment motivated by the low cost per performance of PC commodity clusters. The experiment is to replace a visualization super-computing platform driving a 4-wall immersive display system [1] with a PC commodity cluster. We describe the system, implementation and experimental testing in the paper.
DTIC
Commodities; Computer Graphics; Display Devices; Walls

20090030225 Applied Research Associates, Inc., Tyndall AFB, FL USA
Automated Risk Analysis Tool to Support Transformation of US Air Force Security Forces (Briefing Slides)
Knox, Kenneth; Jun 2009; 41 pp.; In English; Security and Risk Management Association (SARMA) Conference, 16-18 Jun. 2009, Arlington, VA, USA
Contract(s)/Grant(s): FA4819-07-D-0001
Report No.(s): AD-A501585; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501585

The Automated Risk Analysis Tool to Support Transformation of US Air Force Security Forces briefing provides an overview of AFRL's risk analysis methodology and the software tool ForcePRO. Discussed is the research from AFRL, Airbase Technologies Division, Integrated Defense Technologies vulnerability and risk assessment support to the Air Force's Security Forces Center.
DTIC
Chutes; Computer Programs; Decision Support Systems; Risk; Security; Software Development Tools; Threat Evaluation

20090030285 TRADOC Analysis Command, Monterey, CA USA
OneSAF Objective System (OOS) Behavior Model Verification
Tollefson, Eric; Martin, Michael S; Fletcher, Andrew; Aug 15, 2008; 108 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-666
Report No.(s): AD-A501563; TRAC-M-TM-08-053; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501563

The Army's One Semi-Automated Forces (OneSAF) Objective System (OOS) is a composable, next-generation computer generated forces (CGF) that has been designed to represent a full range of operations, systems, and control processes from the entity level to brigade level. Its development has leveraged the ever-increasing computing power available today to represent highly-complex battlefield phenomena, particularly entity and unit behaviors. In the fall of 2005, the Product Manager (PM) OneSAF asked the USA (US) Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) in Monterey, California (TRAC-MTRY), to develop and execute quantitative and qualitative tests to verify the orderable, composite behaviors within OOS. As a result, we developed and executed a unique process to verify those behaviors under tight resource constraints. We developed an overall behavior verification methodology, a test design construct, a verification tracking database, and a detailed reporting procedure. We then executed the verification process on OOS behavior models and provided valuable feedback to PM OneSAF. Our methodology and test designs allowed us to evaluate the behaviors thoroughly with a minimum number of scenarios. Additionally, we devised a process to verify traceability within the documentation from requirements to implementation. Our work led to a follow-on effort to automate the verification process for OOS.
DTIC
Combat; Education; Proving; Simulation

20090030313 Chief Information Officer (Air Force), Arlington, VA USA
Dynamic Training Environments of the Future
Seaman, Keith; Mar 13, 2008; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A501544; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501544

The video game is the new media in cyberspace; it can be used by us and it will be used against us. Online Games are used for cyber attacks, espionage, & command and control. The world of the massively multiplayer online role-playing games (MMORPG) is the emergence of a new society. This generation of Airmen grew up on video games. It is time to adapt to new way of thinking and training.
DTIC
Education; Games; Computerized Simulation

20090030596 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Data Quality - A Key to Successfully Implementing ECSS
Lane, Craig A.; Mar. 2009; 96 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502559; AFIT/GLM/ENS/09-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to the Expeditionary Logistics for the 21st Century (eLog21) campaign initiatives published in 2003, the USA

Air Force (USAF) pursued the acquisition of the technology needed to transform its logistics processes. Today, with process mapping complete and a firm base release schedule, forward progress towards full implementation of the Expeditionary Combat Support System (ECSS) continues. As a key enabler to achieving eLog21 initiatives, implementing ECSS will completely transform current USAF logistics business processes. Integrating more than 450 legacy systems, and with a projected end-state in excess of 750,000 primary, secondary, and tertiary users, ECSS is the largest enterprise resource planning (ERP) implementation in the world. While the driving force behind ERP implementation is exploitation of the numerous benefits associated with transformation, there are several key challenges to address which can mean the difference between success and failure. Data quality is a critical factor in the successful implementation of any ERP system. It is a key factor in optimizing system performance and maintaining an uninterrupted and acceptable level of support to the war fighter. The following research provides a representative snapshot and evaluates current item record data quality in selected USAF legacy systems; specifically a comparison of data in the source system (D043A) versus the same data in the client system (SBSS). The analysis lays the foundation for developing an action plan for efficient and effective resource allocation to cleanse the legacy system data prior to migrating into ECSS, thereby creating an operating environment more prone to a successful implementation.
DTIC
Client Server Systems; Combat; Logistics Management; Support Systems

20090030616 Arizona Univ., Tucson, AZ USA
Multicore Hardware Experiments in Software Producibility
Sprinkle, Jonathan; Eames, Brandon; Jun. 2009; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-08-1-0024; Proj-459T
Report No.(s): AD-A502782; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This final technical report was prepared for the Air Force Research Laboratory, under award #FA8750-08-1-0024, titled MultiCore Hardware Experiments in Software Producibility. This report details our findings when taking heterogeneous systems software, designed for a distributed environment, and running it on a single-core, and later multi-core, computers. Our research outcomes are significant, indicating that in our case, significant variance was seen in system performance, and that the variance increased with the number of cores used. We also created some strategies to reduce this variance, namely a weak time triggered infrastructure, which we imposed upon the system: this strategy significantly reduced the variance of behaviors when trading up to multicore processors.
DTIC
Computer Programming; Computer Programs; Computers; Software Engineering

20090030645 Telecommunications Research Establishment, Malvern, UK
Electrical Simulator and Proposed Control System for Long Shot
Rutherglen, J.; May 1945; 37 pp.; In English
Report No.(s): AD-A800665; TRE-T1880; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Missiles; Simulators

20090030668 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Deceiving Adversary Network Scanning Efforts Using Host-Based Deception
Murphy, Sherry B.; Jun 2009; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-08-296
Report No.(s): AD-A502233; AFIT/ICW/ENG/09-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502233
In this research, we demonstrate the usefulness of manipulating system traffic to deceive an attacker's operating system (OS) fingerprinting as part of their network scanning efforts. Specifically, we address whether host-based OS obfuscation has merit and application as an integral part of Air Force network defense and whether the technique warrants further research and application development. We accomplish this objective through a literature review and a proof of concept evaluation of a selected OS obfuscation tool against selected OS fingerprinting tools under current Air Force network configuration. Our focus areas in the literature review include how to characterize the scanning phase of an adversary attack, a survey of current OS fingerprinting and obfuscation tools, and a description of current AF network concepts. To evaluate the effectiveness of a candidate OS tool, we set up an experimental network environment that simulates adversarial network scanning. The results

of our study are as follows: (1) current OS obfuscation tools designed for Windows OS are capable of providing some OS obfuscation on AF networks; (2) current tools need to be evaluated for their impact on network maintenance tools and processes, to include future initiatives like IPv6; and (3) current tools need to improve OS fingerprints and add options to force inconclusive results from fingerprinting tools.
DTIC
Computer Information Security; Computer Networks; Deception; Prevention; Security

20090031747 Tamkang Univ., Taipei, Taiwan, Province of China
Hybrid Evolutionary Algorithm for PID Controller Design of AVR System
Wong, Ching-Chang; Li, Shih-An; Wang, Hou-Yi; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 251-264; In English; See also 20090031741
Contract(s)/Grant(s): NSC 95-2221-E-032-057-MY3; Copyright; Avail.: Other Sources

In this paper, a Hybrid Evolutionary Algorithm (HEA) combined with the concepts of Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) algorithm is proposed. Moreover, a new fitness function is proposed to let the evolutionary algorithms search for a high-quality solution effectively and improve the transient response of the controlled system. The proposed algorithm was applied in a PID controller design for an Automatic Voltage Regulator (AVR) system. From some simulation and comparison results, we can see that the proposed new fitness function can let the optimal algorithms find a high-quality solution effectively. Moreover, the PID controller obtained by the proposed algorithm controls the AVR system better than other methods.
Author
Algorithms; Control Systems Design; Genetic Algorithms; Voltage Regulators

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COMPUTER SYSTEMS

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

20090030228 Oak Ridge National Lab., TN USA
Results from a Demonstration of RF-Based UF(sub 6) Cylinder Accounting and Tracking System Installed at a USEC Facility
Pcikett, C. A.; Kovacic, D. N.; Morgan, J. B.; Younkin, J. R.; Carrick, B.; Sep. 2008; 47 pp.; In English
Report No.(s): DE2009-951934; ORNL/TM-2008/189; No Copyright; Avail.: Department of Energy Information Bridge

The overall objective of the effort was to validate the robustness of RF technology for potential use as a future international safeguards tool for tracking UF6 cylinders at uranium-processing facilities. The results to date indicate that RF tags represent a feasible technique for tracking UF(sub 6) cylinders in operating facilities. Additional work will be needed to improve the operational robustness of the tags for repeated autoclave processing and to add tamper-indicating and data authentication features to some of the pertinent system components. Future efforts will focus on these needs along with implementing protocols relevant to IAEA safeguards. The work detailed in this report demonstrates the feasibility of constructing RF devices that can survive the operational rigors associated with the transportation, storage, and processing of UF6 cylinders. The system software specially designed for this project is called Cylinder Accounting and Tracking System (CATS). This report details the elements of the CATS rules-based architecture and its use in safeguards-monitoring and asset-tracking applications. Information is also provided on improvements needed to make the technology ready, as well as options for improving the safeguards aspects of the technology.
NTIS
Radio Frequencies; Uranium; Uranium Fluorides; Fissionable Materials; Security; Identifying

20090030405 Vanderbilt Univ., Nashville, TN USA
Pollux: Enhancing the Quality of Service of the Global Information Grid (GIG)
Schmidt, Douglas C.; Jun. 2009; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-2-0054; Proj-ICED; 62702F
Report No.(s): AD-A501615; AFRL-RI-RS-TR-2009-154; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501615

The Pollux project focused on developing, analyzing, empirically evaluating, and optimizing technologies that can

support the GIG's real-time QoS needs. This effort also focused on solutions that leveraged and enhanced commercial-off-the-shelf (COTS) and standards-based technologies. The final report describes the results of the Pollux project during the period of April 2006 to February 2009. Pollux focused on the following primary technical focus areas during this period of performance: DDS Benchmarking Environment (DBE), DDS QoS Modeling Language (DQML), Resource Allocation and Control Engine (RACE), Model-driven engineering tools for QoS configuration, Ricochet++ adaptive middleware/transport framework, CUTS System Execution Modeling Tool.
DTIC
Applications Programs (Computers); Commercial Off-the-Shelf Products; Real Time Operation; Resource Allocation

20090030512 NASA Johnson Space Center, Houston, TX, USA
CCSDS Spacecraft Monitor and Control Mission Operations Interoperability Prototype
Lucord, Steve; Martinez, Lindolfo; [2010]; 1 pp.; In English; SpaceOps 2010, 25-30 Apr. 2010, Huntsville, AL, USA
Report No.(s): JSC-CN-18571; Copyright; Avail.: Other Sources; Abstract Only

We are entering a new era in space exploration. Reduced operating budgets require innovative solutions to leverage existing systems to implement the capabilities of future missions. Custom solutions to fulfill mission objectives are no longer viable. Can NASA adopt international standards to reduce costs and increase interoperability with other space agencies? Can legacy systems be leveraged in a service oriented architecture (SOA) to further reduce operations costs? The Operations Technology Facility (OTF) at the Johnson Space Center (JSC) is collaborating with Deutsches Zentrum fur Luft- und Raumfahrt (DLR) to answer these very questions. The Mission Operations and Information Management Services Area (MOIMS) Spacecraft Monitor and Control (SM&C) Working Group within the Consultative Committee for Space Data Systems (CCSDS) is developing the Mission Operations standards to address this problem space. The set of proposed standards presents a service oriented architecture to increase the level of interoperability among space agencies. The OTF and DLR are developing independent implementations of the standards as part of an interoperability prototype. This prototype will address three key components: validation of the SM&C Mission Operations protocol, exploration of the Object Management Group (OMG) Data Distribution Service (DDS), and the incorporation of legacy systems in a SOA. The OTF will implement the service providers described in the SM&C Mission Operation standards to create a portal for interaction with a spacecraft simulator. DLR will implement the service consumers to perform the monitor and control of the spacecraft. The specifications insulate the applications from the underlying transport layer. We will gain experience with a DDS transport layer as we delegate responsibility to the middleware and explore transport bridges to connect disparate middleware products. A SOA facilitates the reuse of software components. The prototype will leverage the capabilities of existing legacy systems. Various custom applications and middleware solutions will be combined into one system providing the illusion of a set of homogenous services. This paper will document our journey as we implement the interoperability prototype. The team consists of software engineers with experience on the current command, telemetry and messaging systems that support the International Space Station (ISS) and Space Shuttle programs. Emphasis will be on the objectives, results and potential cost saving benefits.
Author
Aerospace Systems; Interoperability; Service Oriented Architecture; Space Exploration; International Cooperation; NASA Programs; Space Programs; Systems Integration

20090030594 USA Army Program Executive Office, Alexandria, VA USA
AKO/DKO Information Briefing
Noble, Earl; 8 Aug. 2008; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available
Computer Networks; Knowledge Based Systems; On-Line Systems; Procurement

20090030647 City Univ. of New York, NY USA
Optimizing Airborne Networking Performance with Cross-Layer Design Approach
Saadawi, Tarek; Jun. 2009; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-08-1-0102; Proj-558B
Report No.(s): AD-A502634; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We analyzed the impact of the physical propagation environment on the performance of mobile ad hoc network (MANET) protocols. Dynamic Source Routing (DSR) protocol is chosen as typical routing protocol for the experiment. We used the network simulator OPNET to design our airborne network (AN) environment model. Our approach utilized the experimental

results that we have obtained at the Air Force Lab in our design to model a cross layer design to reduce the impact of the physical propagation parameters in AN environment. We evaluated the performance of MANET-based protocol under Air Force environment. We designed a delay tolerant network (DTN)-based probabilistic routing protocol to work in AN environment that is associated with intermittent connectivity.
DTIC
Networks; Routes

20090030672 National Oceanic and Atmospheric Administration, Silver Spring, MD USA
The Hydrographic Survey Meta Database
Neumann, Daniel E.; Sep 2008; 7 pp.; In English; MTS/IEEE Oceans 2008 Conference Ocean Poles and Climate, 15-18 Sept. 2008, Quebec City, Canada; Original contains color illustrations
Report No.(s): AD-A502148; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502148

In 2005, the design and future considerations of this Hydrographic Survey Metadata Data Base (HSMDB) were presented at the Marine Technology Society Proceedings. This paper will provide an update. The HSMDB now offers a user interface to previously unavailable hydrographic survey data, data products and metadata conveniently and freely over the internet. The product descriptive report images alone have had over 90,000 hits over the last year. Moreover, over 1,500 archived HSMDB records have become the source of Coastal Services Center (CSC) Geospatial one-stop entries. The most exciting new product is the addition of new bottom sample information. This paper will illustrate how to access and use the new HSMDB user interface. Several examples of queried HSMDB displays called survey rap sheets will be shown. Survey products will also be outlined. Lastly, future considerations of HSMDB use in hydrographic survey accuracy and geospatial overlays will be discussed.
DTIC
Data Bases; Hydrography; Oceanographic Parameters; Relational Data Bases; Surveys

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*.

20090030337 Simon Fraser Univ., Burnaby, British Columbia Canada
Autonomous Sustain and Resupply, Phase 1 Report
Vaughan, R.; Litus, Y.; Wawerla, J.; Lein, A.; Oct. 2008; 90 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502631; DRDC-S-CR-2009-067; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents our progress to date on the DRDC Autonomous Sustain and Resupply project. We are using the ASR problem as the key motivating problem for the AI and autonomy research in our lab. The document is structured as follows. First we state our general approach, which is unchanged from the proposal. Then we summarize our progress to date, referencing detailed descriptions of our work provided as chapters of this report. Next we provide the research plan, which is slightly revised from the version in our proposal. Next is the literature review, followed by our formal model of the problem, and then a design for a planning-based solution. The remainder is a series of chapters describing our progress during Phase 1 on various aspects of the ASR problem.
DTIC
Artificial Intelligence; Autonomy; Robotics

20090030612 Defence Research and Development Suffield, Suffield, Alberta Canada
Control Algorithms for a Shape-shifting Tracked Robotic Vehicle Climbing Obstacles
Vincent, I.; Dec 2008; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502632; DRDC-S-TR-2008-123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Research in mobile robot navigation has demonstrated some success in navigating flat world while avoiding obstacles. However, algorithms which analyze complex environments in order to climb three-dimensional obstacles have had very little success due to the complexity of the task. Unmanned ground vehicles currently exhibit simple autonomous behaviours compared to the human ability to move in the world. This research work aims to design controllers for a shape-shifting tracked robotic vehicle, thus enabling it to autonomously climb obstacles by adapting its geometric configuration. Three control

algorithms are proposed to solve the autonomous locomotion problem for climbing obstacles. A reactive controller evaluates the appropriate geometric configuration based on terrain and vehicle geometric considerations. As a scripted controller is difficult to design for every possible circumstance, learning algorithms are a plausible alternative. A neural network based controller works if a task resembles a learned case. However, it lacks adaptability. Learning in real-time by reinforcement and progress estimation facilitates robot control and navigation. This report presents the reinforcement learning algorithm developed to find alternative solutions when the reactive controller gets stuck while climbing an obstacle. The controllers are validated and compared with simulations.
DTIC
Adaptive Control; Algorithms; Robotics; Robots; Shapes; Tracked Vehicles

20090030824 Air Force Research Lab., Rome, NY USA
Performance Optimization for Pattern Recognition Using Associative Neural Memory
Wu, Qing; Mukre, Prakash; Linderman, Richard; Renz, Tom; Burns, Daniel; Moore, Michael; Qiu, Qinru; Published in the proceedings of the conference, p. 1-14.; Jun. 2008; 15 pp.; In English; IEEE International Conference on Multimedia and Expo, 23-26 Jun. 2008, Hanover, Germany; Original contains color illustrations
Contract(s)/Grant(s): Proj-231T
Report No.(s): AD-A502126; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502126

This paper describes the performance optimization in software and hardware solutions for a cognitive computing model called Brain State in a Box (BSB). This BSB model is implemented using two different configurations of the proposed architecture. The first implementation is a software only approach using the Cell Broadband Engine. The other implementation is a hybrid configurable computing platform which uses Field Programmable Gate Array (FPGA) for implementing the computation. To compensate its efficiency, the BSB based associative neural memory is applied for symbol and character recognition.
DTIC
Associative Memory; Computer Storage Devices; Memory; Neural Nets; Neurophysiology; Pattern Recognition

20090031744 Hsiuping Inst. of Technology, Taichung, Taiwan, Province of China
Predictive Control Using Recurrent neural Networks for Industrial Processes
Lu, Chi-Huang; Tsai, Ching-Chih; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 277-283; In English; See also 20090031741
Contract(s)/Grant(s): NSC 93-2213-E-005-008; Copyright; Avail.: Other Sources

The paper presents a design methodology for predictive control of industrial processes via recurrent neural networks (RNNs). A discrete-time mathematical model using RNN is established and a multi-step neural predictor is then constructed. With the predictor, a neural predictive control (NPC) law is developed from the generalized predictive performance criterion. Both the RNN model and the NPC controller are proven convergent based on Lyapunov stability theory. Two examples of a nonlinear process system and a physical variable-frequency oil-cooling machine are used to demonstrate the effectiveness of the proposed control method. Through the experimental results, the proposed method has been shown capable of giving satisfactory performance for industrial processes under setpoint changes, external disturbances and load changes.
Author
Neural Nets; Nonlinear Systems; Control Theory; Control Systems Design

20090031751 Overseas Chinese Inst. of Technology, Taichung, Taiwan, Province of China
Word Sense Disambiguation Using Word Ontology and Concept Distribution
Hung, Jason C.; Yang, Che-Yu; Journal of the Chinese Institute of Engineers, Volume 32, No. 2; March 2009, pp. 153-168; In English; See also 20090031741
Contract(s)/Grant(s): NSC 95-2221-E-149-009; NSC 96-2221-E-240-003; Copyright; Avail.: Other Sources

This paper presents a method of word sense disambiguation that assigns a target word the sense that is most related to the senses of its neighbor words. We explore the use of measures of relatedness between word senses based on a novel hybrid approach. First, we investigate how to 'literally' and 'regularly' express a 'concept'. We apply set algebra to Wordnet's synsets cooperating with Wordnet's word ontology. In this way we establish regular rules for constructing various representations (lexical notations) of a concept using Boolean operators and word forms in various synset(s) defined in Wordnet. Then we establish a formal mechanism for quantifying and estimating the semantic relatedness between concepts - we facilitate

‘concept distribution statistics’ to determine the degree of semantic relatedness between two lexically expressed concepts. Human languages have words that can mean different things in different contexts, such words with multiple meanings are potentially ‘ambiguous’. The process of ‘deciding which of several meanings of a term is intended in a given context’ is known as ‘Word Sense Disambiguation (WSD)’. The proposed method is not supervised, and does not require any manually created sense-tagged training examples. The experimental results showed good performance on Semcor, a subset of the Brown corpus. We observe that measures of semantic relatedness are useful sources of information for word sense disambiguation.
Author
Natural Language Processing; Words (Language); Semantics

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NUMERICAL ANALYSIS

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

20090030404 National Bureau of Standards, Boulder, CO USA
Variances Based on Data with Dead Time Between the Measurements
Barnes, James A.; Allan, David W.; Proceedings of the 19th Precise Time and Time Interval (PTTI) Applications and Planning Meeting; Dec. 1987, pp. 227-234; In English; 19th Precise Time and Time Interval (PITI) Applications and Planning Meeting, 1 - 3 Dec. 1987, Redondo Beach, CA, USA
Report No.(s): AD-A501620; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501620

The accepted definition of frequency stability in the time domain is the two-sample variance (or Allan variance). It is based on the measurement of average frequencies over adjacent time intervals, with no dead time between the intervals. The primary advantages of the Allan variance are that (1) it is convergent for many actual noise types for which the conventional variance is divergent; (2) it can distinguish between many important and different spectral noise types; (3) the two-sample approach relates to many practical implementations, for example, the rms change of an oscillator’s frequency from one period to the next; and (4) Allan variances can be easily estimated at integer multiples of the sample interval. In 1974 a table of bias functions which related variance estimates with various configurations of number of samples and dead time to the two-sample (or Allan) variance was published. The tables were based on noises with pure power-law power spectral densities. Often situations recur which unavoidably have distributed dead time between measurements, but still the conventional variances are not convergent. Some of these applications are outside of the time and frequency field. Also, the dead times are often distributed throughout a given average, and this distributed dead time is not treated in the 1974 tables. This paper reviews the bias functions B1(N, r,p), and B2(r,p) and introduces a new bias function, B3(2, r,p), to handle the commonly occurring cases of the effect of distributed dead time on the computed variances. Some convenient and easy to interpret asymptotic limits are reported. The actual tables will be published elsewhere in book form.
DTIC
Measure and Integration; Time Lag; Time Measurement

20090030508 NASA Glenn Research Center, Cleveland, OH, USA
The a(4) Scheme-A High Order Neutrally Stable CESE Solver
Chang, Sin-Chung; July 2009; 31 pp.; In English; 43rd Joint Propulsion Conference, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.03.04.03.01
Report No.(s): NASA/TM-2009-215658; AIAA Paper 2007-5820; E-16100-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030508

The CESE development is driven by a belief that a solver should (i) enforce conservation laws in both space and time, and (ii) be built from a nondissipative (i.e., neutrally stable) core scheme so that the numerical dissipation can be controlled effectively. To provide a solid foundation for a systematic CESE development of high order schemes, in this paper we describe a new high order (4-5th order) and neutrally stable CESE solver of a 1D advection equation with a constant advection speed a. The space-time stencil of this two-level explicit scheme is formed by one point at the upper time level and two points at the lower time level. Because it is associated with four independent mesh variables (the numerical analogues of the dependent variable and its first, second, and third-order spatial derivatives) and four equations per mesh point, the new scheme is referred to as the a(4) scheme. As in the case of other similar CESE neutrally stable solvers, the a(4) scheme enforces conservation

laws in space-time locally and globally, and it has the basic, forward marching, and backward marching forms. Except for a singular case, these forms are equivalent and satisfy a space-time inversion (STI) invariant property which is shared by the advection equation. Based on the concept of STI invariance, a set of algebraic relations is developed and used to prove the a(4) scheme must be neutrally stable when it is stable. Numerically, it has been established that the scheme is stable if the value of the Courant number is less than 1/3
Author
Computational Grids; Space-Time CE/SE Method; Inversions; Dependent Variables; Independent Variables

20090030518 NASA Langley Research Center, Hampton, VA, USA
On Problems Associated with Grid Convergence of Functionals
Salas, Manuael D.; Atkins, Harold L; Journal of Computers and Fluids; [2009]; Volume 38, 7, pp. 1445-1454; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.01.01
Report No.(s): LF99-5342; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030518

The current use of functionals to evaluate order-of-convergence of a numerical scheme can lead to incorrect values. The problem comes about because of interplay between the errors from the evaluation of the functional, e.g., quadrature error, and from the numerical scheme discretization. Alternative procedures for deducing the order property of a scheme are presented. The problems are studied within the context of the inviscid supersonic flow over a blunt body; however, the problems and solutions presented are not unique to this example.
Author
Functionals; Computational Grids; Convergence; Blunt Bodies; Inviscid Flow; Quadratures

20090031030 Texas Univ., San Antonio, TX USA
Application of Efficient Methods for Inspection Sensitivity
Garza, Jose; Millwater, Harry, Jr.; Apr. 2009; 22 pp.; In English; 50th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 4 - 7 May 2009, Palm Springs, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): FA8650-07-C-5060; Proj-4347; 62102F
Report No.(s): AD-A501964; AFRL-RX-WP-TP-2009-4090; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501964

Nondestructive evaluation (NDE) inspections play a vital role in the reliability of structural components. NDE inspections are simulated using a Probability-of-Detection curve (POD) that is obtained experimentally. In this paper a methodology using the expectation operator was developed to obtain the sensitivity of the Probability-of-Failure (POF) with respect to parameters of the POD via Monte Carlo Sampling. The methodology scales to any number of inspections and can be integrated with existing Monte Carlo sampling methods. Sensitivities of the probability-of-failure with respect to the parameters of a POD curve were calculated for several numerical examples then compared against analytical and numerical finite difference solutions.
DTIC
Inspection; Nondestructive Tests; Sensitivity

65
STATISTICS AND PROBABILITY

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

20090030145 Department of Housing and Urban Development, Washington, DC, USA
Compliance Audits and Agreed-Upon Procedures Reviews of Participating Administrative Entities for the Year ended May 31, 2003. Final Report
Jan. 23, 2004; 35 pp.; In English
Report No.(s): PB2008-108315; No Copyright; Avail.: National Technical Information Service (NTIS)

In this report, we present the overall results of our work and a projection to the entire population. The projected results offer a perspective on the PAEs compliance with the laws, regulations, and guidelines of the M2M program. Our projected

results indicate that, based on a 99% confidence level, the PAEs are in substantial compliance with the requirements of the M2M Program.
NTIS
Regulations; Confidence Limits; Accounting

20090030195 Federal Deposit Insurance Corp., Washington, DC, USA
FDIC Center for Financial Research Working Paper No. 2004-01. Risk-Neutralizing Statistical Distribution: With An Application to Pricing Reinsurance Contracts on FDIC Losses
Madan, D. B.; Unal, H.; Sep. 15, 2004; 38 pp.; In English
Report No.(s): PB2009-108965; FDIC-FR-WP-2004-01; No Copyright; Avail.: CASI: A03, Hardcopy
This paper proposes methods for obtaining risk neutral distributions when only the statistical density is observed. We employ renormalized exponential tilts and estimate the tilt coefficients from related options markets. Particular emphasis is placed on reinsurance losses for which we price in closed form using the Weibull extreme value distribution. The procedure is illustrated in detail for FDIC losses.
NTIS
Deposits; Insurance (Contracts); Risk; Statistical Distributions

20090030196 Federal Deposit Insurance Corp., Washington, DC, USA
FDIC Center for Financial Research Working Paper No. 2004-04. Common Failings: How Corporate Defaults are Correlated
Das, S. R.; Duffie, D.; Kapadia, N.; Sep. 2004; 35 pp.; In English
Report No.(s): PB2009-108968; FDIC-WP-2004-04; No Copyright; Avail.: National Technical Information Service (NTIS)
We develop, and apply to data on U.S. corporations from 1987-2000, tests of the standard doubly-stochastic assumption under which firms default times are correlated only as implied by correlation of their default intensity processes, for example through dependence on common or correlated observable risk factors. Our tests do not require assumptions on the correlation structure of default intensities. The data do not support the joint hypothesis of well specified default intensities and the doublystochastic assumption, although we provide evidence that this may be due to mis-specification of the default intensities, which do not include macroeconomic default-prediction covariates. Despite this rejection, there is at most weak evidence of default clustering in excess of that implied by the doubly-stochastic model and correlation of the firm-specific default covariates.
NTIS
Goodness of Fit; Organizations; Statistical Tests

20090030466 Bureau of the Census, Washington, DC, USA
Methodology for the USA Resident Population Estimates by Age, Sex, Race, and Hispanic Origin (Vintage 2008): April 1, 2000 to July 1, 2008
Jan. 2009; 7 pp.; In English
Report No.(s): PB2009-110814; No Copyright; Avail.: CASI: A02, Hardcopy
The U.S. Census Bureau produces monthly estimates of resident population for the USA on an annual basis. We revise the estimates time series each year as final input data become available. These postcensal estimates from April 1, 2000 through July 1, 2008 supersede all previous estimates produced since Census 2000. For each month in the time series, the total national resident population is obtained by summing the estimates across all age, sex, race, and Hispanic origin categories. The following documentation describes the process by which we produce the April 1, 2000 through July 1, 2008 resident population estimates at the national level.
NTIS
Estimates; Populations; Sex; Time Series Analysis

20090030524 NASA Langley Research Center, Hampton, VA, USA

Loss Factor Estimation Using the Impulse Response Decay Method on a Stiffened Structure

Cabell, Randolph; Schiller, Noah; Allen, Albert; Moeller, Mark; August 23, 2009; 9 pp.; In English; Inter Noise 2009/Innovations in Practical Noise Control, 23-26 Aug. 2009, Ottawa, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868.02.07.07.04.01

Report No.(s): LF99-8369; Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090030524

High-frequency vibroacoustic modeling is typically performed using energy-based techniques such as Statistical Energy Analysis (SEA). Energy models require an estimate of the internal damping loss factor. Unfortunately, the loss factor is difficult to estimate analytically, and experimental methods such as the power injection method can require extensive measurements over the structure of interest. This paper discusses the implications of estimating damping loss factors using the impulse response decay method (IRDM) from a limited set of response measurements. An automated procedure for implementing IRDM is described and then evaluated using data from a finite element model of a stiffened, curved panel. Estimated loss factors are compared with loss factors computed using a power injection method and a manual curve fit. The paper discusses the sensitivity of the IRDM loss factor estimates to damping of connected subsystems and the number and location of points in the measurement ensemble.

Author

Vibrational Stress; Acoustics; Statistical Analysis; Losses; Finite Element Method; Estimating

20090030634 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

The Trust-based Interactive Partially Observable Markov Decision Process

Seymour, Richard S; Jun. 2009; 101 pp.; In English

Contract(s)/Grant(s): Proj-08-221

Report No.(s): AD-A502678; AFIT/GCS/ENG/09-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cooperative agent systems are designed so that each is working toward the same common good. The problem is that software systems are complex and can be subverted by an adversary to either break the system or potentially worse, create sneaky agents who are willing to cooperate when the stakes are low and take selfish, greedy actions when the rewards rise. This research focuses on the ability of a group of agents to reason about the trustworthiness of each other and make optimal decisions about whether to cooperate. A TI-POMDP is developed to model the trust interactions between agents, enabling the agents to select the best course of action from the current state. The TI-POMDP is a novel approach to multiagent cooperation based on an I-POMDP augmented with trust relationships. Experiments demonstrate the TI-POMDP's ability to accurately track the trust levels of agents with hidden agendas, providing the agents the information needed to make decisions based on their level of trust and model of the environment. On average, agents achieved rewards 3.8 times higher using the TI-POMDP model compared to a trust vector model.

DTIC

Decision Making; Markov Processes; Observation

20090030729 Bureau of Labor Statistics, Washington, DC, USA

Bureau of Labor Statistics, USA Department of Labor: Its History, Activities, and Organization

Weber, G. A.; Oct. 1922; 69 pp.; In English

Report No.(s): PB2008-108059; No Copyright; Avail.: CASI: A04, Hardcopy

The Bureau of Labor Statistics is one of the executive bureaus of the Department of Labor. It is charged with the duty of 'acquiring and diffusing among the people of the USA useful information on subjects connected with labor in the most general and comprehensive sense of the word,' and of investigating 'the causes of, and facts relating to, controversies and disputes between employers and employees as they may occur.' Its functions are educational, not administrative.

NTIS

Labor; United States; Education

20090030842 Congressional Research Service, Washington, DC, USA

USA Military Casualty Statistics: Operation Iraqi Freedom and Operation Enduring Freedom. Updated March 18, 2008

Fischer, H.; Mar. 18, 2008; 5 pp.; In English

Report No.(s): PB2008-108117; No Copyright; Avail.: CASI: A01, Hardcopy

This report presents difficult-to-find statistics regarding U.S. military casualties in Operation Iraqi Freedom (OIF) and

Operation Enduring Freedom (OEF, Afghanistan), including those concerning medical evacuations, amputations, and the demographics of casualties.
NTIS
Casualties; Military Operations; Military Personnel; United States

20090030925 Geological Survey, Reston, VA USA; Upper Mississippi River Basin Commission, Twin Cities, MN, USA
Estimated and Measured Traveltime for the Crow River Watershed, Minnesota
Arntson, A. D.; Jan. 2007; 20 pp.; In English
Report No.(s): PB2008-108751; USGS-SIR-2007-5138; No Copyright; Avail.: CASI: A03, Hardcopy

A time-of-travel study involving a luminescent dye was done on the Crow River in Minnesota from Rockford to the confluence with the Mississippi River at Dayton on July 11, 2006, at a streamflow of 293 cubic feet per second at Rockford. Dye was injected in the Crow River at Rockford, and traveltime and concentrations were measured at three sampling locations downstream: at the Hanover historic bridge in Hanover, at County Road 116 near St. Michael, and at County Road 12 in Dayton. The results of the measured traveltimes were compared to estimated traveltimes from a previous study of the Crow River and six other rivers in the Upper Mississippi River basin in 2003. Regression equations based on watershed characteristics of drainage area, river slope, mean-annual streamflow, and instantaneous streamflow at the time of measurement from more than 900 stream segments across the Nation were used to estimate traveltimes. Traveltimes were estimated and measured for the leading edge, peak concentration, and trailing edge of tracer-response curves. Estimated traveltimes for the leading edge, peak concentration, and trailing edge at Dayton were 25.3, 28.4, and 35.6 hours, respectively. Measured traveltimes for the leading edge, peak concentration, and trailing edge at Dayton were 33.2, 38.2, and 49.2 hours, respectively, for the 22.4-mile reach. Although traveltimes for the Crow and the Sauk Rivers were underestimated by use of the regression equations, the regression estimates were close enough to measured values to be considered satisfactory; hence, this estimating technique should be applicable in other source-water planning efforts in and near the study area.
NTIS
Dyes; Estimating; Luminescence; Rivers; Watersheds

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20090030825 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Structural Optimization of Joined-Wing Beam Model with Bend-Twist Coupling Using Equivalent Static Loads
Green, Nicholas S; Jun. 2009; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502107; AFIT/GAE/ENY/09-J01; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502107

This study is based on the merger of two separate theories to further the efficiency with which joined-wing structural models are designed. The first theory is Geometrically Exact Beam Theory (GEBT). GEBT is a small strain beam theory which is capable of accurately capturing the geometric bend-twist coupling in beam elements that are experiencing large global deformations. This is crucial to the joined-wing problem as it is geometrically nonlinear. The second theory concerns Equivalent Static Loads (ESL). These ESL consist of a load vector that produces the same nodal displacements and rotations as those computed from a pure nonlinear analysis. The ESL displacements and rotations are then used to calculate ESL stresses. By merging these two theories into a single structural optimization effort, computational cost is reduced by orders of magnitude when compared to purely nonlinear response optimization efforts. It is shown that the final design obtained by the optimization is the same for both types of analysis. The final result is a much simpler model than a detailed finite element model of the joined-wing aircraft that can be optimized without significant loss in fidelity in a fraction of the time required for a single nonlinear response optimization cycle using finite element analysis.
DTIC
Models; Static Loads; Structural Analysis; Wings

67
THEORETICAL MATHEMATICS

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

20090030669 Texas Univ., San Antonio, TX USA
Complex Variable Methods for Fatigue Sensitivity Analysis (Preprint)
Voorhees, A.; Bagley, R.; Millwater, H.; Apr 2009; 13 pp.; In English
Contract(s)/Grant(s): FA8650-07-C-5060; Proj-4347
Report No.(s): AD-A502218; AFRL-RX-WP-TP-2009-4089; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502218

Complex variable, numerical differentiation techniques have proven useful in many fields of engineering analysis. Complex Taylor series expansion and Fourier differentiation are two such complex variable methods. This paper adapts the use of both complex Taylor series expansion and Fourier differentiation for fatigue sensitivity analysis. The sensitivity of the number of cycles to failure to input parameters and initial conditions has been determined by traditional numerical differentiation techniques as well as through complex variable methods. Both complex Taylor series expansion and Fourier differentiation have been found to be more accurate and stable than traditional central differencing.
DTIC
Complex Variables; Finite Difference Theory; Fourier Analysis; Numerical Analysis; Sensitivity Analysis

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*.

20090030098 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Deviations from the Local Field Approximation in Negative Streamer Heads
Li, C.; Brok, W. J. M.; Ebert, U.; Van der Mullen, J. J. A. M.; Feb. 2007; 22 pp.; In English
Report No.(s): PB2008-108141; MAS-E0706; Copyright; Avail.: National Technical Information Service (NTIS)

Negative streamer ionization fronts in nitrogen under normal conditions are investigated both in a particle model and in a fluid model in local field approximation. The parameter functions for the fluid model are derived from swarm experiments in the particle model. The front structure on the inner scale is investigated in a 1D setting, allowing reasonable run-time and memory consumption and high numerical accuracy without introducing super-particles. If the reduced electric field immediately before the front is less than or equal to 50kV/(cm bar), solutions of fluid and particle model agree very well. If the field increases up to 200kV/(cm bar), the solutions of particle and fluid model deviate, in particular, the ionization level behind the front becomes up to 60 percent higher in the particle model while the velocity is rather insensitive. Particle and fluid model deviate because electrons with high energies do not yet fully run away from the front, but are somewhat ahead. This leads to increasing ionization rates in the particle model at the very tip of the front. The energy overshoot of electrons in the leading edge of the front actually agrees quantitatively with the energy overshoot in the leading edge of an electron swarm or avalanche in the same electric field.
NTIS
Approximation; Electric Discharges; Ionization

20090030171 Los Alamos National Lab., NM USA
High-Precision Gamma-Ray Total Cross-Section Measurements Between 3.45 and 12 MeV
Frankle, C. M.; Moss, C. E.; Dec. 01, 2008; 20 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25396
Report No.(s): DE2009-948552; LA-14383; No Copyright; Avail.: Department of Energy Information Bridge

A Compton-backscatter capability has recently become available at the Duke University Free Electron Laser Laboratory. This capability allows one to produce high fluxes of tunable, nearly monoenergetic gamma rays. Using these gamma-ray

beams, we have made high-precision (approx. 0.5%) measurements of the gamma-ray total cross section at 3.45, 4, 5, 6, 8, 10, and 12 MeV. The nuclei measured were Be, C, Cu, Ta, W, Pb, and U.
NTIS
Free Electron Lasers; Gamma Rays

20090030172 Los Alamos National Lab., NM USA
Measurement of Gamma-Ray Total Absorption Cross Sections Using a (sup 56)Co Source
Frankle, C. M.; Moss, C. E.; Dec. 01, 2008; 18 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25396
Report No.(s): DE2009-948553; LA-14384; No Copyright; Avail.: Department of Energy Information Bridge
We have used a 150 MBq (sup 56)Co source to perform gamma-ray total absorption cross section measurements with very high precision. The use of (sup 56)Co allowed us to simultaneously measure the total cross section at 15 energies ranging from 0.847 MeV to 3.451 MeV. Seven sample materials were measured: Be, C, Cu, Ta, W, Pb, and U. In general, the measurement precision is better than 0.5% and in all cases better than 1.3%.
NTIS
Absorption Cross Sections; Gamma Rays

20090030192 Fermi National Accelerator Lab., Batavia, IL, USA; Boston Univ., Boston, MA, USA; Brookhaven National Lab., Upton, NY USA; Cornell Univ., Ithaca, NY, USA
New (g-2) Experiment: A Proposal to Measure the Muon Anomalous Magnetic Moment to +-0.14 ppm Precision
Feb. 09, 2009; 129 pp.; In English
Report No.(s): DE2009-952029; No Copyright; Avail.: Department of Energy Information Bridge
We propose to measure the muon anomalous magnetic moment, a(sub (mu)), to 0.14 ppm-a fourfold improvement over the 0.54 ppm precision obtained in the BNL experiment E821. The muon anomaly is a fundamental quantity and its precise determination will have lasting value. The current measurement was statistics limited, suggesting that greater precision can be obtained in a higher-rate, next-generation experiment. We outline a plan to use the unique FNAL complex of proton accelerators and rings to produce high-intensity bunches of muons, which will be directed into the relocated BNL muon storage ring. The physics goal of our experiment is a precision on the muon anomaly of 16 x 10(sup -11), which will require 21 times the statistics of the BNL measurement, as well a factor of 3 reduction in the overall systematic error. Our goal is well matched to anticipated advances in the worldwide effort to determine the standard model (SM) value of the anomaly. The present comparison, (Delta)a(sub (mu)) (Expt: -SM) = (295 (+-) 81) x 10(sup -11), is already suggestive of possible new physics contributions to the muon anomaly. Assuming that the current theory error of 51 x 10(sup -11) is reduced to 30 x 10(sup -11) on the time scale of the completion of our experiment, a future (Delta)a(sub (mu)) comparison would have a combined uncertainty of (approx) 34 x 10(sup -11), which will be a sensitive and complementary benchmark for proposed standard model extensions.
NTIS
Magnetic Anomalies; Magnetic Moments; Muons

20090030214 Fermi National Accelerator Lab., Batavia, IL, USA
Proposal to Search for Mu (sup -) N yields e (sup -) N with a Single Event Sensitivity Below 10 (sup -16)
Oct. 10, 2008; 234 pp.; In English
Report No.(s): DE2009-952028; No Copyright; Avail.: National Technical Information Service (NTIS)
With the discovery of neutrino masses and lepton mixing, the fact that individual lepton-flavor numbers-electron-number, muon-number, and tau-number-are not conserved has been established. All such violating effects to date have been observed in the neutral lepton sector, through the phenomenon of neutrino oscillations. Charged-lepton flavor-violation (CLFV), on the other hand, has been the subject of intense experimental searching since the discovery of the muon but, to this date, no evidence for it has ever been uncovered. The Standard Model augmented by new physics that leads to the experimentally observed neutrino masses predicts a non-zero rate for CLFV process, but expectations depend dramatically on the mechanism responsible for neutrino mass generation. For example, if the physics responsible for neutrino masses is very heavy (as in the case of a high mass scale seesaw mechanism or very weakly coupled)(as in the case of Dirac neutrinos), expectations for CLFV processes are around forty orders of magnitude smaller than current experimental bounds.
NTIS
Electrons; Leptons; Neutrinos; Sensitivity

20090030217 Sandia National Labs., Albuquerque, NM USA

LDRD Final Report on Bloch Oscillations in Two-Dimensional Nanostructure Arrays for High Frequency Applications

Lyo, S. K.; Pan, W.; Reno, J. L.; Wendt, J. R.; Barton, D. L.; Sep. 01, 2008; 42 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2009-948689; SAND2008-6223; No Copyright; Avail.: National Technical Information Service (NTIS)

We have investigated the physics of Bloch oscillations (BO) of electrons, engineered in high mobility quantum wells patterned into lateral periodic arrays of nanostructures, i.e. two-dimensional (2D) quantum dot superlattices (QDSLs). A BO occurs when an electron moves out of the Brillouin zone (BZ) in response to a DC electric field, passing back into the BZ on the opposite side. This results in quantum oscillations of the electron--i.e., a high frequency AC current in response to a DC voltage. Thus, engineering a BO will yield continuously electrically tunable high-frequency sources (and detectors) for sensor applications, and be a physics tour-de-force. More than a decade ago, Bloch oscillation (BO) was observed in a quantum well superlattice (QWSL) in short-pulse optical experiments. However, its potential as electrically biased high frequency source and detector so far has not been realized. This is partially due to fast damping of BO in QWSLs. In this project, we have investigated the possibility of improving the stability of BO by fabricating lateral superlattices of periodic coupled nanostructures, such as metal grid, quantum (anti)dots arrays, in high quality GaAs/Al(sub x)Ga(sub 1-x)As heterostructures. In these nanostructures, the lateral quantum confinement has been shown theoretically to suppress the optical-phonon scattering, believed to be the main mechanism for fast damping of BO in QWSLs.

NTIS

Electrons; High Frequencies; Nanostructure (Characteristics); Oscillations

20090030219 Sandia National Labs., Albuquerque, NM USA

Terahertz-Based Target Typing

Lyo, S. K.; Wanke, M. C.; Reno, J. L.; Shaner, E. A.; Grine, A. D.; Sep. 01, 2008; 34 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2009-948692; SAND2008-6125; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this work was to create a THz component set and understanding to aid in the rapid analysis of transient events. This includes the development of fast, tunable, THz detectors, along with filter components for use with standard detectors and accompanying models to simulate detonation signatures. The signature effort was crucial in order to know the spectral range to target for detection. Our approach for frequency agile detection was to utilize plasmons in the channel of a specially designed field-effect transistor called the grating-gate detector. Grating-gate detectors exhibit narrow-linewidth, broad spectral tunability through application of a gate bias, and no angular dependence in their photoresponse. As such, if suitable sensitivity can be attained, they are viable candidates for Terahertz multi-spectral focal plane arrays.

NTIS

Field Effect Transistors; Targets

20090030221 Princeton Univ., NJ USA

Analytic Study of the Perpendicularly Propagating Electromagnetic Drift Instabilities in the Magnetic Reconnection Experiment

Wang, Y.; Kulsrud, R.; Ji, H.; Dec. 03, 2008; 48 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CHO3073

Report No.(s): DE2009-948734; PPPL-4370; No Copyright; Avail.: National Technical Information Service (NTIS)

A local linear theory is proposed for a perpendicularly propagating drift instability driven by relative drifts between electrons and ions. The theory takes into account local cross-field current, pressure gradients and modest collisions as in the Magnetic Reconnection Experiment (MRX). The unstable waves have very small group velocities in the direction of the pressure gradient, but have a large phase velocity near the relative drift velocity between electrons and ions in the direction of cross-field current. By taking into account the electron-ion collisions and applying the theory in the Harris sheet, we establish that this instability could be excited near the center of the Harris sheet and have enough e-foldings to grow to large amplitude before it propagates out of the unstable region. Comparing with the other magnetic reconnection related instabilities (LHDI, MTSI et.) studied previously, we believe the instability we find is a favorable candidate to produce anomalous resistivity because of its unique wave characteristics, such as electromagnetic component, large phase velocity, and small group velocity in the cross current layer direction.

NTIS

Electromagnetism; Magnetic Field Reconnection; Magnetohydrodynamic Stability

20090030232

Search for Scalar Top and Bottom Quarks at the Tevatron

Calfayan, P.; 01 Jan. 2009; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2009-951340; FERMILAB-CONF-09-108-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Searches for the supersymmetric partners of top and bottom quarks using data up to 340 pb(sup -1) taken at the Tevatron p(bar p) collider are described. We report on searches for scalar top quarks (tilde t) in the decays (tilde t) (yields) c(tilde (chi))(sub 1)(sup 0) and (tilde t) (yields) bl(tilde v) and for scalar bottom quarks in the decay (tilde b) (yields) b(tilde (chi))(sub 1)(sup 0).

NTIS

Particle Accelerators; Quarks; Scalars

20090030233

Measurement of W Boson Helicity Fractions in T Anti-t Decays at DZero and CDF

Potter, C.T.; 01 Apr. 2008; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2009-951344; FERMILAB-CONF-08-635; No Copyright; Avail.: National Technical Information Service (NTIS)

Since the discovery of the top quark in 1995 by the CDF and D0 collaborations, the mass of this most massive known elementary particle has been measured with high precision. However, the measurements of other top-quark properties are still statistically limited, so the question remains whether the standard model successfully predicts these properties. In the report we present the analysis techniques and updated measurements.

NTIS

Bosons; Quarks

20090030234

Measurement of Single Top Production at the Tevatron

Hirschbuehl, D.; 01 Apr. 2008; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2009-951345; FERMILAB-CONF-08-638-E; No Copyright; Avail.: National Technical Information Service (NTIS)

This article reports on first evidence for single top-quark production by the CDF and DO collaboration at the Tevatron. Both experiments have measured the cross section with more the 3 standard deviations significance using a data set that corresponds to an integrated luminosity of 2.2 fb to the minus 1 power and 0.9 fb to the minus 1 power, respectively. Also direct measurements of the CKM matrix element that describes the Wtb coupling, are performed.

NTIS

Particle Accelerators; Particle Production; Quarks

20090030235 Lawrence Livermore National Lab., Livermore, CA USA

Comparison of Monte Carlo Particle Transport Algorithms for Binary Stochastic Mixtures

Brantley, P.S.; 23 Feb. 2009; 25 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2009-952425; LLNL-PROC-410959; No Copyright; Avail.: Department of Energy Information Bridge

Two Monte Carlo algorithms originally proposed by Zimmerman and Zimmerman and Adams for particle transport through a binary stochastic mixture are numerically compared using a standard set of planar geometry benchmark problems. In addition to previously-published comparisons of the ensemble-averaged probabilities of reflection and transmission, we include comparisons of detailed ensemble-averaged total and material scalar flux distributions. Because not all benchmark scalar flux distribution data used to produce plots in previous publications remains available, we have independently regenerated the benchmark solutions including scalar flux distributions.

NTIS

Algorithms; Binary Mixtures; Monte Carlo Method; Radiation Transport; Stochastic Processes

20090030250 Fermi National Accelerator Lab., Batavia, IL, USA; Technische Univ., Twente, Netherlands
Measurement of the Top Quark Pair Production Cross Section in Proton-Antiproton Collisions at a Center of Mass Energy of 1.96 TeV, Hadronic Top Decays with the D0 Detector, (Thesis/Dissertation)
Hegeman, J. G.; Jan. 16, 2009; 193 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2009-951334; FERMILAB-THESIS-2009-07; No Copyright; Avail.: National Technical Information Service (NTIS)

Of the six quarks in the standard model the top quark is by far the heaviest: 35 times more massive than its partner the bottom quark and more than 130 times heavier than the average of the other five quarks. Its correspondingly small decay width means it tends to decay before forming a bound state. Of all quarks, therefore, the top is the least affected by quark confinement, behaving almost as a free quark. Its large mass also makes the top quark a key player in the realm of the postulated Higgs boson, whose coupling strengths to particles are proportional to their masses. Precision measurements of particle masses for e.g. the top quark and the W boson can hereby provide indirect constraints on the Higgs boson mass.
NTIS
Center of Mass; Hadrons; Pair Production; Particle Collisions; Particle Decay; Proton-Antiproton Interactions; Quarks

20090030280 Brookhaven National Lab., Upton, NY USA
IBS and Possible Luminosity Improvement for RHIC Operation Below Transition Energy
Fedotov, A.V.; [2009]; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952538; BNL-81814-2009; No Copyright; Avail.: Department of Energy Information Bridge

There is a strong interest in low-energy RHIC collisions in the energy range below present RHIC transition energy. These collisions will help to answer one of the key questions in the field of QCD about the existence and location of a critical point on the QCD phase diagram. For such low-energy RHIC operation, particle losses from the RF bucket are of particular concern since the longitudinal beam size is comparable to the existing RF bucket at low energies. In this paper, we explore an Intrabeam Scattering (IBS) feature below transition energy that drives the transverse and longitudinal beam temperatures towards equilibrium to see whether we can minimize longitudinal diffusion due to IBS and predict some luminosity improvement for the low-energy RHIC project.
NTIS
Luminosity; Quantum Chromodynamics; Scattering

20090030281 Chicago Univ., Chicago, IL USA
Limit on the Branching Ratio of the Flavor-Changing Top Quark Decay T Yields ZC
Paramonov, A. A.; Jun. 2009; 119 pp.; In English
Report No.(s): DE2009-952635; No Copyright; Avail.: National Technical Information Service (NTIS)

We have used the Collider Detector at Fermilab (CDF-II) to set upper limits on the branching ratio of the flavor-changing neutral-current (FCNC) top quark de- cay t yields Zc using a technique employing ratios of W and Z production, measured in 1.52 fb-1 of pp data. The analysis uses a comparison of two decay chains to cancel systematic uncertainties in acceptance, efficiency, and luminosity. We validate the MC modeling of acceptance and efficiency for lepton identification over the multi-year dataset also using a ratio of W and Z production, in this case the observed ratio of inclusive production of W to Z-bosons, a technique that will be essential for precision comparisons with the standard model at the LHC. We introduce several methods of determining backgrounds to the W and Z samples. To improve the discrimination against SM backgrounds to top quark decays, we calculate the top mass for each event with two leptons and four jets assuming it is a tt event with one of the top quarks decaying to Zc. The upper limit on the Br(t yields Zc) is estimated from a likelihood constructed with the l+l-cjjb top mass distribution and the number of lvbjjb events.
NTIS
Chains; Particle Decay; Quarks

20090030286 Brookhaven National Lab., Upton, NY USA
Beam Dynamics and Expected RHIC Performance with 56MHz RF Upgrade
Fedotov, A. V.; Ben-Zvi, I.; Jan. 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952539; BNL-81815-2009; No Copyright; Avail.: Department of Energy Information Bridge

An upgrade of the RHIC storage RF system with a superconducting 56 MHz cavity was recently proposed. This upgrade

win provide a significant increase in the acceptance of the RHIC 197 MHz storage RF bucket. This paper summarizes simulations of beam evolution due to intra-beam scattering (IBS) for beam parameters expected with the 56 MHz SRF cavity upgrade. Expected luminosity improvements are shown for Au ions at 100 GeVInudeon and protons at 250 GeV.
NTIS
Radio Frequencies; Scattering

20090030292 Pittsburgh Univ., PA, USA
Neutrino and Antineutrino Inclusive Charged-Current Cross Section Measurement with the Minos Near Detector
Bhattacharya, D.; Jan. 2009; 211 pp.; In English
Report No.(s): DE2009-952653; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents the measurement of energy dependence of the neutrino-nucleon inclusive charged current cross section on an isoscalar target in the range 3-50 GeV for neutrinos and 5- 50 GeV energy range for antineutrinos. The data set was collected with the MINOS Near Detector using the wide band NuMI beam at Fermilab. The size of the charged current sample is 1.94106 neutrino events and 1.60105 antineutrino events. The flux has been extracted using a low hadronic energy sub-sample of the charged current events. The energy dependence of the cross section is obtained by dividing the charged current sample with the extracted flux. The neutrino and antineutrino cross section exhibits a linear dependence on energy at high energy but shows deviations from linear behavior at low energy. We also present a measurement of the ratio of antineutrino to neutrino inclusive cross section.
NTIS
Antineutrinos; Neutrinos

20090030294 Fermi National Accelerator Lab., Batavia, IL, USA
Search for Admixture of Scalar Top in the ttbar Lepton+Jets Final State at s(1/2) = 1.96 TeV, Thesis/Dissertation**
Park, S. J.; Rochester, U.; Dec. 01, 2007; 215 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921978; FERMILAB-THESIS-2007-45; No Copyright; Avail.: National Technical Information Service (NTIS)

Elementary Particle Physics is based on studies of the fundamental building blocks of nature and their interactions. The Standard Model of Particle Physics is the most complete and successful theory to describe all observed particle phenomena. It has also made successful quantitative predictions for interaction rates and couplings, as well as for the existence of particles such as the t neutrino and the top quark, that were observed subsequently. The latter was found in 1995 at Fermi National Accelerator Laboratory (Fermilab) by the CDF and DO collaborations. In spite of the tremendous success of the Standard Model, we know that it is incomplete. To name a few shortcomings, the Standard Model does not include gravity, does not provide explanations for the choice of its parameters, does not account for dark matter and dark energy, and there is the notorious fine-tuning problem due to radiative corrections to the Higgs-boson mass. While the Standard Model successfully unifies the electromagnetic and the weak interactions, the strong and the gravitational forces are still decoupled. For decades, the ultimate goal of particle physics has been to unify all interactions in one Grand Unified Theory.
NTIS
Admixtures; Elementary Particles; Scalars; Particle Theory

20090030296 Fermi National Accelerator Lab., Batavia, IL, USA; Brookhaven National Lab., Upton, NY USA
6D Ionization Cooling Channel with Resonant Dispersion Generation, Conference
Palmer, R. B.; Alexahin, Y. I.; Yonehara, K.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921986; FERMILAB-CONF-07-289-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

For muons with preferable for ionization cooling momentum <300MeV/c the longitudinal motion is naturally undamped. In order to provide the longitudinal damping a correlation between muon momentum and transverse position - described in terms of the dispersion function - should be introduced. In the present report we consider the possibility of dispersion generation in a periodic sequence of alternating solenoids (FOFO channel) by choosing the tune in the second passband (i.e. above half-integer per cell) and tilting the solenoids in adjacent cells in the opposite direction. Analytical estimates for equilibrium emittances and cooling rates are presented.
NTIS
Conferences; Cooling; Ionization; Momentum; Muons

20090030297 Fermi National Accelerator Lab., Batavia, IL, USA
Coupled Optics Reconstruction from TBT Data Using MAD-X
Kapin, V.; Alexahin, Y.; Schmidt, F.; Gianfelice-Wendit, E.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921989; FERMILAB-CONF-07-290-AD; No Copyright; Avail.: Department of Energy Information Bridge

Turn-by-turn BPM data provide immediate information on the coupled optics functions at BPM locations. In the case of small deviations from the known (design) uncoupled optics some cognizance of the sources of perturbation, BPM calibration errors and tilts can also be inferred without detailed lattice modeling. In practical situations, however, fitting the lattice model with the help of some optics code would lead to more reliable results. We present an algorithm for coupled optics reconstruction from TBT data on the basis of MAD-X and give examples of its application for the Fermilab Tevatron accelerator.
NTIS
Beams (Radiation); Coupled Modes; Crystal Optics

20090030298 Fermi National Accelerator Lab., Batavia, IL, USA
Correction of Second Order Chromaticity at Tevatron, Conference
Valishev, A.; Annala, G.; Lebedev, V.; Moore, R. S.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921990; FERMILAB-CONF-07-294-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Correction of the second order betatron tune chromaticity is essential for operation at the working point near half integer resonance which is proposed as one of the ways to improve performance of the Tevatron. In this report the new chromaticity correction scheme with split sextupole families is described. Details of implementation and commissioning at the present working point are discussed.
NTIS
Color; Conferences; Particle Accelerators

20090030299 Fermi National Accelerator Lab., Batavia, IL, USA
Status of the R&D Towards Electron Cooling of RHIC, Conference
Ben-Zvi, I.; Alduino, J.; Barton, D.; Beavis, D.; Burrill, A.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921997; FERMILAB-CONF-07-591-AD; No Copyright; Avail.: Department of Energy Information Bridge

The physics interest in a luminosity upgrade of RHIC requires the development of a cooling-frontier facility. Detailed calculations were made of electron cooling of the stored RHIC beams. This has been followed by beam dynamics simulations to establish the feasibility of creating the necessary electron beam. The electron beam accelerator will be a superconducting Energy Recovery Linac (ERL). An intensive experimental R&D program engages the various elements of the accelerator, as described by 24 contributions to the 2007 PAC.
NTIS
Conferences; Cooling; Luminosity; Research and Development

20090030300 Fermi National Accelerator Lab., Batavia, IL, USA
High-Power Target Experiment at the CERN PS, Conference
Kirk, H. G.; Fabich, A.; Palm, M.; Carroll, A.; Haug, F.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-921999; FERMILAB-CONF-07-593-APC; No Copyright; Avail.: National Technical Information Service (NTIS)

We test a target concept devised for the purpose of producing copious secondary pions and capturing the muon decay products. This experiment is designed to test the target system for a neutrino factory or muon collider and consists of a free flowing mercury stream embedded in a high-field solenoid. Key components are described.
NTIS
Conferences; Muons; Nuclides; Particle Decay; Pions; Targets

20090030302 Fermi National Accelerator Lab., Batavia, IL, USA
Dynamic Dispersion Insert in the Fermilab Main Injector for Momentum Collimation, Conference
Johnson, D. F.; Jun. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922003; FERMILAB-CONF-07-284-AD; No Copyright; Avail.: Department of Energy Information Bridge

The Fermilab Main Injector (MI) accelerator is designed as a FODO lattice with zero dispersion straight sections. A scheme will be presented that can dynamically alter the dispersion of one of the long straight sections to create a non-zero dispersion straight section suitable for momentum collimation. During the process of slip stacking DC beam is generated which is lost during the first few milliseconds of the ramp. A stationary massive primary collimator/absorber with optional secondary masks could be utilized to isolate beam loss due to uncaptured beam.
NTIS
Collimation; Conferences; Injectors; Inserts; Momentum

20090030309 Fermi National Accelerator Lab., Batavia, IL, USA
Design and Commissioning of Fermilab's Vertical Test Stand for ILC SRF Cavities
Ozelis, J. P.; Camille, M.; Peterson, T.; Huang, Y.; Norris, B.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922010; FERMILAB-CONF-07-246-TD; No Copyright; Avail.: Department of Energy Information Bridge

As part of its ILC program, Fermilab is developing a facility for vertical testing of SRF cavities. It operates at a nominal temperature of 2K, using a cryoplant that can supply LHe in excess of 20g/sec and provide bath pumping capacity of 125W at 2K. The below-grade cryostat consists of a vacuum vessel and LHe vessel, equipped with magnetic shielding to reduce the ambient magnetic field to <10mG. Internal fixed and external movable radiation shielding ensures that exposure to personnel is minimzed. The facility features an integrated personnel safety system consisting of RF switches, interlocks, and area radiation monitors.
NTIS
Cavities; Superconductivity; Test Stands

20090030334 Georgia Inst. of Tech., Atlanta, GA, USA
Acoustic Forming for Enhanced Dewatering and Formation
Aidum, C. K.; Nov. 02, 2007; 49 pp.; In English
Contract(s)/Grant(s): DE-FC07-02ID14267
Report No.(s): DE2008-920309; No Copyright; Avail.: National Technical Information Service (NTIS)

The next generation of forming elements based on acoustic excitation to increase drainage and enhances formation both with on-line control and profiling capabilities has been investigated in this project. The system can be designed and optimized based on the fundamental experimental and computational analysis and investigation of acoustic waves in a fiber suspension flow and interaction with the forming wire.
NTIS
Acoustic Excitation; Dewatering; Drainage; Analysis (Mathematics)

20090030346 Brookhaven National Lab., Upton, NY USA
Design and Performance of the Matching Beamline Between the BNL EBIS and AN Req, Conference
Alessi, J.; Beebe, E.; Kponou, A.; Okamura, M.; Pikin, A.; Jun. 25, 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886; 18033
Report No.(s): DE2008-921932; BNL--79625-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A part of a new EBIS-based heavy ion preinjector, the low energy beam transport (LEBT) section between the high current EBIS and the RFQ is a challenging design, because it must serve many functions. In addition to the requirement to provide an efficient matching between the EBIS and the RFQ, this line must serve as a fast switchyard, allowing singly charged ions from external sources to be transported into the EBIS trap region, and extracted, highly charged ions to be deflected to off-axis diagnostics (time-of-flight or emittance). The space charge of the 5-10 mA extracted heavy ion beam is a major consideration in the design, and the space charge force varies for different ion beams having Qlm fitom 1- 0.16. The line

includes electrostatic lenses, spherical and parallel-plate deflectors, magnetic solenoid, and diagnostics for measuring current, charge state distributions, emittance, and profile. A prototype of this beamline has been built, and results of tests are presented.
NTIS
Conferences; Electron Beams; Energy Transfer; Ion Beams; Ion Sources; Quadrupoles; Radio Frequencies

20090030347 Savannah River National Lab., Aiken, SC, USA
Design, Development and Field Deployment of a Teleoperated Sampling System, Conference
Dalmaso, M.; Fogle, R.; Hicks, T.; Harpring, L.; Odell, D.; Nov. 09, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2008-921965; R-TRT-A-00003; No Copyright; Avail.: Department of Energy Information Bridge
A teleoperated sampling system for the identification, collection and retrieval of samples following the detonation of an Improvised Nuclear Device (IND) or Radiological Dispersion Devise (RDD) has been developed and tested in numerous field exercises. The system has been developed as part of the Defense Threat Reduction Agencys (DTRA) National Technical Nuclear Forensic (NTNF) Program. The system is based on a Remotec ANDROS Mark V-A1 platform. Extensive modifications and additions have been incorporated into the platform to enable it to meet the mission requirements.
NTIS
Conferences; Deployment; Nuclear Devices; Sampling; Teleoperators

20090030362 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Analysis of Explicit Multirate and Partitioned Runge-Kutta Schemes for Conservation Laws
Hundsdorfer, W.; Mozartova, A.; Savcenco, V.; Aug. 2007; 42 pp.; In English
Report No.(s): PB2008-108725; MAS-E0715; Copyright; Avail.: National Technical Information Service (NTIS)
Multirate schemes for conservation laws or convection-dominated problems seem to come in two flavors: schemes that are locally inconsistent, and schemes that lack mass-conservation. In this paper these two defects are discussed for one-dimensional conservation laws. Particular attention will be given to monotonicity properties of the multirate schemes, such as maximum principles and the total variation diminishing (TVD) property. The study of these properties will be done within the framework of partitioned Runge-Kutta methods.
NTIS
Conservation Laws; Runge-Kutta Method

20090030380 Stanford Linear Accelerator Center, CA, USA; Birmingham Univ., UK
CP Violation at BaBar
Hawkes, C.; Jan. 08, 2008; 7 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922214; SLAC-PUB-13074; No Copyright; Avail.: National Technical Information Service (NTIS)
Several new and updated BABAR measurements of sin 2 are presented, together with the latest constraints on the Unitarity Triangle angles and DG. The higher statistics now available allow more sophisticated analysis techniques, such as time-dependent Dalitz plottting. Combined world average results place tight constraints on the Unitarity Triangle. There is good agreement among the measurements and with the unitarity of the CKM matrix. This represents an impressive verifcation of the Standard Model description of the quark-DGavour sector and of CP violation.
NTIS
CP Violation; Time Dependence; Quarks

20090030381 Stanford Linear Accelerator Center, CA, USA; Stanford Univ., CA, USA; Los Alamos National Lab., NM USA
Supersymmetric Model Building (and Sweet Spot Supersymmetry)
Ibe, M.; Kitano, R.; Jan. 08, 2008; 13 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922215; SLAC-PUB-13059; No Copyright; Avail.: National Technical Information Service (NTIS)
It has been more than twenty years since theorists started discussing supersymmetric model building/phenomenology. We

review mechanisms of supersymmetry breaking/mediation and problems in each scenario. We propose a simple model to address those problems and discuss its phenomenology.
NTIS
Broken Symmetry; Supersymmetry

20090030408 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Coaxial TE011 Cavity and a System to Measure DC and RF Properties of Superconductors
Elliott, T.; Mondal, J.; Myneri, G.; Knesei, P.; Bundy, R.; Jan. 23, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922269; JLAB-ACC-07-770; DOE/OR/23177-0288; No Copyright; Avail.: National Technical Information Service (NTIS)

A coaxial niobium cavity has been designed and built where the center conductor consists of a removable sample. In addition, a system to measure properties such as magnetization, penetration depth, critical temperature and thermal conductivity on the same cylindrical sample has been designed and built. The purpose of this effort is to investigate possible correlations between DC and RF properties of superconductors. In this contribution, the design of the various components is discussed and the test results on a niobium sample obtained so far are presented.
NTIS
Cavities; Niobium; Radio Frequencies; Superconductors (Materials)

20090030409 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Review of High Field Q Slope, Cavity Measurements
Ciovati, G.; Jan. 23, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922270; JLAB-ACC-07-769; DOE/OR23177-0289; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the most interesting phenomenon occurring in superconducting radio-frequency (SRF) cavities made of bulk niobium is represented by a sharp decrease of the quality factor above peak surface magnetic field of about 90 mT and is referred to as 'high field Q-slope' or 'Q-drop'. This phenomenon was observed first in 1997 and since then some effort was devoted to the understanding of the causes behind it. Still, no clear physical interpretation of the Q-drop has emerged, despite several attempts. In this contribution, I will review the experimental results for various cavities measured in many laboratories and I will try to identify common features and differences related to the Q-drop.
NTIS
Cavities; Q Factors; Radio Frequencies; Slopes; Superconductivity

20090030412 Idaho National Lab., Idaho Falls, ID, USA
Failure Rate Data Analysis for High Technology Components
Cadwallader, L. C.; Jul. 2007; 9 pp.; In English
Report No.(s): DE2008-923504; No Copyright; Avail.: Department of Energy Information Bridge

Understanding component reliability helps designers create more robust future designs and supports efficient and cost-effective operations of existing machines. The accelerator community can leverage the commonality of its high-vacuum and high-power systems with those of the magnetic fusion community to gain access to a larger database of reliability data. Reliability studies performed under the auspices of the International Energy Agency are the result of an international working group, which has generated a component failure rate database for fusion experiment components. The initial database work harvested published data and now analyzes operating experience data. This paper discusses the usefulness of reliability data, describes the failure rate data collection and analysis effort, discusses reliability for components with scarce data, and points out some of the intersections between magnetic fusion experiments and accelerators.
NTIS
Failure Analysis; Accelerators; Data Processing

20090030417 Fermi National Accelerator Lab., Batavia, IL, USA; Centre National de la Recherche Scientifique, Cedex, France

Non-inclusive Searches for Squarks and Gluinos at the Tevatron

Biscarat, C.; Jan. 2007; 3 pp.; In English

Report No.(s): DE2008-923525; FERMILAB-07-611-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent results from the CDF and D0 Collaborations on searches for squarks and gluinos at the Run II of the Fermilab Tevatron collider are presented. This review covers searches for final states involving specific mass hierarchies. The analyzed datasets correspond to an integrated luminosity of 300-1000 pb(sup -1) collected from proton anti-proton collisions at a center-of-mass energy of 1.96 TeV. No significant deviations from the Standard Model expectations are observed and limits on parameters of supersymmetry are set in generic MSSM and in specific mSUGRA scenarios.

NTIS

Elementary Particles; Particle Accelerators; Protons

20090030419 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Demonstration of Femtosecond-Phase Stabilization in 2 DM Optical Fiber

Staples, J. W.; Wilcox, R.; Byrd, J. M.; Jan. 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-05CH1121

Report No.(s): DE2008-923646; No Copyright; Avail.: National Technical Information Service (NTIS)

Long-term phase drifts of less than a femtosecond per hour have been demonstrated in a 2 km length of single-mode optical fiber, stabilized interferometrically at 1530 nm. Recent improvements include a wide-band phase detector that reduces the possibility of fringe jumping due to fast external perturbations of the fiber and locking of the master CW laser wavelength to an atomic absorption line. Mode-locked lasers may be synchronized using two wavelengths of the comb, multiplexed over one fiber, each wavelength individually interferometrically stabilized.

NTIS

Optical Fibers; Stabilization; Continuous Wave Lasers

20090030420 Rome Univ., Rome, Italy; Stanford Linear Accelerator Center, CA, USA

Heavy Quarkonium Spectroscopy

Faccini, R.; Jan. 200; 7 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2008-924102; BABAR/CONF-07/035; SLAC/PUB-13080; No Copyright; Avail.: National Technical Information Service (NTIS)

Although the Standard Model of elementary particles is well established, strong interactions are not yet fully under control. We believe QCD is the field theory capable of describing them, but we are not yet capable, in most of the cases, to make exact predictions. Systems that include heavy quark-antiquark pairs (quarkonia) are ideal and unique laboratories to probe both the high energy regimes of QCD, where an expansion in terms of the coupling constant is possible, and the low energy regimes, where non-perturbative effects dominate. In the last years this field is experiencing a rapid expansion with a wealth of new data coming in from diverse sources: data on quarkonium formation from dedicated experiments (BES at BEPC, KEDR at VEPP-4M CLEO-c at CESR), clear samples produced by high luminosity B-factories (PEP and KEKB), and very large samples produced from gluon-gluon fusion in p(bar p) annihilations at Tevatron (CDF and D0 experiments). In this review I will first summarize recent developments in the understanding of heavy quarkonium states which have a well established quark content. Next, the core of the paper will be spent to review the experimental evidences of new states that might be aggregations of more than just a quark-antiquark pair. Although the possibility to have bound states of two quarks and two antiquarks or of quark-antiquark pairs and gluons has been predicted since the very start of the quark model, no observed state has yet been attributed to one of them: achieving such an attribution would be a major step in the understanding of the strong interactions.

NTIS

Spectroscopy; Quark Models; Quantum Chromodynamics; Standard Model (Particle Physics)

20090030421 Stanford Linear Accelerator Center, CA, USA
Interaction Region Upgrades of E+E- B-Factories
Sullivan, M.; Feb. 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-924105; SLAC/PUB-13137; No Copyright; Avail.: National Technical Information Service (NTIS)

Both the PEP-II and KEKB B-Factories have plans to upgrade their Interaction Regions (IRs) in order to improve luminosity performance. Last summer PEP-II added cooling to the IR beam pipe in order to increase beam currents thereby raising the luminosity. In addition, PEP-II is working on a design that modifies the permanent magnets near the Interaction Point (IP) for an even higher luminosity increase. KEKB is also planning an improvement to their IR that will decrease the detector beam pipe radius. In addition, KEK has a design to increase the luminosity of KEKB to 1 x 10(sup 35) cm(sup -2) sec(sup -1) which includes changes to the IR. PEP-II is also investigating the feasibility of a 1 x 10(sup 36) cm(sup -2) sec(sup -1) luminosity design. I summarize these various upgrades and concentrate on issues common to the different designs.
NTIS
Beam Currents; Industrial Plants

20090030422 Stanford Linear Accelerator Center, CA, USA; State Univ. of New York, Albany, NY, USA
Study of Charmed Sigma(sub c)(2800) Production at tne BABAR Experiment
Ahmed, S.; January 2006; 221 pp.; In English
Report No.(s): DE2008-924757; SLAC-R-887; No Copyright; Avail.: Department of Energy Information Bridge

This dissertation reports on a study of search for an orbitally excited state of charmed baryons Sigma (sub d) (2800). We measure the widths, momentum spectrum and production cross-section for these decaying states.
NTIS
Baryons; Charm (Particle Physics); Excitation; Particle Decay

20090030430 Fermi National Accelerator Lab., Batavia, IL, USA; Boston Univ., Boston, MA USA; Brookhaven National Lab., Upton, NY USA; California Univ., Berkeley, CA USA
Letter of Intent. A Muon to Electron Conversion Experiment at Fermilab. The mu2e Collaboration
Ankenbrandt, C. M.; Bertein, R. H.; Bogert, D.; Brice, S. J.; Broemmelsick, D. R.; Jan. 2007; 44 pp.; In English
Report No.(s): DE2008-924918; FERMILAB-TM-2396-AD-E-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Standard Model (SM) provides a remarkably good description of the basic constituents of matter and the interactions among them, from low energies to the mass scale of the weak vector bosons. Nevertheless, the SM appears to be incomplete, and the goal of world-wide experimental efforts is to uncover physics beyond the SM (BSM). BSM physics is motivated by the Standard Models inability to satisfactorily account for several important puzzles, such as the resolution of the hierarchy problem that renders the Higgs boson radiative corrections unstable, the origin of CP violation required for baryogenesis, and the incorporation of cosmological evidence for the existence of cold dark matter. The majority of the theoretical approaches that address the aforementioned issues predict new dynamics at the TeV scale. Examples include supersymmetry, technicolor, and extra dimensions. While the first evidence for such new physics might be discovered at the Tevatron or at the LHC, a comprehensive understanding will likely require both high precision measurements at lower energy as well as collider experiments beyond the LHC. Desirable low energy precision measurements are those that are, first and foremost, sensitive to new TeV-scale dynamics in BSM models where collider signals would be weak or nonexistent. Additionally, should BSM physics be first observed at the Tevatron or the LHC, specific precision low energy measurements would play an important role in deciphering the underlying BSM dynamics. The most important measurements are those where experimental techniques can achieve the high sensitivity required to indirectly access phenomena at the multi-TeV scale and where theoretical uncertainties are under control at the required level of interpretability.
NTIS
Electrons; Electroweak Interactions (Field Theory); Leptons; Muons; Particle Accelerators

20090030431 Fermi National Accelerator Lab., Batavia, IL, USA; Boston Univ., Boston, MA USA; Brookhaven National Lab., Upton, NY USA; California Univ., Berkeley, CA USA
Expression of Interest. A Muon to Electron Conversion Experiment at Fermilab. The mu2e Collaboration
Prebys, E. J.; Bogert, D.; Broemmelsick, D. R.; Ankenbrandt, C. M.; Brice, S. J.; January 2007; 7 pp.; In English
Report No.(s): DE2008-924917; FERMILAB-TM-2389-AD-E; No Copyright; Avail.: Department of Energy Information Bridge

The search for lepton flavor violation (LFV) has long played an important role in the evolution of our understanding of

electroweak interactions. The neutrinoless conversion of a muon to an electron in the field of a nucleus is a particularly interesting example of an LFV process involving charged leptons. In the Standard Model, such conversions would take place via loop diagrams involving virtual neutrino mixing, at a rate far below the threshold of any currently conceivable experiment. Indeed, any detectable signal would be a definite indication, albeit indirect, of new dynamics at multi-TeV energy scales. Enhanced rate for this process is an almost universal feature of beyond the Standard Model physics, and the fact that such a process has not been observed has constrained or eliminated many models. While it is widely believed that new physics will appear at LHC energies, the LHC is not well-equipped to study LFV directly. An often-quoted example is in the case of supersymmetry. The LHC will probe slepton masses, but it cannot compete with muon decay experiments in constraining the slepton mixing angles. Sensitive searches for rare or forbidden leptonic and semi-leptonic LFV processes, especially those involving charged leptons, are essential for the comprehensive characterization of new high energy physics. While there are several potential reactions that can be used to probe LFV, muon to electron conversion has the remarkable feature that it does not require the coincidence of two final-state particles.
NTIS
Electrons; Electroweak Interactions (Field Theory); Leptons; Muons; Particle Accelerators

20090030441 Stanford Linear Accelerator Center, CA, USA; California State Univ., Los Angeles, CA, USA
Preliminary Results from the UCLA/SLAC Ultra-High Gradient Cerenkov Wakefield Accelerator Experiment
Thompson, M. C.; Badakov, H.; Rosenzweig, J. B.; Travish, G.; Oct. 2005; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-923313; SLAC/PUB-13117; UCRL/PROC-220696; No Copyright; Avail.: National Technical Information Service (NTIS)

The first phase of an experiment to study the performance of dielectric Cerenkov wakefield accelerating structures at extremely high gradients in the GV/m range has been completed. This experiment takes advantage of the unique SLAC FFTB electron beam and its demonstrated ultra-short pulse lengths and high currents (e.g., (sigma)(sub z) = 20 (micro)m at Q = 3 nC). The FFTB electron beam has been successfully focused down and sent through varying lengths of fused silica capillary tubing with two different sizes: ID = 200 (micro)m/OD = 325 (micro)m and ID = 100 (micro)m/OD = 325 (micro)m. The pulse length of the electron beam was varied in the range 20 (micro)m < (sigma)(sub z) < 100 (micro)m which produced a range of electric fields between 2 and 20 GV/m at the inner surface of the dielectric tubes. We observed a sharp increase in optical emissions from the capillaries in the middle part of this surface field range which we believe indicates the transition between sustainable field levels and breakdown. If this initial interpretation is correct, the surfaced fields that were sustained equate to on axis accelerating field of several GV/m. In future experiments we plan to collect and measure coherent Cerenkov radiation emitted from the capillary tube to gain more information about the strength of the accelerating fields.
NTIS
Cerenkov Counters; Cerenkov Radiation; Gradients; Dielectrics

20090030446 Fermi National Accelerator Lab., Batavia, IL, USA
Electron Lenses for Particle Collimation in LHC
Shiltsev, V.; Jan. 2008; 5 pp.; In English
Report No.(s): DE2008-923066; FERMILAB-CONF-07-698-APC; No Copyright; Avail.: Department of Energy Information Bridge

Electron Lenses built and installed in Tevatron have proven themselves as safe and very reliable instruments which can be effectively used in hadron collider operation for a number of applications, including compensation of beam-beam effects, DC beam removal from abort gaps, as a diagnostic tool. In this presentation we following original proposal consider in more detail a possibility of using electron lenses with hollow electron beam for ion and proton collimation in LHC.
NTIS
Collimation; Electron Beams; Electron Optics; Lenses; Particle Accelerators

20090030448 Brookhaven National Lab., Upton, NY USA; Stanford Linear Accelerator Center, CA, USA
Superconducting Magnets of the ILC Beam Delivery System
Parker, B.; Anerella, M.; Escallier, J.; He, P.; Jain, A.; Jan. 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-922985; BNL-79791-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge

The ILC Beam Delivery System (BDS) uses a variety of superconducting magnets to maximize luminosity and minimize

background. Compact final focus quadrupoles with multifunction correction coils focus incoming beams to few nanometer spot sizes while focusing outgoing disrupted beams into a separate extraction beam line. Anti-solenoids mitigate effects from overlapping focusing and the detector solenoid field. Far from the interaction point (IP) strong octupoles help minimize IP backgrounds. A low-field but very large aperture dipole is integrated with the detector solenoid to reduce backgrounds from beamstrahlung pairs generated at the IP. Physics requirements and magnetic design solutions for the BDS superconducting magnets are reviewed in this paper
NTIS
Superconducting Magnets; Beam Steering; Beams (Radiation)

20090030449 Stanford Linear Accelerator Center, CA, USA; California Univ., Los Angeles, CA, USA; California Univ., Santa Barbara, CA, USA; Manhattan Coll., Bronx, NY, USA
Observation of Multi-GeV Breakdown Thresholds in Dielectric Wakefield Structures
Thompson, M. C.; Badakov, H.; Rosenzweig, J. B.; Travish, G.; Hogan, M. J.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922959; SLAC-PUB-13106; No Copyright; Avail.: Department of Energy Information Bridge
An experiment designed to test the breakdown threshold of a dielectric subjected to the GV/m-scale electric-fields of an intense electron-beam has been completed. In this experiment at the Final Focus Test Beam (FFTB) facility, the 28.5 GeV SLAC electron beam was focused down and propagated through short fused-silica capillary-tubes with internal diameters of as little as 100 micron. The electric field at the inner surface of the tubes was varied from about 1 GV/m to 22 GV/m by adjusting the longitudinal compression of the electron bunch. We observed a sharp increase in optical emissions from the capillaries in the middle part of this surface field range which we believe indicates the transition between sustainable field levels and breakdown. If this initial interpretation is correct, the multi-GV/m surfaced fields that were sustained equate to on axis accelerating field of several GV/m.
NTIS
Dielectrics; Linear Accelerators

20090030450 Stanford Linear Accelerator Center, CA, USA; California Univ., Los Angeles, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Dielectric Wakefield Accelerator Experiments at the Saber Facility
Travish, G.; Badakov, H.; Cook, A.; Soenzweig, J.; Tikhoplav, R.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922958; SLAC-PUB-13099; No Copyright; Avail.: Department of Energy Information Bridge
Electron bunches with the unparalleled combination of high charge, low emittances, and short time duration, as first produced at the SLAC Final Focus Test Beam (FFTB), are foreseen to be produced at the SABER facility. These types of bunches have enabled wakefield driven accelerating schemes of multi-GV/m in plasmas. In the context of the Dielectric Wakefield Accelerators (DWA) such beams, having rms bunch length as short as 20 um, have been used to drive 100 micron and 200 micron ID hollow tubes above 20 GV/m surface fields. These FFTB tests enabled the measurement of a breakdown threshold in fused silica (with full data analysis still ongoing). With the construction and commissioning of the SABER facility at SLAC, new experiments would be made possible to test further aspects of DWAs including materials, tube geometrical variations, direct measurements of the Cerenkov fields, and proof of acceleration in tubes >10 cm in length. This collaboration will investigate breakdown thresholds and accelerating fields in new materials including CVD diamond. Here we describe the experimental plans, beam parameters, simulations, and progress to date as well as future prospects for machines based of DWA structures.
NTIS
Dielectrics; Electron Bunching; Electrons

20090030451 Stanford Linear Accelerator Center, CA, USA; California Univ., Santa Barbara, CA, USA
Search for Rare Quark-Annihilation Decays, Charged B Mesons Decaying to Charged D(S) Mesons And Phi Mesons, Thesis/Dissertation
Cunha, J. A. M.; Jan. 16, 2008; 210 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922230; SLAC-R-880; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Annihilation Reactions; Mesons; Particle Decay; Quarks

20090030452 Brookhaven National Lab., Upton, NY USA
High Energy Hadron Polarimetry
Bunce, G.; Sep. 10, 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-922242; BNL--79729-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Proton polarimetry at RHIC uses the interference of electromagnetic (EM) and hadronic scattering amplitudes. The EM spin-flip amplitude for protons is responsible for the proton's anomalous magnetic moment, and is large. This then generates a significant analyzing power for small angle elastic scattering. RHIC polarimetry has reached a 5% uncertainty on the beam polarization, and seem capable of reducing this uncertainty further. Polarized neutron beams ax also interesting for RHIC and for a polarized electron-polarized proton lion collider in the fume. In this case, deuterons, for example, have a very small anomalous magnetic moment, making the approach used for protons impractical. Although it might be possible to use quasielastic scattering from the protons in the deuteron to monitor the polarization. 3-He beams can provide polarized neutrons, and do have a large anomalous magnetic moment, making a similar approach to proton polarimetry possible.
NTIS
Hadrons; Polarimeters; Polarimetry; Protons

20090030453 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Measurement of the High-Field Q-Drop in a Large-Grain Niobium Cavity for Different Oxidation Processes
Ciovati, G.; Kneisel, P.; Gurevich, A.; Jan. 23, 2008; 1 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922264; JLAB-ACC-07-775; DOE/OR/23177-0283; No Copyright; Avail.: Department of Energy Information Bridge

In this contribution, we present the results from a series of RF tests at 1.7 K and 2.0 K on a single-cell cavity made of high-purity large (with area of the order of few cm2) grain niobium which underwent various oxidation processes. After initial buffered chemical polishing, anodization, baking in pure oxygen atmosphere and baking in air up to 180C was applied with the objective of clearly identifying the role of oxygen and the oxide layer on the Q-drop. During each rf test a temperature mapping system was used allowing to measure the local temperature rise of the cavity outer surface due to RF losses, which gives information about the losses location, their field dependence and space distribution on the RF surface. The results confirmed that the depth affected by baking is about 20-30 nm from the surface and showed that the Q-drop did not re-appear in a previously baked cavity by further baking at 120C in pure oxygen atmosphere or in air up to 180C. A statistic of the position of the hot-spots on the cavity surface showed that grain-boundaries are not the preferred location. An interesting correlation was found between the Q-drop onset, the quench field and the low-field energy gap, which supports the hypothesis of thermo-magnetic instability governing the Q-drop and the baking effect.
NTIS
Cavities; Niobium; Oxidation; Q Factors

20090030454 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Measurement of RF Losses Due to Trapped Flux in a Large-Grain Niobium Cavity
Ciovati, G.; Gurevich, A.; Jan. 23, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922265; JLAB-ACC-07-774; DOE/OR/23177-0284; No Copyright; Avail.: National Technical Information Service (NTIS)

Trapped magnetic field in superconducting niobium is a well known cause of radio-frequency (RF) residual losses. In this contribution, we present the results of RF tests on a single-cell cavity made of high-purity large grain niobium before and after allowing a fraction of the Earth magnetic field to be trapped in the cavity during the cooldown below the critical temperature Tc. This experiment has been done on the cavity before and after a low temperature baking. Temperature mapping allowed us to determine the location of hot-spots with high losses and to measure their field dependence. The results show not only an increase of the low-field residual resistance, but also a larger increase of the surface resistance for intermediate RF field (higher medium field Q-slope), which depends on the amount of the trapped flux. These additional field-dependent losses can be described as losses of pinned vortices oscillating under the applied RF magnetic field.
NTIS
Cavities; Niobium; Radio Frequencies; Superconductivity

20090030455 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Mysql-Based Data Archiver: Preliminary Results
Bickley, M.; Slominski, C.; Jan. 23, 2008; 4 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922267; JLAB-ACO-07-772; DOE/OR/23177-0286; No Copyright; Avail.: National Technical Information Service (NTIS)

Following an evaluation of the archival requirements of the Jefferson Laboratory accelerators user community, a prototyping effort was executed to determine if an archiver based on MySQL had sufficient functionality to meet those requirements. This approach was chosen because an archiver based on a relational database enables the development effort to focus on data acquisition and management, letting the database take care of storage, indexing and data consistency. It was clear from the prototype effort that there were no performance impediments to successful implementation of a final system. With our performance concerns addressed, the lab undertook the design and development of an operational system. The system is in its operational testing phase now. This paper discusses the archiver system requirements, some of the design choices and their rationale, and presents the acquisition, storage and retrieval performance.
NTIS
Data Acquisition; Linear Accelerators; Prototypes

20090030456 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Preliminary Results on 'Polarized' Buffered Chemical Polishing pf a Large Grain Niobium Cavity
Halbritter, J.; Ciovali, G.; Corcoran, S.; Jan. 23, 2008; 4 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922268; JLAB-ACC-07-771; DOE/OR23177-0287; No Copyright; Avail.: National Technical Information Service (NTIS)

In order to further understand the relation between the high-field Q-drop and the native oxide layer on the surface of SRF niobium cavities, we tried to alter the oxidation of niobium by applying a small voltage between a large-grain niobium cavity and a niobium rod inserted in the center, during buffered chemical polishing (BCP). The cavity RF test results at 1.7 K and 2.0 K did not show any major difference in the Q-drop behavior, compared to a standard BCP treatment. In one case, dark gray regions were visible inside the cavity and were responsible for additional losses, as seen with temperature maps. In order to better understand the electrochemical process occurring during the 'polarized' BCP treatment, measurements of the polarization curve have been made on a cylindrical niobium sample, with a cylindrical niobium rod in the center.
NTIS
Cavities; Niobium; Polishing; Superconducting Cavity Resonators

20090030457 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
JLab CW Cryomodules for 4th Generation Light Sources
Kneisel, P.; Marhauser, F.; Smith, K.; Wang, H.; Wilson, K.; Jan. 23, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922273; JLAB-ACC-07-767; DOE/OR/23177-0291; No Copyright; Avail.: National Technical Information Service (NTIS)

Fourth generation light sources hold the prospect of unprecedented brightness and optical beam quality for a wide range of scientific applications. Many of the proposed new facilities will rely on large superconducting radio frequency (SRF) based linacs to provide high energy, low emittance CW electron beams. For high average power applications there is a growing acceptance of energy recovery linac (ERL) technology as the way to support large recirculating currents with modest RF power requirements. CW SRF and high current ERLs are two core competencies at Jefferson Lab. JLab has designed and built a number of CW cryomodules of several different types starting with the original CEBAF design, with variations for higher current in the two generations of JLabs free-electron laser (FEL), through two intermediate prototypes to the final high-performance module for the 12 GeV upgrade. Each of these represent fully engineered and tested configurations with a variety of specifications that could be considered for possible use in fourth generation light sources. Furthermore JLab has been actively pursuing advanced concepts for highcurrent high-efficiency cryomodules for next generation ERL based FELs. These existing and proposed designs span the range from about 1mA single-pass to over 100 mA energy recovered current capability. Specialized configurations also exist for high-current non-energy recovered sections such as the injector region where very high RF power is required. We discuss the performance parameters of these existing and proposed designs and their suitability to different classes of fourth generation light sources.
NTIS
Continuous Radiation; Energy Technology; Light Sources; Linear Accelerators; Radio Frequencies; Superconductivity

20090030459 Fermi National Accelerator Lab., Batavia, IL, USA; Kyoto Univ., Japan
Single Pion Measurement Capabilities at SciBooNE
Nakajima, Y.; Dec. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922301; FERMILAB-CONF-07-670-E; No Copyright; Avail.: Department of Energy Information Bridge

The precise knowledge of the single pion production cross-section of neutrino around the (approx)1 GeV energy region is an essential ingredient in the interpretation of neutrino oscillation experiments. The unique opportunities and prospects of single pion measurements at SciBooNE are described.
NTIS
Pions; Cross Sections

20090030460 Stanford Linear Accelerator Center, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Measurements of the Propagation of EM Waves through the Vacuum Chamber of the PEP-II Low Energy Ring for Beam Diagnostics
Byrd, J. M.; Pivi, M. T. F.; De Santis, S.; Jan. 23, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922594; SLAC-PUB-13093; No Copyright; Avail.: Department of Energy Information Bridge

We present the results of our measurements of the electron cloud density in the PEP-II low energy ring (LER) by propagating a TE wave into the beam pipe. By connecting a signal generator to a beam position monitor button we can excite a signal above the vacuum chamber cut-off frequency and measure its propagation through the beam pipe with a spectrum analyzer connected to another button about 50 meters away. The measurement can be performed with different beam conditions and also at different settings of the solenoids used to reduce the build up of electrons. The presence of a modulation in the TE wave transmission, synchronous with the beam revolution frequency, which appear to increase in depth when the solenoids are switched off, seem to be directly correlated to the electron cloud density in the region between the two BPM's. In this paper we present and discuss the measurements taken in the Interaction Region 12 straight of the LER during 2006 and the first part of 2007.
NTIS
Diagnosis; Electron Clouds; Vacuum Chambers; Wave Propagation

20090030461 Fermi National Accelerator Lab., Batavia, IL, USA
Start-to-End Simulations for the Proposed Fermilab High Intensity Proton Source
Carneiro, J. P.; Johnson, D.; Webber, R. C.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2008-922014; No Copyright; Avail.: National Technical Information Service (NTIS)

A High Intensity Proton Source consisting in an 8 GeV superconducting H-minus linac and transfer line to the Main Injector has been proposed. The primary mission is to increase the intensity of the Fermilab Main Injector for the production of neutrino superbeams. Start-to-end simulations from the RFQ to the stripping foil using the simulation code TRACK (ANL) is presented in this paper. In particular, we will study the impact of jitter errors on the H-minus phase space at the stripping foil.
NTIS
Particle Accelerators; Protons; Simulation

20090030462 Fermi National Accelerator Lab., Batavia, IL, USA
Capture Cavity II Results at FNAL
Branlard, J.; Chase, B.; Cancelo, G.; Carcagno, R.; Edwards, H.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2008-921992; FERMILAB-CONF-07-296-AD-CD-TD; No Copyright; Avail.: Department of Energy Information Bridge

As part of the research and development towards the International Linear Collider (ILC), several test facilities have been developed at Fermilab. This paper presents the latest Low Level RF (LLRF) results obtained with Capture Cavity II (CCII)

at the ILC Test Accelerator (ILCTA) test facility. The main focus will be on controls and RF operations using the SIMCON based LLRF system developed in DESY. Details about hardware upgrades and future work will be discussed.
NTIS
Cavities; Accelerators

20090030463 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Applications for Energy Recovering Free Electron Lasers
Neil, G. R.; Jan. 2007; 5 pp.; In English
Report No.(s): DE2008-921940; No Copyright; Avail.: National Technical Information Service (NTIS)
The availability of high-power, high-brilliance sources of tunable photons from energy-recovered Free Electron Lasers is opening up whole new fields of application of accelerators in industry. This talk will review some of the ideas that are already being put into production, and some of the newer ideas that are still under development.
NTIS
Free Electron Lasers; Accelerators

20090030464 Brookhaven National Lab., Upton, NY USA
Progress in Finite Temperature Lattice QCD
Petreczky, P.; Nov. 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921935; BNL-79634-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
The author reviews recent progress in finite temperature lattice calculations, including the determination of the transition temperature, equation of state, screening of static quarks and meson spectral functions.
NTIS
Progress; Quantum Chromodynamics

20090030494 Stanford Linear Accelerator Center, CA, USA; University of Southern California, Los Angeles, CA USA; California Univ., Los Angeles, CA, USA
Possibility of Accelerating Positron on an Electron Wake at Saber
Wang, X.; Muggli, P.; Katsouleas, T.; Ischebeck, R.; Joshi, C.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922955; SLAC-PUB-13102; No Copyright; Avail.: Department of Energy Information Bridge
A new approach for positron acceleration in non-linear plasma wakefields driven by electron beams is presented. Positrons can be produced by colliding an electron beam with a thin foil target embedded in the plasma. Integration of positron production and acceleration in one stage is realized by a single relativistic, intense electron beam. Simulations with the parameters of the proposed SABER facility at SLAC suggest that this concept could be tested there.
NTIS
Electron Beams; Electrons; Positrons; Wakes

20090030495 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Design of a VHF-Band RF Photoinjector with Megahertz Beam Repetition Rate
Stables, J. W.; Baptiste, K. M.; Corlett, J. N.; Kwiatkowski, S.; Lidia, S. M.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-923347; No Copyright; Avail.: Department of Energy Information Bridge
New generation accelerator-based X-ray light sources require high quality beams with high average brightness. Normal conducting L- and S-band photoinjectors are limited in repetition rate and D-C (photo)injectors are limited in field strength at the cathode. We propose a low frequency normal-conducting cavity, operating at 50 to 100MHz CW, to provide beam bunches of up to the cavity frequency. The photoinjector uses a re-entrant cavity structure, requiring less than 100 kW CW, with a peak wall power density less than 10 W/cm(sup 2). The cavity will support a vacuum down to 10 picoTorr, with a load-lock mechanism for easy replacement of photocathodes. The photocathode can be embedded in a magnetic field to provide correlations useful for emittance exchange. Beam dynamics simulations indicate that normalized emittances smaller than 1 mm-mrad are possible with gap voltage of 750 kV, with fields up to 20 MV/m at the photocathode, for 1 nanocoulomb

charge per bunch after acceleration and emittance compensation. Long-bunch operation (10's of picosecond) is made possible by the low cavity frequency, permitting low bunch current at the 750 kV gap voltage.
NTIS
Very High Frequencies; Electron Guns; Photocathodes; Cavities

20090030501 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Old Dominion Univ., Norfolk, VA, USA
Plasma Treatment of Bulk Nb Surface in the Ar/CI(sub2) Discharge
Raskovic, M.; Vuskovic, L.; Popovic, S.; Valente-Feliciano, A. M.; Phillips, L.; Jan. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923382; No Copyright; Avail.: National Technical Information Service (NTIS)
The preparation of the cavity walls has been one of the major challenges in the superconducting radio-frequency (SRF) accelerator technology. Therefore, constant research and development effort is devoted to develop surface preparation processes that will improve roughness and lower the level of impurities, like hydrogen or oxygen, embedded in bulk Nb, having in the same time reasonable etching rates. Plasma based surface modification provides an excellent opportunity to achieve these goals. We present Ar/Cl2 discharge treatment of bulk Nb where we achieved etching rates comparable to the rates obtained with the electropolishing method without introducing impurities in Nb. The current experiments were performed on disk shaped Nb samples, exposed to plasma produced in a microwave discharge system. Surface composition and topology measurements were carried out before and after plasma treatment. Upon determining optimal experimental conditions on disk shaped samples, we will apply the same procedure on the single cell cavities, pursuing improvement of their RF performance.
NTIS
Niobium; Plasmas (Physics)

20090030502 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Latest Results of ILC High-Gradient R&D 9-Cell Cavities at JLAB
Geng, R. L.; Afandor, R.; Crawford, A. C.; Davis, K.; Forehand, D.; Jan. 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923380; No Copyright; Avail.: National Technical Information Service (NTIS)
It has been over a year since JLAB started processing and testing ILC 9-cell cavities in the frame work of ILC high-gradient cavity R&D, aiming at the goal of a 35 MV/m gradient at a Q of 1E10 with a yield of 90%. The necessary cavity processing steps include field flatness tuning, electropolishing (EP), hydrogen out-gassing under vacuum, high-pressure water rinsing, clean room assembly, and low temperature bake. These are followed by RF test at 2 Kelvin. Ultrasonic cleaning with Micro-90, an effective post-EP rinsing recipe discovered at JLAB, is routinely used. Seven industry manufactured 9-cell TESLAshape cavities are processed and tested repeatedly. So far, 33 EP cycles are accumulated, corresponding to more than 65 hours of active EP time. An emphasis put on RF testing is to discern cavity quench characteristics, including its nature and its location. Often times, the cavity performance is limited by thermal-magnetic quench instead of field emission. The quench field in some cavities is lower than 20 MV/m and remains unchanged despite repeated EP, implying material and/or fabrication defects. The quench field in some other cavities is high but changes unpredictably after repeated EP, suggesting processing induced defects. Based on our experience and results, several areas are identified where improvement is needed to improve cavity performance as well as yield.
NTIS
Cavities; Gradients

20090030503 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Device Control Tool for CEBAF Beam Diagnostics Software
Chevtsov, P.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923377; No Copyright; Avail.: Department of Energy Information Bridge
Continuously monitoring the beam quality in the CEBAF accelerator, a variety of beam diagnostics software created at Jefferson Lab makes a significant contribution to very high availability of the machine for nuclear physics experiments. The interface between this software and beam instrumentation hardware components is provided by a device control tool, which is optimized for beam diagnostics tasks. As a part of the device/driver development framework at Jefferson Lab, this tool is

very easy to support and extend to integrate new beam instrumentation components. All device control functions are based on the configuration (ASCII text) files that completely define the used hardware interface standards (CAMAC, VME, RS-232, GPIB, etc.) and communication protocols. The paper presents the main elements of the device control tool for beam diagnostics software at Jefferson Lab.
NTIS
Diagnosis; Linear Accelerators

20090030504 Brookhaven National Lab., Upton, NY USA
Superconducting Magnet Needs for the ILC
Tompkins, J. C.; Kashikhin, V. I.; Parker, B.; Palmer, M. A.; Clarke, J. A.; Jan. 17, 2008; 7 pp.; In English
Report No.(s): DE2008-923371; BNL-79792-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge
The ILC Reference Design Report was completed early in February 2007. The Magnet Systems Group was formed to translate magnetic field requirements into magnet designs and cost estimates for the Reference Design. As presently configured, the lLC will have more than 13,000 magnetic elements of which more than 2300 will be based on superconducting technology. This paper will describe the major superconducting magnet needs for the ILC as presently determined by the Area Systems Groups, responsible for beam line design, working with the Magnet Systems Group. The superconducting magnet components include Main Linac quadrupoles, Positron Source undulators, Damping Ring wigglers, a complex array of Final Focus superconducting elements in the Beam Delivery System, and large superconducting solenoids in the e(sup +) and e(sup -) Sources, and the Ring to Main Linac lines.
NTIS
Superconducting Magnets; Linear Accelerators

20090030539 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Review of High Field Q Slope, Cavity Measurements
Ciovati, G.; Jan. 23, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922261; JLAB-ACC-07-777; DOE/OR23177-0280; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Cavities; Q Factors; Superconductivity

20090030548 Stanford Linear Accelerator Center, CA, USA; Argonne National Lab., IL USA
Instrument Design for the Accurate Determination of the Electron Beam Location in the Linac Coherent Light Source Undulator
Morgan, J. W.; Bailey, J. L.; Capatina, D.; Nuhn, H. D.; Jan. 23, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922593; SLAC-PUB-13068; No Copyright; Avail.: Department of Energy Information Bridge
The Linac Coherent Light Source (LCLS), currently under design, requires accurate alignment between the electron beam and each undulator's magnetic centerline. A beam finder wire (BFW) instrument has been developed to provide beam location information that is used to move the undulators to their appropriate positions. A BFW instrument is mounted at each of the 33 magnets in the undulator section. Beam detection is achieved by electrons impacting two carbon fiber wires and then sensing the downstream radiation. The wires are mounted vertically and horizontally on a wire card similar to that of a traditional wire scanner instrument. The development of the BFW presents several design challenges due to the need for high accuracy of the wires locations and the need for removal of the wires during actual operation of the LCLS (30 microns repeatability is required for the wire locations). In this paper, we present the technical specification, design criteria, mechanical design, and results from prototype tests for the BFW.
NTIS
Coherent Light; Electron Beams; Light Sources; Linear Accelerators; Beam Steering

20090030550 Stanford Linear Accelerator Center, CA, USA; Argonne National Lab., IL, USA
Design and Performance of the LCLS Cavity BPM System
Walters, D. R.; Straumann, T.; Norum, W. E.; Smith, S.; Morrison, L. H.; Jan. 23, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922592; SLAC-PUB-13067; No Copyright; Avail.: National Technical Information Service (NTIS)
In this paper we present the design of the beam position monitor (BPM) system for the LCLS undulator, which features

a high-resolution X-band cavity BPM. Each BPM has a TM(sub 010) monopole reference cavity and a TM(sub 110) dipole cavity designed to operate at a center frequency of 11.384 GHz. The signal processing electronics features a low noise single-stage three-channel heterodyne receiver that has selectable gain and a phase locking local oscillator. We will discuss the system specifications, design, and prototype test results.
NTIS
Beams (Radiation); Cavities; Coherent Light; Light Sources; Linear Accelerators

20090030551 Stanford Linear Accelerator Center, CA, USA; Durham Univ., UK; Louvain Univ., Belgium; Fermi National Accelerator Lab., Batavia, IL, USA
Les Houches Interface for BSM Generators
Alwall, J.; Richardson, P.; Dukdo, L.; Skands, P.; Boos, E.; Jan. 23, 2008; 4 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922591; SLAC-PUB-13087; No Copyright; Avail.: Department of Energy Information Bridge
We propose to combine and slightly extend two existing Les Houches Accords to provide a simple generic interface between beyond the standard model parton-level and event-level generators. All relevant information particle content, quantum numbers of new states, masses, cross sections, parton level events, etc is collected in one single file, which adheres to the Les Houches Event File (LHEF) standard.
NTIS
Data Structures; Standard Model (Particle Physics)

20090030552 Stanford Linear Accelerator Center, CA, USA
Electron Bypass Line (EBL) Design: Electrons to A-line bypassing LCLS
Fieguth, T. A. R.; Jan. 23, 2008; 19 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922589; SLAC-TN-08-001; No Copyright; Avail.: Department of Energy Information Bridge
Forty one years ago, September 20, 1966, the first beam entered End Station A, passed on through, and was terminated in Beam Dump East. This beam had an energy of 18.4 GeV, a record for the time. Since then, the SLAC ESA has been a mainstay facility for many high-energy physics and test beam experiments involving countless hours of data taking. Heretofore, it was assumed that with the completion and commissioning of the LCLS facility, beams from the main injector would no longer be available to this well equipped experimental facility. Fortunately, it has become clear that a bypass beamline design calling for modest modifications and using existing, soon to be surplus, components will enable continued utilization of this important facility.
NTIS
Coherent Light; Electrons; Light Sources; Linear Accelerators; Electron Beams

20090030563 Imperial Coll. of London, London, UK
Search for Supersymmetric Neutral Higgs Bosons at the Tevatron
Scanlon, T.; January 2007; 4 pp.; In English
Report No.(s): DE2008-922306; No Copyright; Avail.: National Technical Information Service (NTIS)
Recent preliminary results obtained by the CDF and D0 Collaborations on searches for Higgs bosons beyond the Standard Model at Run II of the Tevatron are discussed. The data, corresponding to integrated luminosities of up to 1 fb(sup -1), are compared to theoretical expectations. No significant excess of signal above the expected background is observed in any of the various final states examined, and so limits at 95% Confidence Level (CL) are presented.
NTIS
Higgs Bosons; Particle Accelerators; Supersymmetry

20090030566 Fermi National Accelerator Lab., Batavia, IL, USA; Illinois Univ., Urbana-Champaign, IL, USA
Prospects for a Low-Mass Higgs Boson
Junk, T. R.; Jan. 01, 2007; 9 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922302; FERMILAB-CONF-07-636-E; No Copyright; Avail.: Department of Energy Information Bridge
The SU(2)(sub L) x U(1)(sub Y) gauge theory of the electroweak interactions has enjoyed tremendous success over the

past four decades, accurately predicting, or at least accommodating, all high-energy collider data. The gauge group must be broken somehow to U(1)(sub EM), because the unbroken theory predicts massless gauge bosons and massless fermions. The Standard Model incorporates a minimal Higgs sector with a single complex doublet field, to break the symmetry spontaneously, but it is not the only possibility. SUSY Higgses, general two-Higgs-doublet models, and other ideas may prove to model nature better than the minimal model. Many of these models, and even the SM, prefer a light Higgs boson, with a mass between the LEP limit of 114.4 GeV and 200 GeV. The Constrained MSSM favors masses under 120 GeV. A survey of the experimental work so far at LEP and the Tevatron, with estimations of the sensitivity of the upcoming LHC experiments is provided.
NTIS
Higgs Bosons; Mass

20090030600 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 69, Number 2, August 1928
Arthur, Robert; Whelchel, James L; Aug 1928; 93 pp.; In English
Report No.(s): AD-A502552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: Signal Service in the Theater of Operations, by Major General G. S. Gibbs; The Tactical Handling of A.A. Units in the Field, by Captain K. M. Loch, M.C., R.A.; Recent Developments in Antiaircraft Artillery, by Lieutenant Colonel W. S. Bowen, C.A.C.; Industrial Preparedness for War, by Major W. P. Cherrington, C.A.C.; The Military Situation of China, by Lieutenant J. H. Featherston, C.A.C.; and Movement of 14-Inch Railway Gun from Aberdeen Proving Ground to Fort MacArthur, by Lieutenant R. A. Knapp, C.A.C. The remainder of the issue contains the following features: Professional Notes on Coat of Arms of the Harbor Defenses of the Delaware, Deflection Calipers for the 155-mm Gun, Coast Artillery Resumes Training Under New Rules, Antiaircraft Exercise Program, Names of British and American Warships, Italian Naval Construction, New German Cruiser, Training a Reserve, The Anti-War Treaty, More Than a Fighting Machine, Making a Modern Army, Laws Endanger Liberty, The Destructive Battle, Foreign Periodicals, Military Libraries and Book Supplies in France and Poland, An Impressive Memorial Service in Bulgaria, A Serious Question to Consider, and Medical Advice by Radio; and book reviews.
DTIC
Air Defense; Artillery; China; Coasts; Guns (Ordnance); Industrial Management; Rail Transportation; Signal Processing

20090030664 College of William and Mary, Gloucester Point, VA, USA
Understanding the Impact of Surface Waves on Microwave Water Level Measurements
Heitsenrether, Robert M.; Bushnell, Mark H.; Boon, John D.; Sep 2008; 9 pp.; In English; MTS/IEEE Oceans 2008 Conference and Exhibition, 15-18 Sept. 2008, Quebec City, Canada; Original contains color illustrations
Report No.(s): AD-A502241; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502241

The National Oceanic and Atmospheric Administration (NOAA) Center for Operational Oceanographic Products (CO-OPS) has been conducting a series of tests of several different types Microwave Water Level (MWWL) sensors in order to gain an understanding of sensor functions and performance capabilities and to assess the suitability for incorporation of these sensors into the NOAA National Water Level Observation Network (NWLON). On March 5-6, 2008, one particular laboratory test of four different microwave sensors was conducted with the following objectives: 1) determine the impact of surface gravity waves on the accuracy of measured water level and 2) collect a data set that can be used to develop techniques for removing high frequency surface wave induced noise from long term microwave water level records. The two day test was conducted at the Naval Surface Warfare Center (NSWC) Maneuvering and Sea Keeping Basin (MASK) in Carderock, Maryland. This facility includes a 110 m long, 73 m wide, 6.1 m deep indoor tank, with the capability to generate controlled, multi-directional surface waves. During the test, the four sensors measured water level in the tank from above, at four different sensor-to-water ranges, 3, 5, 7, and 9 meters. At each measurement height, a range of different surface wave conditions were generated in the tank, including regular controlled wavelength waves as well as irregular waves, simulating real ocean conditions. Results indicate that in some cases, continuously generated uniform wavelength waves caused offsets in measured water level for all sensors, and these offsets depend on the ratio between the width of the sensor footprint on the water surface and dominant wavelength of surface waves present. The impact of surface waves on measured water level varied across different sensors, due to different filtering and range tracking algorithms employed. Results will be used to gain a better understanding of sensors' processing capabilities.
DTIC
Altimeters; Microwave Equipment; Microwave Sensors; Microwaves; Ocean Surface; Surface Waves; Water

20090030676 Stanford Linear Accelerator Center, CA, USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Transverse Effects Due to Random Displacement of Resistive Wall Segments and Focusing Elements

Wu, J.; Delayen, J. B.; Jan. 08, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922225; SLAC-PUB-13069; No Copyright; Avail.: Department of Energy Information Bridge

In this paper, we study the single bunch transverse beam dynamics in the presence of random displacements of resistive wall segments and focusing elements. Analytical formulas are obtained for long-range resistive wall wake, together with numerical results for short-range resistive wall wake. The results are applied to the LCLS project and some other proposed accelerators.

NTIS

Displacement; Walls

20090030677 Brookhaven National Lab., Upton, NY USA

Thermal Emittance Measurement Design for Diamond Secondary Emission

Wu, Q.; Zvi, B.; Burrill, A.; Chang, X.; Kayran, D.; Jun. 2007; 5 pp.; In English; 22nd Particle Accelerator Conference (PAC), Albuquerque, New Mexico, June 25-29, 2007, 25-27 Jun. 2007, Albuquerque, NM, USA

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2008-921914; BNL-79233-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

Thermal emittance is a very important characteristic of cathodes. A carefully designed method of measuring the thermal emittance of secondary emission from diamond is presented. Comparison of possible schemes is carried out by simulation, and the most accessible and accurate method and values are chosen. Systematic errors can be controlled and maintained at small values, and are carefully evaluated. Aberration and limitations of all equipment are taken into account.

NTIS

Diamonds; Emittance; Secondary Emission; Thermal Emission

20090030678 Rochester Univ., NY, USA

Error-Induced Beam Degradation in Fermilab's Accelerators

Yoon, S. Y. P.; January 2008; 241 pp.; In English

Report No.(s): DE2008-921701; No Copyright; Avail.: National Technical Information Service (NTIS)

In Part I, three independent models of Fermilab's Booster synchrotron are presented. All three models are constructed to investigate and explore the effects of unavoidable machine errors on a proton beam under the influence of space-charge effects. The first is a stochastic noise model. Electric current fluctuations arising from power supplies are ubiquitous and unavoidable and are a source of instabilities in accelerators of all types. A new noise module for generating the Ornstein-Uhlenbeck (O-U) stochastic noise is first created and incorporated into the existing Object-oriented Ring Beam Injection and Tracking (ORBIT-FNAL) package. After being convinced with a preliminary model that the noise, particularly non-white noise, does matter to beam quality, we proceeded to measure directly current ripples and common-mode voltages from all four Gradient Magnet Power Supplies (GMPS). Then, the current signals are Fourier-analyzed. Based upon the power spectra of current signals, we tune up the Ornstein-Uhlnbeck noise model. As a result, we are able to closely match the frequency spectra between current measurements and the modeled O-U stochastic noise. The stochastic noise modeled upon measurements is applied to the Booster beam in the presence of the full space-charge effects. This noise model, accompanied by a suite of beam diagnostic calculations, manifests that the stochastic noise, impinging upon the beam and coupled to the space-charge effects, can substantially enhance the beam degradation process throughout the injection period. The second model is a magnet misalignment model. It is the first time to utilize the latest beamline survey data for building a magnet-by-magnet misalignment model. Given as-found survey fiducial coordinates, we calculate all types of magnet alignment errors (station error, pitch, yaw, roll, twists, etc.) are implemented in the model. We then follow up with statistical analysis to understand how each type of alignment errors are currently distributed around the Booster ring. The ORBIT-FNAL simulations with space charge included show that rolled magnets, in particular, have substantial effects on the Booster beam. This survey-data-based misalignment model can predict how much improvement in machine performance can be achieved if prioritized or selected realignment work is done.

NTIS

Beam Injection; Degradation; Errors; Particle Accelerators

20090030679 Stanford Linear Accelerator Center, CA, USA
Simulation Studies on the Vertical Emittance Growth at the Existing ATF Extraction Beamline
Zhou, F.; Amann, J.; Selestiky, S.; Woodley, M.; Dec. 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-921291; No Copyright; Avail.: National Technical Information Service (NTIS)

Significant dependence of the vertical emittance growth on the beam intensity was experimentally observed at the ATF/KEK extraction beamline. This technical note describes the simulations of possible vertical emittance growth sources, particularly in the extraction channel, where the magnets are shared by both the ATF extraction beamline and its damping ring. The vertical emittance growth is observed in the simulations by changing the beam orbit in the extraction channel even with all optics corrections. The possible reasons for the experimentally observed dependence of the vertical emittance growth on the beam intensity are discussed. An experiment to measure the emittance vs beam orbit at the existing ATF extraction beamline is proposed.
NTIS
Emittance; Extraction; Particle Accelerators; Simulation

20090030688 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Modeling and Simulation of Longitudinal Dynamics for LER-HER PEP II Rings
Rivetta, C.; Mastorides, T.; Fox, J. D.; Teytelman, D.; Van Winkle, D.; Feb. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-900593; SALC-PUB-12375; No Copyright; Avail.: National Technical Information Service (NTIS)

A time domain modeling and simulation tool for beam-cavity interactions in LER and HER rings at PEP II are presented. The motivation for this tool is to explore the stability margins and performance limits of PEP II RF systems at higher currents and upgraded RF configurations. It also serves as test bed for new control algorithms and can define the ultimate limits of the architecture. The time domain program captures the dynamical behavior of the beam-cavity interaction based on a reduced model. The ring current is represented by macro-bunches. Multiple RF station in the ring are represented via one or two macro-cavities. Each macro-cavity captures the overall behavior of all the 2 or 4 cavity RF station. Station models include nonlinear elements in the klystron and signal processing. This allows modeling the principal longitudinal impedance control loops interacting with the longitudinal beam model. Validation of simulation tool is in progress by comparing the measured growth rates for both LER and HER rings with simulation results. The simulated behavior of both machines at high currents are presented comparing different control strategies and the effect of non-linear klystrons in the growth rates.
NTIS
Particle Accelerators; Simulation; Storage Rings (Particle Accelerators)

20090030690 Stanford Linear Accelerator Center, CA, USA; Milan Univ., Italy
Measurements of Branching Fraction and CP Violation inB Meson Rare Decays to Final States Containing eta or eta' Mesons in the BaBar Experiment at SLAC
Lazzaro, A.; Jul. 17, 2007; 383 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922605; SLAC-R-862; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis has been realized in the BABAR experiment, running on the PEP-II e+e. collider at the Stanford Linear Accelerator Center (SLAC), USA. The main goal of the experiment is the study of the CP violation in the B meson system. The CP violation has a central role in the particle physics since his discovery in 1964. Previously, the observation of the parity violation in the 1950s marks the inception of the discovery of the symmetry-violating properties in weak interaction. In 1956, Lee and Yang showed that parity conservation, while well-tested in strong and electromagnetic interactions, was not experimentally constrained for weak interactions, and proposed a list of experimental tests. C. S. Wu and collaborators performed one of these experiments, and showed that parity was not conserved in nuclear a decay, conclusively demonstrating the uniqueness of the weak interaction among the forces. However the CP transformation was still considered valid. The discovery, eight years later, of the decay of the neutral kaon meson with long lifetime in two pions by Christenson, Cronin, Fitch and Turlay establishes the CP violation in the weak interaction. In 1973 (almost 10 years later), Kobayashi e Maskawa suggested a generalization of the quark mixing matrix, introduced by Cabibbo, where the CP violation in the neutral kaons can be explained using a model with three families of quarks and leptons (this happened a year before even the charm quark was discovered). The quarks of the third family, called b per bottom (or beauty) and t per top, were discovered in 1977 and in 1994, respectively. More than 30 years of experimental researches in the kaon system has yielded only in 1999 the observation of direct CP violation. All measurements are consistent with the Standard Model (SM) description given by

Cabibbo, Kobayashi, Maskawa (CKM) quark-mixing matrix. However, the smallness of the CP violating effects in the kaon system is an impediment to progress in that sector. The present and the future to constraint the CKM scenario (or to find effects beyond the SM) is in general given by the decays with b quark.
NTIS
Eta-Mesons; Linear Accelerators; Mesons; Particle Decay

20090030702 National Inst. of Standards and Technology, Gaithersburg, MD USA
NCMC (NIST Combinatorial Methods Center) Workshop Report NCMC-9: Combinatorial Methods for Nanostructured Materials. Held in Gaithersburg, MD. on April 24-25, 2006
Fasolka, M. J.; Laumeier, C. E.; Jul. 2006; 15 pp.; In English; NCMC (NIST Combinatorial Methods Center) Workshop Report NCMC-9: Combinatorial Methods for Nanostructured Materials., April 24 - 25, 2006, Gaithersburg, MD.
Report No.(s): PB2008-108827; NISTIR-7332; No Copyright; Avail.: CASI: A03, Hardcopy

Traditionally, industrial producers of semiconductors, microelectronics, catalysts, and biotechnology have been considered the commercial stakeholders of nanotechnology and nanostructured materials. However, recent years have seen a new focus on nanostructured materials by industries involved in a growing set of commercial goods, including personal care products and cosmetics, advanced coatings and paints, automotive components, structural plastics, and adhesives. A part of this new focus might be considered a redefinition of terms, driven by an exciting, well publicized technological theme. Nevertheless, the fact is that the materials and chemical industries are striving to incorporate nanostructured materials into more of their products, and this is because nanostructured components promise (and sometimes realize) radically improved properties and performance. In this respect, an explicit connection of this expanded set of goods with nanotechnology is essential, since it provides the appropriate conceptual, scientific, and metrology frameworks for the design, characterization, and manufacture of these innovative products. NCMC-9: Combinatorial Methods for Nanostructured Materials was a forum to examine the application and development of nanostructured materials by industry, with a focus on polymeric products, such as films, coatings and paints, adhesives, and personal care products. NCMC-9 had two main goals: 1. To examine key measurement needs in industrial development and application of nanostructured polymer materials; and 2. To arrive at priorities for the development of combinatorial and high-throughput measurement methods for nanostructured polymer materials.
NTIS
Combinatorial Analysis; Nanotechnology

20090030704 Stanford Linear Accelerator Center, CA, USA
Measurement of the Left-Right Cross Section Asymmetry in Z Boson Production in e+e- Collisions
Dubois, R.; Jan. 2009; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922948; SLAC-PUB-13113; No Copyright; Avail.: Department of Energy Information Bridge

The SLC luminosity improved by a factor of two due mostly to the use of at beams; the polarization improved by slightly less than a factor of three, due to the use of strained lattice photocathodes.
NTIS
Asymmetry; Bosons; Collisions

20090030706 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Electron-Cloud Build-up: Summary
Furman, M. A.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-922826; No Copyright; Avail.: Department of Energy Information Bridge

I present a summary of topics relevant to the electron-cloud build-up and dissipation that were presented at the International Workshop on Electron-Cloud Effects 'ECLOUD 07' (Daegu, S. Korea, April 9-12, 2007).
NTIS
Electron Beams; Electron Clouds

20090030716 Brookhaven National Lab., Upton, NY, USA
From Hera to Future Electron-Ion Colliders
Ptitsyn, V.; Jun. 25, 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913085; BNL--77550-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

An overview of the proposals of new electron-ion colliders--e-RHIC at BNL, EIC at JLab and LHeC at CERN--in the light of experience with HERA is presented.
NTIS
Electrons; Ionic Collisions

20090030725 Geological Survey, Reston, VA USA
Geophysical Delineation of the Freshwater/Saline-Water Transition Zone in the Barton Springs Segment of the Edwards Aquifer, Travis and Hays Counties, Texas, September 2006
Payne, J. B.; Kress, W. H.; Shah, S. D.; Stefanov, J. E.; Smith, B. A.; Jan. 2007; 31 pp.; In English
Report No.(s): PB2008-108357; USGS/SIR-2007-5244; No Copyright; Avail.: National Technical Information Service (NTIS)

During September 2006, the U.S. Geological Survey, in cooperation with the Barton Springs/Edwards Aquifer Conservation District, conducted a geophysical pilot study to determine whether time-domain electromagnetic (TDEM) sounding could be used to delineate the freshwater/saline-water transition zone in the Barton Springs segment of the Edwards aquifer in Travis and Hays Counties, Texas. There was uncertainty regarding the application of TDEM sounding for this purpose because of the depth of the aquifer (200-500 feet to the top of the aquifer) and the relatively low-resistivity clayey units in the upper confining unit. Twenty-five TDEM soundings were made along four 23-mile-long profiles in a study area overlying the transition zone near the Travis-Hays County boundary. The soundings yield measurements of subsurface electrical resistivity, the variations in which were correlated with hydrogeologic and stratigraphic units, and then with dissolved solids concentrations in the aquifer. Geonics Protem 47 and 57 systems with 492-foot and 328-foot transmitter-loop sizes were used to collect the TDEM soundings. A smooth model (vertical delineation of calculated apparent resistivity that represents an estimate (non-unique) of the true resistivity) for each sounding site was created using an iterative software program for inverse modeling. The effectiveness of using TDEM soundings to delineate the transition zone was indicated by comparing the distribution of resistivity in the aquifer with the distribution of dissolved solids concentrations in the aquifer along the profiles. TDEM sounding data show that, in general, the Edwards aquifer in the study area is characterized by a sharp change in resistivity from west to east. The western part of the Edwards aquifer in the study area shows higher resistivity than the eastern part. The higher resistivity regions correspond to lower dissolved solids concentrations (freshwater), and the lower resistivity regions correspond to higher dissolved solids concentrations (saline water). On the basis of reasonably close matches between the inferred locations of the freshwater/saline-water transition zone in the Edwards aquifer in the study area from resistivities and from dissolved solids concentrations in three of the four profiles, TDEM sounding appears to be a suitable tool for delineating the transition zone.
NTIS
Aquifers; Delineation; Fresh Water; Geological Surveys; Geophysics; Water

20090030731 Brookhaven National Lab., Upton, NY, USA
Emittance Growth Due to Beam-Beam Effect in RHIC
Beebe-Wang, J.; Jun. 25, 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913083; BNL--77507-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The beam-beam interaction has a significant impact on the beam emittance growth and the luminosity lifetime in RHIC. A simulation study of the emittance growth was performed using the LIFETRAC code. The operational conditions of RHIC 2006 100GeV polarized proton run were used in the study. In this paper, the result of this study is presented and compared to the experimental measurements.
NTIS
Beam Interactions; Emittance

20090030733 Brookhaven National Lab., Upton, NY, USA
Universal Features of QCD Dynamics in Hadrons and Nuclei at High Energies
Venugopalan, R.; Apr. 16, 2007; 16 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913077; BNL--79191-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

We discuss the empirical evidence for a universal Color Glass Condensate and outline prospects for further studies at future colliders. Some ramifications for initial conditions in heavy ion collisions are pointed out.
NTIS
Hadrons; Quantum Chromodynamics

20090030734 Brookhaven National Lab., Upton, NY, USA
Hadron Multiplicities at the LHC
Kharzeev, D.; Levin, E.; Nardi, M.; May 14, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913076; BNL--79190-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We present the predictions for hadron multiplicities in pp, pA and AA collisions at the LHC based on our approach to the Color Glass Condensate.
NTIS
Hadrons; Particle Collisions

20090030735 Brookhaven National Lab., Upton, NY USA; Brookhaven National Lab., Upton, NY, USA
Proceedings from Riken-BNL Research Center Workshop: Parity-Violating Spin Asymmetries at RHIC
Surrow, B.; Vogelsang, W.; Perdeknmp, M.; Apr. 26, 2007; 130 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913072; BNL--79146-2007; No Copyright; Avail.: Department of Energy Information Bridge

The RHIC spin program is now fully underway. Several runs have been successfully completed and are producing exciting first results. Luminosity and polarization have improved remarkably and promising advances toward the higher RHIC energy of (radical)s = 500 GeV have been made. At this energy in particular, it will become possible to perform measurements of parity-violating spin asymmetries. Parity violation occurs in weak interactions, and in combination with the unique polarization capabilities at RHIC fascinating new opportunities arise. In particular, parity-violating single- and double-spin asymmetries give new insights into nucleon structure by allowing probes of up and down sea and anti-quark polarizations. Such measurements at RHIC are a DOE performance milestone for the year 2013 and are also supported by a very large effort from RIKEN. With transverse polarization, charged-current interactions may be sensitive to the Sivers effect. Parity-violating effects at RHIC have been proposed even as probes of physics beyond the Standard Model. With the era of measurements of parity-violating spin asymmetries at RHIC now rapidly approaching, we had proposed a small workshop that would bring together the main experts in both theory and experiment.
NTIS
Asymmetry; Conferences; Parity

20090030739 Brookhaven National Lab., Upton, NY USA
Recent Progress on the Diamond Amplified Photo-Cathode Experiment
Chang, X.; Ben-Zvi, I.; Burrill, A.; Grimes, J.; Rao, T.; Jun. 2007; 5 pp.; In English; Particle Accelerator Conference (PAC), 25-29 Jun. 2007, Albuquerque, NM, USA
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921915; BNL-79293-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We report recent progress on the Diamond Amplified Photo-cathode (DAP). The use of a pulsed electron gun provides detailed information about the DAP physics. The secondary electron gain has been measured under various electric fields. We have achieved gains of a few hundred in the transmission mode and observed evidence of emission of electrons from the surface. A model based on recombination of electrons and holes during generation well describes the field dependence of the gain. The emittance measurement system for the DAP has been designed, constructed and is ready for use. The capsule design of the DAP is also being studied in parallel.
NTIS
Cathodes; Diamonds; Photocathodes; Accelerators

20090030740 Stanford Linear Accelerator Center, CA, USA
Coherent Synchrotron Radiation and Space Charge for a 1-D Bunch on an Arbitrary Planar Orbit
Warnock, R. L.; Jan. 08, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922223; SLAC-PUB-13071; No Copyright; Avail.: Department of Energy Information Bridge

Realistic modeling of coherent synchrotron radiation (CSR) and the space charge force in single-pass systems and rings usually requires at least a two-dimensional (2- D) description of the charge/current density of the bunch. Since that leads to costly computations, one often resorts to a 1-D model of the bunch for first explorations. This paper provides several improvements to previous 1-D theories, eliminating unnecessary approximations and physical restrictions.
NTIS
Coherent Radiation; Space Charge; Synchrotron Radiation

20090030741 Stanford Linear Accelerator Center, CA, USA; Colorado State Univ., Fort Collins, CO, USA
Charmonium Spectroscopy at Babar
Mokhtar, A. G.; January 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922205; SLAC/PUB-13078; No Copyright; Avail.: National Technical Information Service (NTIS)

The charmonium-like states, Y(4260), Y(4350), produced via initial state radiation, as well as the X(3872), and Y(3940), produced in B meson decays from the BABAR B-factory are reviewed. These mesons do not seem consistent with conventional charmonium models, and several alternate hypotheses have been proposed to explain these new discoveries.
NTIS
Charm (Particle Physics); Mesons; Spectroscopy

20090030742 Fermi National Accelerator Lab., Batavia, IL, USA
Optimization of the Helical Orbits in the Tevatron
Alexahin, Y.; Jan. 2007; 3 pp.; In English
Report No.(s): DE2008-922064; FERMILAB-CONF-07/288-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

To avoid multiple head-on collisions the proton and antiproton beams in the Tevatron move along separate helical orbits created by 7 horizontal and 8 vertical electrostatic separators. Still the residual long-range beam-beam interactions can adversely affect particle motion at all stages from injection to collision. With increased intensity of the beams it became necessary to modify the orbits in order to mitigate the beam-beam effect on both antiprotons and protons. This report summarizes the work done on optimization of the Tevatron helical orbits, outlines the applied criteria and presents the achieved results.
NTIS
Particle Accelerators; Optimization

20090030743 Fermi National Accelerator Lab., Batavia, IL, USA; Deutsches Elektronen-Synchrotron, Hamburg, Germany; Stanford Linear Accelerator Center, CA, USA
Investigations of the Wideband Spectrum of Higher Order Modes Measures on TESLA-style Cavities at the FLASH Linac
Molloy, S.; Adolphsen, C.; Bane, K.; Frisch, J.; Li, Z.; Jan. 2007; 3 pp.; In English
Report No.(s): DE2008-922048; FERMILAB-CONF-07/701-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Higher Order Modes (HOMs) excited by the passage of the beam through an accelerating cavity depend on the properties of both the cavity and the beam. It is possible, therefore, to draw conclusions on the inner geometry of the cavities based on observations of the properties of the HOM spectrum. A data acquisition system based on two 20 GS/s, 6 GHz scopes has been set up at the FLASH facility, DESY, in order to measure a significant fraction of the HOM spectrum predicted to be generated by the TESLA cavities used for the acceleration of its beam. The HOMs from a particular cavity at FLASH were measured under a range of known beam conditions. The dipole modes have been identified in the data. The properties of these were

compared with the results obtained from 3D simulations of a perfect cavity, as well as simulations of cavities with realistic imperfections, in order to ascertain the influence of geometry perturbations on the rf properties of the cavity.
NTIS
Broadband; Cavities; Linear Accelerators; Superconducting Cavity Resonators

20090030744 Fermi National Accelerator Lab., Batavia, IL, USA
Recent Progress in a Beam-Beam Simulation Code for Circular Hadron Machines
Kabel, A.; Fischer, W.; Sen, T.; Sep. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922018; FERMILAB-CONF-07-47-APC; SLAC/PUB-12792; No Copyright; Avail.: Department of Energy Information Bridge

While conventional tracking codes can readily provide higher-order optical quantities and give an estimate of dynamic apertures, they are unable to provide directly measurable quantities such as lifetimes and loss rates. The particle tracking framework Plibb aims at modeling a storage ring with sufficient accuracy and a sufficiently high number of turns and in the presence of beam-beam interactions to allow for an estimate of these quantities. We provide a description of new features of the codes; we also describe a novel method of treating chromaticity in ring sections in a symplectic fashion.
NTIS
Beam Interactions; Computerized Simulation; Hadrons; Progress

20090030745 Brookhaven National Lab., Upton, NY USA
High Performance EBIS for RHIC
Alessi, J.; Beebe, E.; Gould, O.; Kponou, A.; Lockey, R.; Jun. 2007; 5 pp.; In English; 22nd Particle Accelerator Conference (PAC0, 25-29 Jun. 2007, Albuquerque, NM, USA
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921933; BNL-79626-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

An Electron Beam Ion Source (EBIS), capable of producing high charge states and high beam currents of any heavy ion species in short pulses, is ideally suited for injection into a synchrotron. An EBIS-based, high current, heavy ion preinjector is now being built at Brookhaven to provide increased capabilities for the Relativistic Heavy Ion Collider (RHIC), and the NASA Space Radiation Laboratory (NSRL). Benefits of the new preinjector include the ability to produce ions of any species, fast switching between species to serve the simultaneous needs of multiple programs, and lower operating and maintenance costs. A state-of-the-art EBIS, operating with an electron beam current of up to 10 A, and producing multi-milliamperes of high charge state heavy ions, has been developed at Brookhaven, and has been operating very successfully on a test bench for several years. The present performance of this high-current EBIS is presented, along with details of the design of the scaled-up EBIS for RHIC, and the status of its construction. Other aspects of the project, including design and construction of the heavy ion RFQ, Linac, and matching beamlines, are also mentioned.
NTIS
Electron Beams; Ion Beams; Ion Sources

20090030746 Brookhaven National Lab., Upton, NY USA
Prospects for Acceleration of Deutrons and Helions
MacKay, W. W.; Nov. 2007; 10 pp.; In English; 12th International Workshop on Polarized Sources, Targets, and Polarimetry, 10-14 Spe. 2007, Upton, NY, USA
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921930; BNL-79623-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In order to study the spin structure of the neutron at high energy, a beam rich in polarized neutrons needs to be developed. The neutron has no charge and cannot be accelerated, so either deuterons or helions must be considered. When it comes to spin manipulation and stability of the polarization in a circular accelerator, it is the anomalous part of the magnetic moment which is important. If the anomaly is too small, then manipulation becomes difficult as in the case of deuterons--spin rotators and Siberian snakes become ineffective. (sup 3)He nuclei appear to be the easiest choice for a polarized neutron beam. In this paper the author discusses the prospects for both helions and deuterons as polarized beams in RHIC or in an electron-ion collider.
NTIS
Electron Spin; Acceleration (Physics); Helium Isotopes; Spin Dynamics

20090030749 Brookhaven National Lab., Upton, NY USA

Design and Performance of the Matching Beamline Between the BNL EBIS and an RFQ

Alessi, J.; Beebe, E.; Brodowski, J.; Kponou, A.; Okamura, M.; Jun. 2007; 5 pp.; In English; 2lst Particle Accelerator Conference (PAC), 25-29 Jun. 2007, Albuquerque, Nm, USA

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2008-921917; BNL-79428-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A part of a new EBIS-based heavy ion preinjector, the low energy beam transport (LEBT) section between the high current EBIS and the RFQ is a challenging design, because it must serve many functions. In addition to the requirement to provide an efficient matching between the EBIS and the RFQ, this line must serve as a fast 'switchyard', allowing singly charged ions from external sources to be transported into the EBIS trap region, and extracted, highly charged ions to be deflected to off-axis diagnostics (time-of-flight or emittance). The space charge of the 5-10 mA extracted heavy ion beam is a major consideration in the design, and the space charge force varies for different ion beams having Q/m from 1-0.16. The line includes electrostatic lenses, spherical and parallel-plate deflectors, magnetic solenoid, and diagnostics for measuring current, charge state distributions, emittance, and profile. A prototype of this beamline has been built, and results of tests are presented.

NTIS

Beam Injection; Ion Beams; Particle Accelerators

20090030763 Stanford Linear Accelerator Center, CA, USA

Parametric Modeling of Transverse Phase Space of an RF Photoinjector

Hartman, E.; Paterson, E.; Lui, P.; Hartman, M. J.; Schweiger, C. A.; Jan. 24, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922595; SLAC-PUB-13095; No Copyright; Avail.: Department of Energy Information Bridge

High brightness electron beam sources such as rf photo-injectors as proposed for SASE FELs must consistently produce the desired beam quality. We report the results of a study in which a combined neural network (NN) and first-principles (FP) model is used to model the transverse phase space of the beam as a function of quadrupole strength, while beam charge, solenoid field, accelerator gradient, and linac voltage and phase are kept constant. The parametric transport matrix between the exit of the linac section and the spectrometer screen constitutes the FP component of the combined model. The NN block provides the parameters of the transport matrix as functions of quad current. Using real data from SLAC Gun Test Facility, we will highlight the significance of the constrained training of the NN block and show that the phase space of the beam is accurately modeled by the combined NN and FP model, while variations of beam matrix parameters with the quad current are correctly captured. We plan to extend the combined model in the future to capture the effects of variations in beam charge, solenoid field, and accelerator voltage and phase.

NTIS

Brightness; Electron Beams; Injectors; Radio Frequencies

20090030764 Stanford Linear Accelerator Center, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Brookhaven National Lab., Upton, NY USA

Modeling Incoherent Electron Cloud Effects

Raubenheimer, T. O.; Vay, J.; Tomas, R.; Pivi, M. T. F.; Zimmermann, F.; Jan. 24, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922596; SLAC-PUB-13086; No Copyright; Avail.: National Technical Information Service (NTIS)

Incoherent electron effects could seriously limit the beam lifetime in proton or ion storage rings, such as LHC, SPS, or RHIC, or blow up the vertical emittance of positron beams, e.g., at the B factories or in linear-collider damping rings. Different approaches to modeling these effects each have their own merits and drawbacks. We describe several simulation codes which simplify the descriptions of the beam-electron interaction and of the accelerator structure in various different ways, and present results for a toy model of the SPS. In addition, we present evidence that for positron beams the interplay of incoherent electron-cloud effects and synchrotron radiation can lead to a significant increase in vertical equilibrium emittance. The magnitude of a few incoherent e(sup +)e(sup -) scattering processes is also estimated. Options for future code development are reviewed.

NTIS

Electron Clouds; Models; Computerized Simulation; Beam Interactions

20090030768 Stanford Linear Accelerator Center, CA, USA; Uppsala Univ., Uppsala, Sweden; Cornell Univ., Ithaca, NY, USA; Fermi National Accelerator Lab., Batavia, IL, USA

Comparison of Tracking Codes for the International Linear Collider

Latina, A.; Walker, N. J.; Tenenbaum, K. K.; Eliasson, P.; Kubo, K.; Jan. 23, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922597; SLAC-PUB-13094; No Copyright; Avail.: National Technical Information Service (NTIS)

In an effort to compare beam dynamics and create a 'benchmark' for Dispersion Free Steering (DFS) a comparison was made between different International Linear Collider (ILC) simulation programs while performing DFS. This study consisted of three parts. Firstly, a simple betatron oscillation was tracked through each code. Secondly, a set of component misalignments and corrector settings generated from one program was read into the others to confirm similar emittance dilution. Thirdly, given the same set of component misalignments, DFS was performed independently in each program and the resulting emittance dilution was compared. Performance was found to agree exceptionally well in all three studies.

NTIS

Beam Steering; Tracking (Position); Linear Accelerators

20090030770 Stanford Linear Accelerator Center, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Absolute Bunch Length Measurements at the ALS by Incoherent Synchrotron Radiation Fluctuation Analysis

Filippetto, D.; Stupakov, G. V.; Zolotorev, M. S.; Sannibale, F.; Jan. 24, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922599; SLAC-PUB-13089; No Copyright; Avail.: Department of Energy Information Bridge

By analyzing the pulse to pulse intensity fluctuations of the radiation emitted by a charge particle in the incoherent part of the spectrum, it is possible to extract information about the spatial distribution of the beam. At the Advanced Light Source (ALS) of the Lawrence Berkeley National Laboratory, we have developed and tested a simple scheme based on this principle that allows for the absolute measurement of the bunch length. A description of the method and the experimental results are presented.

NTIS

Light Sources; Synchrotron Radiation; Radiant Flux Density; Dimensional Measurement; Spatial Distribution

20090030771 Stanford Linear Accelerator Center, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Modeling of E-Cloud Build-Up in Grooved Vacuum Chambers using POSINST

Venturini, M.; Furman, M. A.; Vay, J. L.; Pivi, M. T. F.; Jan. 23, 2008; 3 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922598; SLAC-PUB-13051; No Copyright; Avail.: National Technical Information Service (NTIS)

Use of grooved vacuum chambers have been suggested as a way to limit electron cloud accumulation in the ILCDR. We report on simulations carried out using an augmented version of POSINST, accounting for e-cloud dynamics in the presence of grooves, and make contact with previous estimates of an effective secondary electron yield for grooved surfaces.

NTIS

Electron Clouds; Vacuum Chambers; Estimates

20090030773 Stanford Linear Accelerator Center, CA, USA; Mississippi Univ., University, MS, USA

Measurement of the Inclusive Branching FractionsB(B(caret)- to D(caret)+ Pi(caret)- Pi(caret)-) and B(B(caret)- to D*(caret)+ Pi(caret)- Pi(caret)-)

Eschenburg, V. O.; Jul. 17, 2007; 135 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2008-922602; SLAC-R-871; No Copyright; Avail.: National Technical Information Service (NTIS)

The D(sub J)(sup 0) is a family of four orbitally excited mesons: D*(sub 2)(2460)(sup 0), D(sub 1)(2420)(sup 0), D(sub 1)(j = 1/2)(sup -), and D*(sub 0)(j = 1/2)(sup 0). This dissertation presents the measurements of the inclusive branching fractions, (Beta)(B(sup -) (yields) D*(sup +)(pi)(sup -)(pi)(sup -)) and (Beta)(B(sup -) (yields) D(sup +)(pi)(sup -)(pi)(sup -)). The D(sub J)(sup 0) provides an intermediate resonance for those two modes. The data used for this analysis consists of Runs 1-5 with total integrated luminosity of 343.38 fb(sup -1), which is corresponding to 383.92 million B(bar B) pairs, provided by the BABAR detector at the PEP-II asymmetric B Factory. The values presented are: (Beta)(B(sup -) (yields) D(sup

+)(pi)(sup -)(pi)(sup -)) = (1.12 (+-) 0.02 (+-) 0.08) x 10(sup -3); (Beta)(B(sup -) (yields) D*(sup +)(pi)(sup -)(pi)(sup -)) = (1.67 (+-) 0.03 (+-) 0.13) x 10(sup -3).
NTIS
Asymmetry; Branching (Mathematics); Luminosity; Measurement

20090030795 Stanford Linear Accelerator Center, CA, USA
Measurement of CKM-Angle Gamma with Charmed BO Meson Decays
Baak, M. A.; Jan. 2008; 232 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922607; SLAC-R-858; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis reports measurements of the time-dependent CP asymmetries in fully reconstructed B(sup 0) (yields) (D(sup (*)(-+)) and B(sup 0) (yields) D(sup (-+)) (rho)(sup (+-))) decays in approximately 232 million (Upsilon)(4S) (yields) B(bar B) events, collected with the BABAR detector at the PEP-II asymmetric-energy B factory at the Stanford Linear Accelerator Center in California. The phenomenon of CP violation allows one to distinguish between matter and antimatter, and, as such, is one of the essential ingredients needed to explain the apparent abundance of matter over antimatter in the universe. The Standard Model describes the observed elementary particles in terms of three generations of quarks and leptons, as well as the weak, electromagnetic, and strong interactions between them. In the Standard Model, CP violation is incorporated in the Cabibbo-Kobayashi-Maskawa (CKM) matrix, which describes the weak interactions between the quarks. The weak interactions between quarks are described by coupling constants that are functions of three real parameters and one irreducible complex phase. The magnitude of all CP violating effects in the Standard Model is related to this complex phase. The measurement of the CP violating phase of the CKM matrix is an important part of the present scientific program in particle physics. Violation of the CP symmetry manifests itself as a non-zero area of the Unitarity Triangle. The Unitarity Triangle needs to be overconstrained by experimental measurements in order to demonstrate that the CKM mechanism is the correct explanation of this phenomenon. No stringent measurement of the CKM-angle (gamma) is yet available.
NTIS
Charm (Particle Physics); Mesons; Particle Decay

20090030800 Stanford Linear Accelerator Center, CA, USA; Bergen Univ., Norway
Search for the Rare Decay B to pi l+l- in the BaBar Experiment
Ofte, I.; Dec. 2006; 167 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922606; SLAC-R-859; No Copyright; Avail.: National Technical Information Service (NTIS)

The rare decay B (yields) (pi)(ell)(sup +)(ell)(sup -) is the simplest manifestation of a b (yields) d(ell)(sup +)(ell)(sup -) flavor-changing neutral current (FCNC) process. This type of process only proceeds through penguin loop or box diagrams and is sensitive to physics at the electroweak scale. It can be used to constrain parameters of the Standard Model and its extensions. B (yields) (pi)(ell)(sup +)(ell)(sup -) events have not yet been observed; the branching fraction is expected to be an order of magnitude smaller than the measured branching fraction for the similar B (yields) K(ell)(sup +)(ell)(sup -) decay. Using 230 million B(bar B) meson pairs collected with the BABAR detector, we have done a search for the rare decay B (yields) (pi)(ell)(sup +)(ell)(sup -). The data was produced in e+e collision at the (Upsilon)(4S) resonance in the PEP-II collider between 1999 and 2004. Four exclusive B-meson decay modes have been reconstructed: B(sup +) (yields) (pi)(sup +)(ell)(sup +)(ell)(sup -) and B(sup 0) (yields) (pi)(sup 0)(ell)(sup +)(ell)(sup -), where (ell)(sup +)(ell)(sup -) is either an electron pair (e(sup +)e(sup -)) or a muon pair ((mu)(sup +)(mu)(sup -)). We find no evidence for a signal, and we obtain upper limits on the branching fractions (Beta). Assuming the isospin relation (Beta)(B(sup +) (yields) (pi)9(up +)(ell)(sup +)(ell)(sup -)) 2 x (sup (tau))B(sup +)/(sup (tau))B(sup 0) (Beta)(B(sup 0) (yields) (pi)(sup 0)(ell)(sup +)(ell)(sup -)), we obtain an upper limit at 90% confidence level on the lepton-flavor-averaged branching fraction of B (yields) (pi)(ell)(sup +)(ell)(sup -) to be (Beta)(B (yields) (pi)e(mu)) < 9.2 x 10(sup -8) at 90% C.L. We have also reconstructed two control modes B(sup +) (yields) (pi)(sup +)e(sup (+-))(mu)(sup (-+)) and B(sup 0) (yields) (pi)(sup 0)e(sup (+-))(mu)(sup (-+)) and we also obtain an upper limit at 90% confidence level on the lepton-flavor-violating decay B (yields) (pi)e(mu) of (Beta)(B (yields) (pi)e(mu)) < 9.2 x 10(sup -8) at 90% C.L. This is the first search for these rare decays at the current B-Factory experiments. This limit is an improvement by four orders of magnitude with respect to the previous experimental limit, and about a factor three above Standard Model predictions.
NTIS
Mesons; Particle Decay; Leptons

20090030906 Toronto Univ., Ontario Canada
Project to Study Soil Electromagnetic Properties
Bailey, Richard C.; West, Gordon F.; 30 Sep. 2007; 212 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7702-03-R942
Report No.(s): AD-A502085; DRDC-SUFFIELD-CR-2009-051; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502085

The overall purpose of the project is to facilitate the design of electromagnetic induction (EMI) mine detectors for humanitarian demining purposes. The specific aim is to help designers optimize the ability of these devices to detect low metal. anti-personnel mines in what are called difficult soils (considered here mainly to be those soils that contain appreciable quantities of electromagnetically lossy ferromagnetic minerals).
DTIC
Electromagnetic Properties; Soil Science

20090030913 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Characterizations of a CERN NbTi Reference Wire at LBNL
Liggins, N. L.; Godeke, A.; Higley, H. C.; Dietdekich, D. R.; Feb. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-913161; LBNL--62392; No Copyright; Avail.: Department of Energy Information Bridge

We report on the measurement of two NbTi reference samples,obtained from CERN through BNL, wire number 02R00056A01UX.265. The purpose of these characterizations is two-fold: (1) To establish a ninter-laboratory comparison of short sample tests and analysis between LBNL, BNL and Fermilab within the LARP collaboration. Due to differences in reaction and mounting procedures and their resulting strain differences, Nb3Sn is not suited for this purpose. (2) To determine the accuracy of LBNL's system with regard to magnetic field, temperature and current after a major system overhaul. The results show that at mu0H = 8T, the critical current result falls within the standard deviation of the CERN database, whereas at mu0H = 5 T, it falls outside the CERN standard deviation, but within the range of critical current values that are reported by CERN for this wire. It is concluded that the LBNL results fall within the characterization variance as reported in the CERN database.
NTIS
Characterization; Niobium; Superconductivity; Wire; Titanium Alloys

20090030914 Fermi National Accelerator Lab., Batavia, IL, USA; Ohio State Univ., Columbus, OH, USA
Searches for the Standard Model Higgs at the Tevatron
Kilminster, B.; May 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-913480; FERMILAB-CONF-07-197-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The CDF and D0 experiments at the Tevatron are currently the only capable of searching for the Standard Model Higgs boson. This article describes their most sensitive searches in the expected Higgs mass range, focusing on advanced methods used to extract the maximal sensitivity from the data. CDF presents newly updated results for H (yields) W(sup +)W(sup -) and Zh (yields) l(sup +)l(sup -)b(bar b). D0 presents two new searches for WH (yields) lvb(bar b). These new analyses use the same 1 fb(sup -1) dataset as previous searches, but with improved techniques resulting in markedly improved sensitivity.
NTIS
Higgs Bosons; Particle Accelerators

20090030930 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Runge-Kutta Methods and Viscous Wave Equations
Verwer, J. G.; Mar. 2008; 22 pp.; In English
Report No.(s): PB2008-108734; MAS-E0803; Copyright; Avail.: National Technical Information Service (NTIS)

We study the numerical time integration of a class of viscous wave equations by means of Runge-Kutta methods. The viscous wave equation is an extension of the standard second-order wave equation including advection-diffusion terms differentiated in time. The viscous wave equation can be very stiff so that for time integration traditional explicit methods are

no longer efficient. A-stable Runge-Kutta methods are then very good candidates for time integration, in particular diagonally implicit ones.
NTIS
Runge-Kutta Method; Wave Equations

20090030935 North Carolina State Coll., Raleigh, NC, USA
Pile Bent Design Criteria
Robinson, B.; Suarez, V.; Robalino, P.; Kowalsky, M.; Gabr, M.; Oct. 2006; 144 pp.; In English
Report No.(s): PB2008-108943; No Copyright; Avail.: National Technical Information Service (NTIS)

This study was undertaken to review the design of pile bents by the North Carolina Department of Transportation (NCDOT). Research was performed to investigate current design methodologies and compare practice approach to other feasible and cost effective design methods. As such, two goals were pursued: (i) enhancing the current equivalent frame model of the pile bents such that it fully considers the resistance of the soil around the piles, and, (ii) adopting a comprehensive state of practice, which involves the integration of a comprehensive software and analytical solutions. It was also deemed important to study displacement limits imposed on bridge design and suggest improved limits based on the results from the soil/structural models.
NTIS
Design Analysis; Transportation

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*.

20090030136 Erbe (C.), Moggill, Australia
Assessment Bioacoustic Impact of Ships on Humpback Whales in Glacier Bay, Alaska
Erbe, C.; May 27, 2003; 38 pp.; In English
Report No.(s): PB2008-107914; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this study was to assess whether ships travelling in Glacier Bay, Alaska, had any acoustic impact on humpback whales. The type of bioacoustic impact and impact ranges were determined. This study made use of a software package that had originally been developed by the author for the Department of Fisheries and Oceans Canada, for the purpose of assessing anthropogenic (human-caused), bioacoustic impact on the marine environment. However, due to limitations in knowledge about the hearing thresholds of humpback whales, the model is based on a transfer of data from odontocetes, pinnipeds and terrestrial mammals to humpback whales. The feasibility and accuracy of such an interspecies transfer is highly debatable. Therefore, the results of this modeling exercise should not be used for environmental decision-making.
NTIS
Bioacoustics; Glaciers; Whales

20090030139 Naval Surface Warfare Center, Bethesda, MD, USA; Naval Surface Warfare Center, Bethesda, MD, USA
Coral Princess Underwater Acoustic Levels
Oct. 2004; 6 pp.; In English
Report No.(s): PB2008-108302; No Copyright; Avail.: National Technical Information Service (NTIS)

On 30 August 2004, the cruise ship Coral Princess conducted four passes by the Southeast Alaska Acoustic Measurement Facility's (SEAFAC) underwater acoustic measurement arrays in Behm Canal. Two of these runs were performed at 10 knots and two at 20 knots. During the runs, the ships radiated noise signatures were measured. This document contains the results of the measurement and analysis of the underwater sound emitted by the Coral Princess during her 10 and 20-knot runs. The 10-knot Coral Princess levels from 2004 are also compared to the 10-knot Dawn Princess levels that were measured at SEAFAC in 1999. In addition to the results reported in this document, specialized underwater sound measurements were performed close to the ships courseline at measurement points less than 15 feet below the waters surface. These measurements were conducted to assess acoustic levels near the surface with the ship approaching bow-on to the measurement point. The data from this particular effort is currently being reduced and analyzed, and will be reported separately.
NTIS
Acoustic Measurement; Sound Pressure; Underwater Acoustics

20090030140 Naval Surface Warfare Center, Bethesda, MD, USA
Volendam Underwater Acoustic Levels
Oct. 2004; 7 pp.; In English
Report No.(s): PB2008-108303; No Copyright; Avail.: National Technical Information Service (NTIS)

On 30 August 2004, the cruise ship Volendam conducted four passes by the Southeast Alaska Acoustic Measurement Facility's (SEAFAC) underwater acoustic measurement arrays in Behm Canal. Two of these runs were performed at 10 knots and two at 20 knots. During the runs, the ships radiated noise signatures were measured. This document contains the results of the measurement and analysis of the underwater sound emitted by the Volendam during her 10 and 20-knot runs. The 10-knot Volendam levels from 2004 are also compared to the 10-knot Statendam levels that were measured at SEAFAC in 1999. In addition to the results reported in this document, specialized underwater sound measurements were performed close to the ships courseline at measurement points less than 15 feet below the waters surface. These measurements were conducted to assess acoustic levels near the surface with the ship approaching bow-on to the measurement point. The data from this particular effort is currently being reduced and analyzed, and will be reported separately.
NTIS
Acoustic Measurement; Sound Pressure; Underwater Acoustics

20090030505 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Distributed Measurements and Data Processing at the Vibro-Acoustic Test Facility, GRC Space Power Facility, Sandusky, Ohio - an Architecture and an Example
Hill, Gerald M.; Evans, Richard K.; [2009]; 18 pp.; In English; 25th Aerospace Testing Seminar, 13-15 Oct. 2009, Manhattan Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 644423.10.34.03.03.03.23
Report No.(s): E-17064; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030505

A large-scale, distributed, high-speed data acquisition system (HSDAS) is currently being installed at the Space Power Facility (SPF) at NASA Glenn Research Center s Plum Brook Station in Sandusky, OH. This installation is being done as part of a facility construction project to add Vibro-acoustic Test Capabilities (VTC) to the current thermal-vacuum testing capability of SPF in support of the Orion Project s requirement for Space Environments Testing (SET). The HSDAS architecture is a modular design, which utilizes fully-remotely managed components, enables the system to support multiple test locations with a wide-range of measurement types and a very large system channel count. The architecture of the system is presented along with details on system scalability and measurement verification. In addition, the ability of the system to automate many of its processes such as measurement verification and measurement system analysis is also discussed.
Author
Acoustics; Data Acquisition; Systems Analysis; Test Facilities; Vibrational Stress

20090030527 NASA Langley Research Center, Hampton, VA, USA
Bulk Current Injection Testing of Cable Noise Reduction Techniques, 50 kHz to 400 MHz
Bradley, Arthur T.; Hare, Richard J.; Singh, Manisha; August 17, 2009; 6 pp.; In English; IEEE EMC 2009 Symposium, 17-21 Aug. 2009, Austin, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 736466.08.01.07.01
Report No.(s): LF99-9174; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030527

This paper presents empirical results of cable noise reduction techniques as demonstrated using bulk current injection (BCI) techniques with radiated fields from 50 kHz - 400 MHz. It is a follow up to the two-part paper series presented at the Asia Pacific EMC Conference that focused on TEM cell signal injection. This paper discusses the effects of cable types, shield connections, and chassis connections on cable noise. For each topic, well established theories are compared with data from a real-world physical system.
Author
Electromagnetic Compatibility; Noise Reduction; Injection

20090030646 Defence Research and Development Canada, Dartmouth, Nova Scotia Canada
Modelling Broadband Scattering From Shelled Spheres in a Waveguide
Fawcett, John A.; Oct 2007; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A502652; DRDC-ATLANTIC-TM-2007-270; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The broadband scattering characteristics of a target may be used to distinguish echos from a target of interest from those of clutter. This type of classification is of interest in many sonar applications: ASW, torpedo, surface mines, and diver detection. In a shallow water situation the original sonar pulse and the echo from the target will consist of a sequence of pulses corresponding to the various combinations of incident and backscattered multipath arrivals. For a very shallow target or one close to the seabed, it may be difficult to isolate some of these multipath arrivals. It is expected that these waveguide effects could have a significant effect upon some classifiers. In this paper, we discuss the modelling of scattering of sound from an elastic sphere (shelled, solid, water-filled, etc) which is in a waveguide with an upper surface and a lower seabed. An exact propagation solution is implemented and used to benchmark a ray-expansion solution. The scattered signals for a variety of different sonar pulses and different positions of a spherical target in the waveguide are shown.
DTIC
Broadband; Scattering; Sonar; Spheres; Waveguides

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NUCLEAR PHYSICS

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

20090030238 Idaho National Lab., Idaho Falls, ID, USA
Evaluation of the Start-Up Core Physics Tests at Japan's High Temperature Engineering Test Reactor (Fully-Loaded Core)
Bess, J. D.; Fuijimoto, N.; Dolphin, B. H.; Snoj, L.; Zueran, A.; Mar. 2009; 250 pp.; In English
Report No.(s): DE2009-952014; INL/EXT-08-1467; No Copyright; Avail.: Department of Energy Information Bridge

The High Temperature Engineering Test Reactor (HTTR) of the Japan Atomic Energy Agency (JAEA)a is a 30 MWth, graphite-moderated, helium-cooled reactor that was constructed with the objectives to establish and upgrade the technological basis for advanced high-temperature gas-cooled reactors (HTGRs) as well as to conduct various irradiation tests for innovative high-temperature research. The core size of the HTTR represents about one-half of that of future HTGRs, and the high excess reactivity of the HTTR, necessary for compensation of temperature, xenon, and burnup effects during power operations, is similar to that of future HTGRs. During the start-up core physics tests of the HTTR, various annular cores were formed to provide experimental data for verification of design codes for future HTGRs. The Japanese government approved construction of the HTTR in the 1989 fiscal year budget; construction began at the Oarai Research Establishment in March 1991 and was completed May 1996. Fuel loading began July 1, 1998, from the core periphery. The first criticality was attained with an annular core on November 10, 1998 at 14:18, followed by a series of start-up core physics tests (Figure 1.1) until a fully-loaded core was developed on December 16, 1998. Criticality tests were carried out into January 1999.
NTIS
High Temperature Tests; Reactor Cores; High Temperature Gas Cooled Reactors; Nuclear Electric Power Generation

20090030911 Brookhaven National Lab., Upton, NY, USA
Molecular Desorption of Baked Stainless Steel from Irradiation with 9 GeV/Nucleon Au79+, 10 GeV/Nucleon Cu29+, and 23GeV p+ Under Perpendicular Impact
Fischer, W.; Mustafin, E.; Apr. 09, 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-913087; BNL--79226-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We report on molecular desorption of baked stainless steel from irradiation with high energy ions under perpendicular impact. Ion induced molecular desorption has affected the performance of a number of ion accelerators, in which the beam loss typically occurs under small angles. However, experimental parameters can be easier controlled in measurements with

perpendicular impact. Desorption coefficients for small angle impact can be estimated from these measurements. The measurements were carried out at Brookhaven's Relativistic Heavy Ion Collider.
NTIS
Desorption; Irradiation; Nucleons; Stainless Steels

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20090029944 NASA Pasadena Office, CA, USA
White-Light Whispering Gallery Mode Optical Resonator System and Method
Matsko, Andrey B., Inventor; Savchenkov, Anatoliy A., Inventor; Maleki, Lute, Inventor; April 07, 2009; 8 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 21 Jul. 2006; US-Patent-7515786; NASA-Case-NPO-42221-1; US-Patent-Appl-SN-11/459109; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029944

An optical resonator system and method that includes a whispering-gallery mode (WGM) optical resonator that is capable of resonating across a broad, continuous swath of frequencies is provided. The optical resonator of the system is shaped to support at least one whispering gallery mode and includes a top surface, a bottom surface, a side wall, and a first curved transition region extending between the side wall and the top surface. The system further includes a coupler having a coupling surface which is arranged to face the transition region of the optical resonator and in the vicinity thereof such that an evanescent field emitted from the coupler is capable of being coupled into the optical resonator through the first curved transition region
Author
Optical Resonators; Whispering Gallery Modes; Light Modulation

20090029972 NASA Pasadena Office, CA, USA
Optical Device, System, and Method of Generating High Angular Momentum Beams
Savchenkov, Anatoliy A., Inventor; Matsko, Andrey B., Inventor; Strekalov, Dmitry V., Inventor; Grudinin, Ivan S., Inventor; Maleki, Lute, Inventor; May 19, 2009; 5 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 16 Feb. 2007; US-Patent-7535634; NASA-Case-NPO-42965-1; US-Patent-Appl-SN-11/675690; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029972

An optical device, optical system, and method of generating optical beams having high angular momenta are provided. The optical device includes a whispering gallery mode resonator defining a resonator radius and an elongated wavegWde having a length defined between a first end and a second end of the waveguide. The waveguide defines a waveguide radius which increases at least along a portion of the length of the waveguide in a direction from the first end to the second end. The waveguide radius at the first end of the waveguide is smaller than the resonator radius and the resonator is integrally formed with the first end of the waveguide.
Official Gazette of the U.S. Patent and Trademark Office
Whispering Gallery Modes; Optical Equipment; Light Beams; Waveguides; Angular Momentum

20090030198 Newport Sensors, Inc., Irvine, CA, USA
Novel Optical Fiber Sensors for Monitoring Bridge Structural Integrity
Feng, M. Q.; Mar. 2009; 52 pp.; In English
Contract(s)/Grant(s): NCHRP-124
Report No.(s): PB2009-113228; No Copyright; Avail.: National Technical Information Service (NTIS)

This IDEA project successfully developed a novel sensor system based on innovative integration of fiber optics and Moire phenomena for measuring dynamic response of highway bridges to assess their structural integrity. The 18-month project was conducted in two phases. Work in the initial phase focused on the development of a prototype sensor system. Technical specifications of the proposed fiber optic accelerometer system were established, based on which a conceptual design of the system was developed. The sensor head consisted of a pair of parallel grating panels, a pendulum, and two pairs of fibers with

collimators. Computer simulation was performed to determine optimal tradeoff between the sensors conflicting dynamic bandwidth and resolution, and furthermore the key design parameters including the optical grating pitch and the mass, stiffness, and damping of the pendulum. A special signal processing algorithm was developed to further broaden the dynamic bandwidth and enhance the measurement sensitivity of the accelerometer. An auto-inspection/auto-adjustment procedure was developed to achieve high accuracy and alignment in fabricating the sensor head. A portable prototype multichannel accelerometer system was developed that included multiple sensor heads, a low cost signal box (for sensor interrogation) and a PC (for signal processing).
NTIS
Fiber Optics; Optical Fibers; Structural Failure; Measuring Instruments; Bridges (Structures)

20090030245 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Improving the Performance of the Actinic Inspection Tool with an Optimized Alignment Procedure
Mochi, I.; Goldberg, K. A.; Naulleau, P.; Huh, S.; Mar. 04, 2009; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2009-949772; LBNL-1607E; No Copyright; Avail.: National Technical Information Service (NTIS)

Extreme ultraviolet (EUV) microscopy is an important tool for the investigation of the performance of EUV masks, for detecting the presence and the characteristics of defects, and for evaluating the effectiveness of defect repair techniques. Aerial image measurement bypasses the difficulties inherent to photoresist imaging and enables high data collection speed and flexibility. It provides reliable and quick feedback for the development of masks and lithography system modeling methods. We operate the SEMATECH Berkeley Actinic Inspection Tool (AIT), a EUV microscope installed at the Advanced Light Source at Lawrence Berkeley National Laboratory. The AIT is equipped with several high-magnification Fresnel zoneplate lenses, with various numerical aperture values, that enable it image the reflective mask surface with various resolution and magnification settings. Although the AIT has undergone significant recent improvements in terms of imaging resolution and illumination uniformity, there is still room for improvement. In the AIT, an off-axis zoneplate lens collects the light coming from the sample and an image of the sample is projected onto an EUV-sensitive CCD camera. The simplicity of the optical system is particularly helpful considering that the AIT alignment has to be performed every time that a sample or a zoneplate is replaced. In this paper we review the main strategies and procedures that have been developed for quick and reliable alignments, and we describe the performance improvements we have achieved, in terms of aberration magnitude reduction.
NTIS
Aerial Photography; Alignment; Extreme Ultraviolet Radiation; Inspection; Light Sources; Masks; Microscopy

20090030279 Brookhaven National Lab., Upton, NY USA
Results from Vernier Scans During the RHIC 2008 PP Run
Drees, A.; D'Ottavio, T.; [2009]; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952537; BNL-81812-2009; No Copyright; Avail.: Department of Energy Information Bridge

Using the vernier scan or Van der Meer scan technique, where one beam is swept stepwise across the other while measuring the collision rate as a function of beam displacement, the transverse beam profiles, the luminosity and the effective cross section of the detector in question can be measured. This report briefly recalls the vernier scan method and presents results from the 100 GeV 2008 RHIC polarized proton (pp) run.
NTIS
Particle Accelerators; Pulse Rate; Scanners; Time Lag; Protons; Polarized Radiation

75
PLASMA PHYSICS

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

20090030246 Lawrence Livermore National Lab., Livermore, CA USA
Soft X-Ray Scattering Using FEL Radiation for Probing Near-Solid Density Plasmas at Few Electronvolt Temperatures
Toleikis, S.; Faustlin, R. R.; Cao, L.; Doppner, T.; Dusterer, S.; Mar. 03, 2009; 26 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2009-949818; LLNL-PROC-411056; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on soft x-ray scattering experiments on cryogenic hydrogen and simple metal targets. As a source of intense

and ultrashort soft x-ray pulses we have used free-electron laser radiation at 92 eV photon energy from FLASH at DESY, Hamburg. X-ray pulses with energies up to 100 (micro)J and durations below 50 fs provide interaction with the target leading simultaneously to plasma formation and scattering. Experiments exploiting both of these interactions have been carried out, using the same experimental setup. Firstly, recording of soft x-ray inelastic scattering from near-solid density hydrogen plasmas at few electronvolt temperatures confirms the feasibility of this diagnostics technique. Secondly, the soft x-ray excitation of few electronvolt solid-density plasmas in simple metals could be studied by recording soft x-ray line and continuum emission integrated over emission times from fs to ns.
NTIS
Free Electron Lasers; Plasmas (Physics); X Ray Scattering; X Ray Spectroscopy

20090030247 Princeton Univ., NJ USA
Study of Turbulent Fluctuations Driven by the Electron Temperature Gradient in the National Spherical Torus Experiment
Mazzucato, E.; Lee, P. M.; Smith, D. R.; Wilson, H. Y.; Bell, S.; Mar. 26, 2009; 40 pp.; In English
Contract(s)/Grant(s): DE-ACO2-09CH11466
Report No.(s): DE2009-951312; PPPL-4395; No Copyright; Avail.: National Technical Information Service (NTIS)
Various theories and numerical simulations support the conjecture that the ubiquitous problem of anomalous electron transport in tokamaks may arise from a short-scale turbulence driven by the electron temperature gradient. To check whether this turbulence is present in plasmas of the National Spherical Torus Experiment (NSTX), measurements of turbulent fluctuations were performed with coherent scattering of electromagnetic waves. Results from plasmas heated by high harmonic fast waves (HHFW) show the existence of density fluctuations in the range of wave numbers k-pe=0.1-0.4, corresponding to a turbulence scale length of the order of the collisionless skin depth. Experimental observations and agreement with numerical results from the linear gyro-kinetic GS2 code indicate that the observed turbulence is driven by the electron temperature gradient. These turbulent fluctuations were not observed at the location of an internal transport barrier driven by a negative magnetic shear.
NTIS
Coherent Scattering; Electromagnetic Radiation; Electron Energy; Temperature Gradients; Toruses; Turbulent Flow

20090030248 Princeton Univ., NJ USA
Particle-in-Cell Modeling of Magnetized Argon Plasma Flow Through Small Mechanical Apertures
Sefkow, A. B.; Cohen, S. A.; Apr. 09, 2009; 18 pp.; In English
Contract(s)/Grant(s): DE-ACO2-09CH11466
Report No.(s): DE2009-951316; PPPL-4398; No Copyright; Avail.: National Technical Information Service (NTIS)
Motivated by observations of supersonic argon-ion flow generated by linear helicon-heated plasma devices, a three-dimensional particle-in-cell (PIC) code is used to study whether stationary electrostatic layers form near mechanical apertures intersecting the flow of magnetized plasma. By self-consistently evaluating the temporal evolution of the plasma in the vicinity of the aperture, the PIC simulations characterize the roles of the imposed aperture and applied magnetic field on ion acceleration. The PIC model includes ionization of a background neutral-argon population by thermal and superthermal electrons, the latter found upstream of the aperture. Near the aperture, a transition from a collisional to a collisionless regime occurs. Perturbations of density and potential, with mm wavelengths and consistent with ion acoustic waves, propagate axially. An ion acceleration region forms at the location of the aperture and is found to be an electrostatic double layer, with axially-separated regions of net positive and negative charge. Reducing the aperture diameter or increasing its length increases the double layer strength.
NTIS
Apertures; Argon Plasma; Magnetohydrodynamic Flow

20090030293 Princeton Univ., NJ USA
Evaporated Lithium Surface Coatings in NSTX
Kugel, H. W.; Mansfield, D.; Maingi, R.; Bel, M. G.; Bell, R. E.; Apr. 2009; 22 pp.; In English
Contract(s)/Grant(s): DE-ACO2-09CH11466
Report No.(s): DE2009-953205; PPPL-4399; No Copyright; Avail.: National Technical Information Service (NTIS)
Two lithium evaporators were used to evaporate more than 100 g of lithium on to the NSTX lower divertor region. Prior to each discharge, the evaporators were withdrawn behind shutters, where they also remained during the subsequent HeGDC

applied for periods up to 9.5 min. After the HeGDC, the shutters were opened and the LITERs were reinserted to deposit lithium on the lower divertor target for 10 min, at rates of 10-70 mg/min, prior to the next discharge. The major improvements in plasma performance from these lithium depositions include: (1) plasma density reduction as a result of lithium deposition; (2) suppression of ELMs; (3) improvement of energy confinement in a low-triangularity shape; (4) improvement in plasma performance for standard, high-triangularity discharges; (5) reduction of the required HeGDC time between discharges; (6) increased pedestal electron and ion temperature; (7) reduced SOL plasma density; and (8) reduced edge neutral density.
NTIS
Evaporators; Ionized Gases; Lithium; Plasmas (Physics); Toruses

20090030493 Stanford Linear Accelerator Center, CA, USA; California Univ., Los Angeles, CA, USA
Scaling of Energy Gain with Plasma Parameters in a Plasma Wakefield Accelerator
Muggli, P.; Katsouleas, T.; Oz, E.; Blemenfeld, I.; Decker, F. J.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922956; SLAC-PUB-13101; No Copyright; Avail.: Department of Energy Information Bridge

We have recently demonstrated the doubling of the energy of particles of the ultra-short, ultra-relativistic electron bunches of the Stanford Linear Accelerator Center. This energy doubling occurred in a plasma only 85..cm-long with a density of approx. 2.6x10(exp 17)..e-/cm(sup -3). This milestone is the result of systematic measurements that show the scaling of the energy gain with plasma length and density, and show the reproducibility and the stability of the acceleration process. We show that the energy gain increases linearly with plasma length from 13 to 31.cm. These are key steps toward the application of beamdriven plasma accelerators or plasma wakefield accelerators (PWFA) to doubling the energy of a future linear collider without doubling its length.
NTIS
Plasma Accelerators; Plasmas (Physics); Electron Bunching

20090030683 Sandia National Labs., Albuquerque, NM USA
Estimating Z-Pinch Computing Resources
Brunner, T. A.; Apr. 01, 2007; 20 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2008-912926; SAND2007-2504; No Copyright; Avail.: Department of Energy Information Bridge

The Z facility at Sandia National Laboratories produces high energy density environments. Computer simulations of the experiments provide key insights and help make the most efficient use of the facility. This document estimates the computer resources needed in order to support the experimental program. The resource estimate is what we would like to have in about five years and assumes that we will have a robust, scalable simulation capability as well as enough physicists to run the simulations.
NTIS
Estimating; Zeta Pinch; Computer Techniques

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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*.

20090029949 NASA Langley Research Center, Hampton, VA, USA
Method of Generating X-Ray Diffraction Data for Integral Detection of Twin Defects in Super-Hetero-Epitaxial Materials
Park, Yeonjoon, Inventor; Choi, Sang Hyouk, Inventor; King, Glen C., Inventor; Elliott, James R., Inventor; July 07, 2009; 20 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 20 Oct. 2008; US-Patent-7558371; NASA-Case-LAR-17044-1; US-Patent-Appl-SN-12/254150; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029949

A method provides X-ray diffraction (XRD) data suitable for integral detection of a twin defect in a strained or lattice-matched epitaxial material made from components having crystal structures having symmetry belonging to different space groups. The material is mounted in an X-ray diffraction (XRD) system. In one embodiment, the XRD system's

goniometer angle Omega is set equal to (Theta(sub B)-Beta) where Theta(sub B) is a Bragg angle for a designated crystal plane of the alloy that is disposed at a non-perpendicular orientation with respect to the {111) crystal plane, and Beta is the angle between the designated crystal plane and a { 111 } crystal plane of one of the epitaxial components. The XRD system's detector angle is set equal to (Theta(sub B)+Beta). The material can be rotated through an angle of azimuthal rotation Phi about the axis aligned with the material. Using the detector, the intensity of the X-ray diffraction is recorded at least at the angle at which the twin defect occurs.
Author
Defects; X Ray Diffraction; Semiconductors (Materials); Crystal Structure; Fault Detection

20090030193 Fermi National Accelerator Lab., Batavia, IL, USA
FERMILAB's Booster Correction Element Power Supply Silicon Temperature Rise
Krafczk, G.; Jense, C.; Pfeffer, H.; Warchol, G.; Jan. 2009; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2009-952648; FERMILAB-CONF-09-149-AD; No Copyright; Avail.: Department of Energy Information Bridge

Fermilab is in the process of upgrading its Booster Correction Element System to include full field correction element magnets to correct position and chromaticity throughout the booster cycle. For good reliability of the switchmode power supplies designed to power the magnets, it is important to limit both the maximum temperature and the repetitive temperature cycling of the silicon junctions of the switching elements. We will describe how we measured these parameters and the results of our measurements.
NTIS
Magnets; Particle Accelerators; Silicon; Supplying

20090030249 Fermi National Accelerator Lab., Batavia, IL, USA; Florida State Univ., Tallahassee, FL, USA
Measurements of the Differential Cross Sections for the Inclusive Production of a Photon and Heavy Flavor Jet
Duggan, D.; Apr. 01, 2009; 168 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2009-951333; FERMILAB-THESIS-2009-08; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents the first measurement of the differential production cross section of a heavy flavor (bottom or charm) jet and direct photon at the Fermilab Tevatron. These measurments were performed using data recorded with the D0 detector from proton-antiproton collisions.
NTIS
Particle Accelerators; Photons; Scattering Cross Sections

20090030278
Environmental Reactivity of Solid State Hydride Materials
Gray, J.; Anton, D.; 23 Apr. 2009; 12 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2009-952442; SRNL-STI-2009-00291; No Copyright; Avail.: National Technical Information Service (NTIS)

In searching for high gravimetric and volumetric density hydrogen storage systems, it is inevitable that higher energy density materials will be used. In order to make safe and commercially acceptable condensed phase hydrogen storage systems, it is important to understand quantitatively the risks involved in using and handling these materials and to develop appropriate mitigation strategies to handle potential material exposure events. A crucial aspect of the development of risk identification and mitigation strategies is the development of rigorous environmental reactivity testing standards and procedures. This will allow for the identification of potential risks and implementation of risk mitigation strategies. Modified testing procedures for shipping air and/or water sensitive materials, as codified by the United Nations, have been used to evaluate two potential hydrogen storage materials, 2LiBH4DTMgH2 and NH3BH3. The modified U.N. procedures include identification of selfreactive substances, pyrophoric substances, and gas-emitting substances with water contact. The results of these tests for air and water contact sensitivity will be compared to the pure material components where appropriate (e.g. LiBH4 and MgH2). The water contact tests are divided into two scenarios dependent on the hydride to water mole ratio and heat transport

characteristics. Air contact tests were run to determine whether a substance will spontaneously react with air in a packed or dispersed form.
NTIS
Hydrides; Hydrogen; Hydrogen Fuels; Reactivity; Solid State

20090030283
Monitoring the Flash Cryomodule Transportation From DESY Hamburg to CEA Saclay: Coupler Contact, Vacuum Acceleration and Vibration Analysis
Barbanotti, S.; Bosotti, A.; Fusetti, M.; Michelato, P.; Bertolini, A.; [2009]; 3 pp.; In English
Report No.(s): DE2009-952639; FERMILAB-CONF-09-086; No Copyright; Avail.: Department of Energy Information Bridge

With a view to the series production of one hundred, 12 m long XFEL 1.3 GHz cryomodules and their transportation from the assembly site at CEA Saclay (F) to the installation site at DESY Hamburg (D) a test transportation of a FLASH cryomodule has been performed, in the condition foreseen for the mass transportation. The present study examines the stresses induced on the module and verifies the damping capabilities of the transport frame in order to minimize risk of damage to the most critical components. During the transportation, acceleration and vibration have been monitored as well as coupler antenna contacts and vacuum performances. This paper describes the analysis performed and compares those results to the data of a similar transportation study at Fermilab for the CM1 cryomodule.
NTIS
Couplers; Dynamic Structural Analysis; Particle Accelerators; Transportation; Vacuum

20090030284
Dual Triangle Timing Circuit for Improved Performance of 4-Quadrant H-Bridge Switchers
Krafezyk, G.; Jense, C.; Pfeffer, H.; Warchol, G.; [2009]; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2009-952647; No Copyright; Avail.: Department of Energy Information Bridge

Fermilab is in the process of upgrading its Booster Correction Element System to include full field correction element magnets to correct position and chromaticity throughout the booster cycle. This upgrade requires power supplies with maximum outputs of -180V/-65A, with current bandwidths of 5k Hz and with slew rates of min to max current in 1ms. For seamless operation around zero current and voltage, we use continuous switching on both sides of the bridge. Although the straightforward way of coordinating the switching on both sides of the bridge can be accomplished with one triangle timing wave and one voltage reference, we have found that using two triangle waves yields a switching coordination that effectively doubles the frequency of the differential ripple on the load and allows for better filtering of the output ripple.
NTIS
Circuits; Magnets; Quadrants; Switches

20090030289 Fermi National Accelerator Lab., Batavia, IL, USA; Colorado Univ., Boulder, CO USA
Highly Accurate Frequency Calculations of Crab Cavities using VORPAL Computation Framework
Austin, T. M.; Cary, J. R.; Bellantoni, L.; Jan. 2009; 3 pp.; In English
Report No.(s): DE2009-952630; FERMILAB-CONF-09-220-E; No Copyright; Avail.: Department of Energy Information Bridge

We have applied the Werner-Cary method (J. Comp. Phys. 227, 5200-5214 (2008)) for extracting modes and mode frequencies from time-domain simulations of crab cavities, as are needed for the ILC and the beam delivery system of the LHC. This method for frequency extraction relies on a small number of simulations, and postprocessing using the SVD algorithm with Tikhonov regularization. The time-domain simulations were carried out using the VORPAL computational framework, which is based on the eminently scalable finite-difference time domain algorithm. A validation study was performed on an aluminum model of the 3.9 GHz RF separators built originally at Fermi National Accelerator Laboratory in the US. Comparisons with measurements of the A15 cavity show that this method can provide accuracy to within 0.01% of experimental results after accounting for manufacturing imperfections. To capture the near degeneracies two simulations, requiring in total a few hours on 600 processors were employed. This method has applications across many areas including obtaining MHD spectra from time-domain simulations.
NTIS
Cavities; Computation; Frequencies

20090030290 Fermi National Accelerator Lab., Batavia, IL, USA; Yale Univ., New Haven, CT, USA
Multi-MW K-Band 7th Harmonic Multiplier for High-Gradient Accelerator R&
Solyak, N. A.; Hirshfield, J. L.; Kazakevich, G. M.; LaPointe, M. A.; Jan. 2009; 4 pp.; In English
Report No.(s): DE2009-952631; FERMILAB-CONF-09-184-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

A preliminary design and current status are presented for a two-cavity 7th harmonic multiplier, intended as a high-power RF source for use in experiments aimed at developing high-gradient structures for a future collider. The harmonic multiplier is to produce power in K-band using as its RF driver an XK-5 S-band klystron (2.856 GHz). The multiplier is to be built with a TE111 rotating mode input cavity and interchangeable output cavities, a principal example being a TE711 rotating mode cavity running at 20 GHz. The design that is described uses a 250 kV, 20 A injected laminar electron beam. With 8.5 MW of S-band drive power, 4.4 MW of 20-GHz output power is predicted. The design uses a gun, magnetic coils, and beam collector from an existing waveguide 7th harmonic multiplier. The gun has been re-conditioned and the desired operating parameters have been achieved.
NTIS
Gradients; Multipliers; Particle Accelerators

20090030291 Fermi National Accelerator Lab., Batavia, IL, USA
Overview and Status Update of the FERMILAB HINS Linac R&D Program
Webber, R. C.; Apollinari, G.; Jan. 2009; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2009-952649; FERMILAB-CONF-09-131-APC; No Copyright; Avail.: Department of Energy Information Bridge

The Fermilab High Intensity Neutrino Source (HINS) Linac R&D program is continuing efforts to construct a first-of-a-kind superconducting H-linac. The goal of the HINS linac is to demonstrate, for the first time, acceleration of high intensity beam with superconducting spoke cavities, control of beam halo growth by use of solenoidal focusing optics throughout, and operation of many cavities from a single high-power RF source for acceleration of non-relativistic particles. The HINS effort is relevant to any future high brightness, high intensity linac and, in particular, to the linac proposed as part of Fermilab Project X to serve the next generation of neutrino physics and future muon storage ring/collider experiments. This paper updates the technical status of the various components being developed, built, and commissioned as a part of HINS and presents the outlook for the HINS program.
NTIS
Linear Accelerators; Neutrinos; Particle Accelerators; Research and Development

20090030301 Fermi National Accelerator Lab., Batavia, IL, USA
Analysis of Optics Designs for the LHC IR Upgrade
Sen, T.; Johnstone, J.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922061; FERMILAB-CONF-07-304-AD-APC; No Copyright; Avail.: National Technical Information Service (NTIS)

We consider the different options proposed for the LHC IR upgrade. The two main categories: quadrupoles first (as in the baseline design) and dipoles-first have complementary strengths. We analyze the potential of the proposed designs by calculating important performance parameters. We also propose a local scheme for correcting the quadratic chromaticity.
NTIS
Particle Accelerators; Optics

20090030317 Fermi National Accelerator Lab., Batavia, IL, USA
Run II Luminosity Progress
Gollwitzer, K.; Jun. 01, 2007; 5 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922031; FERMILAB-CONF-07-247-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fermilab Tevatron Collider Run II program continues at the energy and luminosity frontier of high energy particle physics. To the collider experiments CDF and D0, over 3 fb-1 of integrated luminosity has been delivered to each. Upgrades

and improvements in the Antiproton Source of the production and collection of antiprotons have led to increased number of particles stored in the Recycler. Electron cooling and associated improvements have help make a brighter antiproton beam at collisions. Tevatron improvements to handle the increased number of particles and the beam lifetimes have resulted in an increase in luminosity.
NTIS
Antiprotons; Luminosity; Particle Accelerators

20090030319 Fermi National Accelerator Lab., Batavia, IL, USA; University of Northern Illinois, De Kalb, IL, USA
Plans for a 750 MeV Electron Beam Test Facility at Fermilab
Church, M.; Piot, P.; Nagaitsev, S.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922034; FERMILAB-CONF-07-240-AD; No Copyright; Avail.: Department of Energy Information Bridge

A 750 MeV electron beam test facility at Fermilab is in the planning and early construction phase. An existing building is being converted for this facility. The photoinjector currently in use at the Fermilab NICADD Photoinjector Laboratory (FNPL) will be moved to the new facility and upgraded to serve as an injector for a beam acceleration section consisting of three TTF or ILCtype RF cryomodules. A low energy off-axis beamline will be constructed to test ILC crab cavity designs and provide opportunities for other tests. Downstream beamlines will consist of a diagnostic section, a beam test area for additional beam experiments, and high power beam dumps. The initial program for this facility will concentrate on testing ILC-type cryomodules and RF control with full ILC beam intensity. A future building expansion will open up further possibilities for beam physics and beam technology experiments.
NTIS
Electron Beams; Particle Accelerators; Test Facilities

20090030320 Fermi National Accelerator Lab., Batavia, IL, USA; Rice Univ., Houston, TX USA
Study of WGamma Production at D0: Anomalous Coupling Limits and the Radiation Amplitude Zero
Pawloski, G. J.; Jun. 01, 2007; 293 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922036; FERMILAB-THESIS-2007-44; No Copyright; Avail.: National Technical Information Service (NTIS)

In this analysis, hadronic collisions are analyzed to sample events that are consistent with the signatures of W(gamma) production. Through this examination, the gauge structure of the Standard Model of particle physics is probed by analyzing the energy spectrum and angular distribution of the observed events to test for theoretically predicted features of the Standard Model and to search for evidence of nongauge interaction couplings between the W boson and the photon. In the case of a null discovery of new physics, limits on the coupling values are presented.
NTIS
Elementary Particles; Particle Accelerators

20090030321 Fermi National Accelerator Lab., Batavia, IL, USA; Stanford Linear Accelerator Center, CA, USA
Suppression of Muon Backgrounds Generated in the ILC Beam Delivery System
Drozhdin, A. I.; Striganov, S. I.; Keller, L.; Nakao, N.; Mokhov, N. V.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922037; FERMILAB-CONF-07-276-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Muon background suppression at the ILC collider detectors was studied by MARS15 Monte Carlo simulation with a detailed description of the ILC BDS beam line and tunnel of 1.6-kmlength. Muon suppressions of about 1/5 and 1/50 were obtained for the donut- and wall-shape muon-spoilers, respectively.
NTIS
Monte Carlo Method; Muons; Particle Accelerators

20090030323 Fermi National Accelerator Lab., Batavia, IL, USA
Electron Cooling Rates Characterization at Fermilab's Recycler
Prost, L. R.; Shemyakin, A.; Jun. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922038; FERMILAB-CONF-07-192-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A 0.1 A, 4.3 MeV DC electron beam is routinely used to cool 8 GeV antiprotons in Fermilab's Recycler storage ring. The primary function of the electron cooler is to increase the longitudinal phase-space density of the antiprotons for storing and preparing high-density bunches for injection into the Tevatron. The longitudinal cooling rate is found to significantly depend on the transverse emittance of the antiproton beam. The paper presents the measured rates and compares them with calculations based on drag force data.
NTIS
Antiprotons; Characterization; Cooling; Particle Accelerators

20090030325 Fermi National Accelerator Lab., Batavia, IL, USA
Recent Studies of Dispersion Matched Steering for the ILC Bunch Compressor and Main Linac
Lebrun, P. L. G.; Ostiguy, J. F.; Micheiotti, L. P.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922040; FERMILAB-CONF-07-223-CD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Dispersion Matched Steering (DMS) method is studied in detail in the context of a curved main linac. In the absence of cavity tilts (rotations in the YZ plane), DMS provides a unique and stable solution with negligible emittance growth. If cavity tilts are about 300 rad, the algorithm is not very robust. The emittance growth through the entire linac for positrons is about 5 nm, if the system is strictly static and statistical averaging can be used to improve beam position measurements. This growth is mostly eliminated if the dispersion and its derivative at injection can be adjusted. If anticipated ground motion, beam and klystron jitter, beam position measurement resolution are introduced (i.e. dynamical case), the emittance preservation goal is currently not achieved by DMS alone. Mitigation strategies are outlined.
NTIS
Compressors; Linear Accelerators; Particle Accelerators; Steering

20090030326 Fermi National Accelerator Lab., Batavia, IL, USA; Texas Univ., Austin, TX, USA
Direct Measurements of Beta-Star in the Tevatron
Syphers, M. J.; Mivamoto, R.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922041; FERMILAB-CONF-07-224-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Simultaneous turn-by-turn beam position measurements across collider detector long straight sections provide full phase space information of a free oscillation. For signals with enough coherence (typically 1-2000 revolutions) the amplitude function and its slope at the two BPMs can be directly measured. Results for the Tevatron low-(beta) regions with a few percent accuracy are described.
NTIS
Linear Accelerators; Particle Accelerators

20090030329 Fermi National Accelerator Lab., Batavia, IL, USA
Instabilities of Cooled Antiproton Beam in Recycler
Burov, A.; Lebedev, V.; Jun. 01, 2007; 5 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922044; FERMILAB-CONF-07-243-AD; No Copyright; Avail.: Department of Energy Information Bridge

The more beam is cooled, the less stable it is. In the 3.3 km Recycler Ring, stacked 8 GeV antiprotons are cooled both with stochastic (transversely) and electron (3D) cooling. Since the machine is staying near the coupling resonance, coupled optical functions should be used for stability analysis. To stabilize beam against the resistive wall instability, a digital damper is used. Digital dampers can be described as linear operators with explicit time dependence, and that makes a principle

difference with analogous dampers. Theoretical description of the digital dampers is presented. Electron cooling makes possible a two-beam instability of the cooled beam with the electron beam. Special features of this instability are described, and the remedy is discussed.
NTIS
Antiprotons; Particle Accelerators; Stability

20090030330 Fermi National Accelerator Lab., Batavia, IL, USA
TBT Optics and Impedance Measurements at the Fermilab Main Injector
Alexahin, Y.; Gianfelice-Wendt, G.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922058; FERMILAB-CONF-07-291-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fourier analysis of Turn by Turn (TBT) data provides valuable information about the machine linear and non-linear optics. This technique introduced first at Fermilab in 2006 for correcting the Tevatron linear coupling, has been now extended to the Main Injector with the aim of a better understanding of the beam dynamics, in particular in view of a substantial beam intensity increase in the frame of the laboratory neutrino program.
NTIS
Impedance Measurement; Injectors; Particle Accelerators; Nonlinear Optics

20090030331 Fermi National Accelerator Lab., Batavia, IL, USA; Columbia Univ., New York, NY, USA
Neutral Current pi0 Production in the MiniBooNE Antineutrino Data
Nguyen, V. T.; Jun. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922049; FERMILAB-CONF-07-688; No Copyright; Avail.: Department of Energy Information Bridge

The Mini Booster Neutrino Experiment (MiniBooNE) uses the Fermilab Booster neutrino beam, which is produced from 8 GeV protons incident on a Be target. The target is located inside a horn, which produces a toroidal magnetic field that focuses pions and kaons. These mesons then pass through a collimator and can decay inside a 50-m-long tunnel. The MiniBooNE Cherenkov detector, located 541 m from the front of the target, is a spherical tank filled with 800 tons of pure mineral oil. The inside wall is lined with 1280 phototubes while the outside wall is covered by 240 veto phototubes.
NTIS
Antineutrinos; Neutral Currents; Neutrinos

20090030376 Stanford Linear Accelerator Center, CA, USA; Stanford Univ., CA, USA
Inverse-Transition Radiation Laser Acceleration Experiments at SLAC
Colby, E. R.; Noble, R. J.; Spencer, J. E.; Plettner, T.; Byer, R. L.; Jan. 16, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922208; SLAC-PUB-12754; No Copyright; Avail.: Department of Energy Information Bridge

We present a series of laser-driven particle acceleration experiments that are aimed at studying laser-particle acceleration as an inverse-radiation process. To this end we employ a semi-open vacuum setup with a thin planar boundary that interacts with the laser and the electromagnetic field of the electron beam. Particle acceleration from different types of boundaries will be studied and compared to the theoretical expectations from the Inverse-radiation picture and the field path integral method. We plan to measure the particle acceleration effect from transparent, reflective, black, and rough surface boundaries. While the agreement between the two acceleration pictures is straightforward to prove analytically for the transparent and reflective boundaries the equivalence is not clear-cut for the absorbing and rough-surface boundaries. Experimental observation may provide the evidence to distinguish between the models.
NTIS
Lasers; Particle Accelerators; Background Radiation

20090030377 Stanford Linear Accelerator Center, CA, USA; Chicago Univ., Chicago, IL USA
Proposed Dark Current Studies at the Argonne Wakefield Accelerator Facility
Antipov, S. P.; Power, J. G.; Spentzouris, L. K.; Gai, W.; Conde, M. E.; Jan. 18, 2008; 2 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922209; SLAC-PUB-13091; No Copyright; Avail.: Department of Energy Information Bridge

A study of dark currents has been initiated at the Argonne Wakefield Accelerator Facility (AWA). Emission of dark current

is closely related to a breakdown. Breakdown may include several factors such as local field enhancement, explosive electron emission, Ohmic heating, tensile stress produced by electric field, and others. The AWA is building a dedicated facility to test various models for breakdown mechanisms and to determine the roles of different factors in the breakdown. An imaging system is being put together to identify single emitters on the cathode surface. This will allow us to study dark current properties in the gun. We also plan to trigger breakdown events with a high-powered laser at various wavelengths (IR to UV). Another experimental idea follows from the recent work on a Schottky-enabled photoemission in an RF photoinjector that allows us to determine in situ the field enhancement factor on a cathode surface. Monitoring the field enhancement factor before and after can shed some light on a modification of metal surface after the breakdown.
NTIS
Dark Current; Lasers; Particle Accelerators; Plasma Currents; Trapping

20090030378 Stanford Linear Accelerator Center, CA, USA
Modification and Measurement of the Adjustable Permanent Magnet Quadrupole for the Final Focus in a Linear Collider
Kuroda, S.; Fujisawa, H.; Spencer, C. M.; Tauchi, T.; Okugi, T.; Jan. 18, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922210; SLAC-PUB-13090; No Copyright; Avail.: National Technical Information Service (NTIS)
An adjustable permanent magnet quadrupole has been developed for the final focus (FF) in a linear collider. Recent activities include a newly fabricated inner ring to demonstrate the strongest field gradient at a smaller bore diameter of 15mm and a magnetic field measurement system with a new rotating coil. The prospects of the R&D will be discussed.
NTIS
Adjusting; Particle Accelerators; Permanent Magnets; Quadrupoles

20090030379 Stanford Linear Accelerator Center, CA, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Optimization of the Low Loss SRF Cavity for the ILC
Sekutowicz, J. S.; Higo, T.; Ge, L.; Schussman, G. L.; Xiao, L.; Jan. 18, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922211; SLAC-PUB-13088; No Copyright; Avail.: National Technical Information Service (NTIS)
The Low-Loss shape cavity design has been proposed as a possible alternative to the baseline TESLA cavity design for the ILC main linacs. The advantages of this design over the TESLA cavity are its lower cryogenic loss, and higher achievable gradient due to lower surface fields. High gradient prototypes for such designs have been tested at KEK (ICHIRO) and TJNAF (LL). However, issues related to HOM damping and multipacting still need to be addressed. Preliminary numerical studies of the prototype cavities have shown unacceptable damping factors for some higher-order dipole modes if the typical TESLA HOM couplers are directly adapted to the design. The resulting wakefield will dilute the beam emittance thus reducing the machine luminosity. Furthermore, high gradient tests on a 9-cell prototype at KEK have experienced multipacting barriers although a single LL cell had achieved a high gradient. From simulations, multipacting activities are found to occur in the end-groups of the cavity. In this paper, we will present the optimization results of the end-groups for the Low-Loss designs for effective HOM damping and alleviation of multipacting.
NTIS
Cavities; Particle Accelerators

20090030382 Stanford Linear Accelerator Center, CA, USA
Analysis of the Costs of a Backlog Project in Response to Recommendation 2 of the 2004 Archives and History Office Program Review Committee Report
O'Hara, L.; Dec. 21, 2007; 24 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922220; SLAC-TN-07-030; No Copyright; Avail.: National Technical Information Service (NTIS)
SLAC Archives and History Office (AHO) backlog of unprocessed material is over 3,000 cubic feet and growing. Because much of this material was directly transferred to off-site storage, the provenance and contents are a mystery. The costs of off-site storage, lack of knowledge of the contents, and the impending federal regulations in 2009 concerning storage facilities all suggest the need for a long-term plan for the backlog.
NTIS
Cost Analysis; Costs; Documents; Linear Accelerators

20090030383 Stanford Linear Accelerator Center, CA, USA
Coreless Concept for High Gradient Induction Cell
Krasnykh, A.; Kardo-Sysoev, A.; Jan. 2008; 19 pp.; In English
Report No.(s): DE2008-922221; No Copyright; Avail.: Department of Energy Information Bridge
;Contents: Introduction; Items for Consideration; Accelerating Gradient in Induction Linacs; Analyze Ways How to Increase Gradient; High Gradient (HG) Cell based on Solid State Approaches; SLIM(Trade name): SLAC Induction Module (or Method); Conclusion.
NTIS
Gradients; Linear Accelerators; Particle Accelerators

20090030384 Stanford Linear Accelerator Center, CA, USA
Self Consistent Monte Carlo Method to Study CSR Effects in Bunch Compressors
Warnock, R. L.; Heinemann, K. A.; Bassi, G.; Ellison, J. A.; Jan. 08, 2008; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922222; SLAC-PUB-13072; No Copyright; Avail.: National Technical Information Service (NTIS)
In this paper we report on the results of a self-consistent calculation of CSR effects on a particle bunch moving through the benchmark Zeuthen bunch compressors. The theoretical framework is based on a 4D Vlasov-Maxwell approach including shielding from the vacuum chamber. We calculate the fields in the lab frame, where time is the independent variable, and evolve the phase space density/ points in the beam frame, where arc length, s, along a reference orbit, is the independent variable. Some details are given in, where we also discuss three approaches, the unperturbed source model (UPS), the self constistent Monte Carlo (SCMC) method and the method of local characteristics. Results for the UPS have been presented for 5 GeV before, here we compare them with our new results from the SCMC and study the 500MeV case. Our work using the method of characteristics is in progress.
NTIS
Compressors; Monte Carlo Method; Particle Accelerators

20090030528 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
SRF Materials Other than Niobium
Valente-Feliciano, A. M.; Feb. 2008; 11 pp.; In English
Report No.(s): DE2008-923426; No Copyright; Avail.: National Technical Information Service (NTIS)
For the past three decades, bulk niobium has been the material of choice for SRF cavity applications. Alternative materials, mainly Nb compounds and A15 compounds have been investigated with moderate effort in the past. In the recent years, RF cavity performance has approached the theoretical limit for bulk niobium. For further improvement of RF cavity performance for future accelerator projects, research interest is renewed towards alternative materials to niobium. A few laboratories around the world are now investigating superconductors with higher transition temperature Tc for application to SRF cavities. This paper gives an overview of the results obtained and challenges encountered for Nb compounds and A15 compounds, as well as for MgB2, for SRF cavity applications. An interesting alternative has been recently proposed by Alex Gurevich with the Superconductor-Insulator-Superconductor multilayer approach. This could potentially lead to further improvement in RF cavity performance using the benefit of the higher critical field Hc of higher-Tc superconductors without being limited with their lower Hc1.
NTIS
Radio Frequencies; SIS (Superconductors); Superconductors (Materials); Superconductivity

20090030529 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Recent XPS Studies of the Effect of Processing on NB SRF Surfaces
Tian, H.; Xiao, B.; Kelley, M. J.; Reece, C. E.; DeMasi, A.; Jan. 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923388; No Copyright; Avail.: National Technical Information Service (NTIS)
XPS studies have consistently shown that Nb surfaces for SRF chiefly comprise of a few nm of Nb2O5 on top of Nb metal, with minor amounts of Nb sub-oxides. Nb samples after BCP/EP treatment with post-baking at the various conditions have been examined by using synchrotron based XPS. Despite the confounding influence of surface roughness, certain outcomes are clear. Lower-valence Nb species are always and only associated with the metal/oxide interface, but evidence for an explicit layer structure or discrete phases is lacking. Post-baking without air exposure shows decreased oxide layer

thickness and increased contribution from lower valence species, but spectra obtained after subsequent air exposure cannot be distinguished from those obtained prior to baking, though the SRF performance improvement remains.
NTIS
Photoelectron Spectroscopy; X Ray Spectroscopy; Superconductivity; Superconductors (Materials)

20090030531 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Progress on Large Grain and Single Grain Niobium--Ingots and Sheet and Review of Progress on Large Grain and Single Grain Niobium Cavities
Kneisel, P.; Jan. 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923391; No Copyright; Avail.: National Technical Information Service (NTIS)

Large grain and single crystal niobium has been proposed several years ago as an alternative material to poly-crystalline niobium for superconducting cavities, exhibiting potential advantages such as 'stream-lined' procedures, reduced costs and better reproducibility in performance. Several major laboratories have investigated the use of large grain and single crystal material in the past years and the niobium producing industry has responded in providing ingot material with enlarged grain sizes. Besides a large number of single cell and multi-cell cavities from large grain niobium, several single crystal cavities have been fabricated and tested with good performances. This contribution will review the progress since the SRF workshop in 2005 in material processing and handling and in cavity performances.
NTIS
Grain Size; Niobium; Single Crystals; Superconductivity; Superconductors (Materials)

20090030532 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA; College of William and Mary, Newport News, VA, USA
Novel Characterization of the Electropolishing of Niobium with Sulfuric and Hydrofluoric Acid Mixtures
Tian, H.; Corcoran, S. G.; Kelley, M. J.; Reece, C. E.; Jan. 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2008-923387; No Copyright; Avail.: National Technical Information Service (NTIS)

Niobium surfaces are commonly electropolished in an effort to obtain optimally smooth surfaces for high-field SRF cavity applications. We report the first use of controlled electrochemical analysis techniques to characterize electropolishing of Nb in a sulfuric and hydrofluoric acid electrolyte. Through the use of a reference electrode we are able to clearly distinguish the anode, cathode polarization potentials as well as the electrolyte voltage drop that sum to the applied power supply voltage. We then separate the temperature and HF concentration dependence of each. We also report the first use of Electrochemical Impedance Spectroscopy (EIS) on this system. EIS results are consistent with a presence of a compact salt film at the Nb/electrolyte interface that is responsible for the limiting current. Microscopic understanding of the basic Nb EP mechanism is expected to provide an appropriate foundation with which to optimize the preparation of high-field niobium cavity surfaces. The implication of EIS for monitoring Nb surface during electropolishing shows this technology could be potentially used as a source of on-line feedback.
NTIS
Electropolishing; Hydrofluoric Acid; Niobium; Sulfuric Acid; Electrochemistry

20090030705 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Kharkov State Univ., Ukraine; Lebedev Physical Inst., Moscow, Russian Federation
Development of an Ultra-High Resolution Diffraction Grating for Soft X-Rays
Voronov, D. L.; Cambie, R.; Feshchenko, R. M.; Gullikson, E. M.; Padmore, H. A.; Jan. 2007; 12 pp.; In English
Report No.(s): DE2008-922858; No Copyright; Avail.: Department of Energy Information Bridge

Resonant Inelastic X-ray Scattering (RIXS) is the one of the most powerful methods for investigation of the electronic structure of materials, specifically of excitations in correlated electron systems. However the potential of the RIXS technique has not been fully exploited because conventional grating spectrometers have not been capable of achieving the extreme resolving powers that RIXS can utilize. State of the art spectrometers in the soft x-ray energy range achieve approx. 0.25 eV resolution, compared to the energy scales of soft excitations and superconducting gap openings down to a few meV. Development of diffraction gratings with super high resolving power is necessary to solve this problem. In this paper we study the possibilities of fabrication of gratings of resolving power of up to 106 for the 0.5 1.5KeV energy range. This energy range corresponds to all or most of the useful dipole transitions for elements of interest in most correlated electronic systems, i.e.,

oxygen K-edge of relevance to all oxides, the transition metal L2,3 edges, and the M4,5 edges of the rare earths. Various approaches based on different kinds of diffraction gratings such as deep-etched multilayer gratings, and multilayer coated echelettes are discussed. We also present simulations of diffraction efficiency for such gratings, and investigate the necessary fabrication tolerances.
NTIS
Gratings (Spectra); High Resolution; Inelastic Scattering; X Ray Scattering; X Rays

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

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

20090029983 Army Research Lab., Cleveland, OH USA
Heat Transfer Measurements for a Film Cooled Turbine Vane Cascade
Thurman, Douglas R.; Poinsatte, Philip E; Heidmann, James D; May 2008; 26 pp.; In English; See also 20090008669; Original contains color illustrations
Report No.(s): AD-A482412; ARL-MR-0697; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029983; http://hdl.handle.net/100.2/ADA482412

Experimental heat transfer and pressure measurements were obtained on a large scale film cooled turbine vane cascade. The objective was to investigate heat transfer on a commercial high pressure first stage turbine vane at near engine Mach and Reynolds number conditions. Additionally blowing ratios and coolant density were also matched. Numerical computations were made with the Glenn-HT code of the same geometry and compared with the experimental results. We used a transient thermochromic liquid crystal technique to obtain steady state heat transfer data on the mid-span geometry of an instrumented vane with 12 rows of circular and shaped film cooling holes. A mixture of SF6 and Argon gases was used for film coolant to match the coolant-to-gas density ratio of a real engine. The exit Mach number and Reynolds number were 0.725 and 2.7 million respectively. Trends from the experimental heat transfer data matched well with the computational prediction, particularly for the film cooled case.
Author
Film Cooling; Heat Transfer; Turbines; Vanes

20090030239 Fermi National Accelerator Lab., Batavia, IL, USA
Remarks on the Concept of Dispersion in a Curved Linac
Ostiguy, J. F.; Jan. 11, 2009; 7 pp.; In English
Report No.(s): DE2009-952027; FN-0829-APC; No Copyright; Avail.: Department of Energy Information Bridge

A next-generation linear collider is expected to span tens of kilometers in length. For various reasons, it may be desirable to house such an accelerator in a tunnel that follows the earth's curvature rather that in a 'laser-straight' tunnel. One side effect of opting for a curved linac is the introduction of vertical dispersion. In recent years, much work has been dedicated to understand and evaluate the impact of the presence of dispersion on emittance preservation. While performing simulations with our in-house code (CHEF) we observed a discrepancy between the dispersion function it produces and that computed using other codes in use within the accelerator community. Understanding the origin and the meaning of this discrepancy required a re-examination of the meaning of the concept of dispersion in the context of a linac. The object of this note is to document our findings. We establish that the default dispersion algorithm used by CHEF corresponds to a different, and ultimately more appropriate, definition of the dispersion in presence of acceleration. Not surprisingly, a consistent definition of dispersion restores agreement between codes.
NTIS
Linear Accelerators; Curvature; Dispersing

20090030282
Measurement of the Single Top Quark Production Cross Section in 1.96-TeV Proton-Antiproton Collisions
Nakamura, K.; [2009]; 157 pp.; In English
Report No.(s): DE2009-952637; UTPP-81; No Copyright; Avail.: National Technical Information Service (NTIS)

;Contents: Introduction (The Standard Model, The Top Quark, Parton Distribution Function and Production Cross Section, Single Top Production); Experimental Setup (The Tevatron, Proton Antiproton Production, The Collision and Luminosity, The

CDF II Detector, Data Acquisition System); Event Reconstruction (Tracking, Calorimeter Object, Jets, Missing Transverse Energy, Lepton Identification, Central Electrons, Plug Electrons, Triggered Muons, Untriggered Muons, Bottom-quark Jet Identification, SecVtx Algorithm, Jet-probability Algorithm, b-Tagging Efficiency, Mistag, Luminosity Calibration); Signal and Background Modeling (s-Channel Single Top, t-Channel Single top, Top Pair Production and Diboson, W+jets, Z+jets, QCD Multijets); Event Selection (Trigger, Lepton selection, Jet Multiplicity Selection, Missing Transverse Energy, Event Veto, PHX QCD Multijet Veto, b-Tagging); Background Estimation (Signal expectation and MC Based Background Estimation, QCD Multijet and W+jets Background Estimation, Event Yield Prediction); Optimized Search for s-Channel Single Top Production 59 (Kinematic Solver, b-Jet Energy Correction, Likelihood-Based Separator of Signal from Background, Systematic Uncertainties, Expected Sensitivity and Hypothesis Test); Results and Discussions (Results in s-channel analysis, Results in s- and t-channel analysis); Conclusion; A Shape Comparison for the Control Sample; B Shape Systematic Uncertainties; References.
NTIS
Particle Collisions; Proton-Antiproton Interactions; Quarks; Quantum Chromodynamics

20090030308 Fermi National Accelerator Lab., Batavia, IL, USA; IIT Research Inst., Chicago, IL, USA
Coupling Interaction Between the Power Coupler and the Third Harmonic Superconducting Cavity
Li, J.; Solyak, N.; Wong, T.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922007; FERMILAB-CONF-07-295-TD; No Copyright; Avail.: Department of Energy Information Bridge

Fermilab has developed a third harmonic superconducting cavity operating at the frequency of 3.9 GHz to improve the beam performance for the FLASH user facility at DESY. It is interesting to investigate the coupling interaction between the SRF cavity and the power coupler with or without beam loading. The coupling of the power coupler to the cavity needs to be determined to minimize the power consumption and guarantee the best performance for a given beam current. In this paper, we build and analyze an equivalent circuit model containing a series of lumped elements to represent the resonant system. An analytic solution of the required power from the generator as a function of the system parameters has also been given based on a vector diagram.
NTIS
Cavities; Harmonic Generations; Superconductivity; Couplers; Coupling

20090030310 Fermi National Accelerator Lab., Batavia, IL, USA
Experimental and Simulation Studies of Beam-beam Compensation with Tevatron Electron Lenses
Kamerdzhiev, V.; Zhang, X. L.; Alexahin, Y.; Shiltsen, V.; Valsthev, A.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922012; FERMILAB-CONF-07-229-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Initially the Tevatron Electron Lenses (TELs) were intended for compensation of the beam-beam effect on the antiproton beam. Owing to recent increase in the number of antiprotons and reduction in their emittance, it is the proton beam now that suffers most from the beam-beam effect. We present results of beam studies, compare them with the results of computer simulations using LIFETRAC code and discuss possibilities of further improvements of the Beam-Beam Compensation efficiency in the Tevatron.
NTIS
Electron Optics; Lenses; Particle Accelerators; Simulation; Beam Interactions

20090030311 Fermi National Accelerator Lab., Batavia, IL, USA; Daresbury Lab., UK; Lancaster Univ., UK
Power Coupler for the ILC Crab Cavity
Burt, B.; Beard, C.; Jenkins, R.; Dexter, A.; Maintosh, P. A.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922017; FERMILAB-CONF-07-471-E; No Copyright; Avail.: Department of Energy Information Bridge

The ILC crab cavity will require the design of an appropriate power coupler. The beam-loading in dipole-mode cavities is considerably more variable than accelerating cavities, hence simulations have been performed to establish the required

external Q. Simulations of a suitable coupler were then performed and were verified using a normal conducting prototype with variable coupler tips.
NTIS
Cavities; Couplers; Particle Accelerators

20090030312 Fermi National Accelerator Lab., Batavia, IL, USA; Brookhaven National Lab., Upton, NY USA; Birmingham Univ., UK; Lancaster Univ., UK
Design of the Beam Delivery System for the International Linear Collider
Seryi, A.; Armann, J.; Arnold, R.; Asiri, F.; Fasso, A.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922021; FERMILAB-CONF-07-473; No Copyright; Avail.: National Technical Information Service (NTIS)

The beam delivery system for the linear collider focuses beams to nanometer sizes at its interaction point, collimates the beam halo to provide acceptable background in the detector and has a provision for state-of-the art beam instrumentation in order to reach the ILCs physics goals. This paper describes the design details and status of the baseline configuration considered for the reference design and also lists alternatives.
NTIS
Linear Accelerators; Beamforming; Beams (Radiation)

20090030314 Fermi National Accelerator Lab., Batavia, IL, USA; Argonne National Lab., IL USA; OMEGA-P, Inc., New Haven, CT, USA
Conceptual Design of an L-Band Recirculating Superconducting Traveling Wave Accelerating Structure for ILC
Avrakhov, F.; Gai, W.; Liu, Z.; Soylak, N.; Kazaikov, S.; Jun. 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922023; FERMILAB-CONF-07-254-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

There is an active neutrino program making use of the high-energy (larger than 50 GeV) accelerators both in USA at Fermilab with NuMI and at CERN in Europe with CNGS. In this paper we will review the prospects for high intensity high energy beams in those two locations during the next decade.
NTIS
Neutrinos; Superconductivity; Ultrahigh Frequencies; Particle Accelerators

20090030315 Fermi National Accelerator Lab., Batavia, IL, USA
Review of Recent Tevatron Operations
Moore, R. S.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922025; FERMILAB-CONF-07-270-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

There is an active neutrino program making use of the high-energy (larger than 50 GeV) accelerators both in USA at Fermilab with NuMI and at CERN in Europe with CNGS. In this paper we will review the prospects for high intensity high energy beams in those two locations during the next decade.
NTIS
Neutrinos; Particle Accelerators

20090030316 Fermi National Accelerator Lab., Batavia, IL, USA; OMEGA-P, Inc., New Haven, CT, USA; Yale Univ., New Haven, CT, USA; Argonne National Lab., IL USA
Conceptual Design of an L-Band Recirculating Superconducting Traveling Wave Accelerating Structure for ILC
Avrakhov, P.; Liu, Z.; Akoviev, Y.; Kanareykin, A.; Kazaikev, S.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922026; FERMILAB-CONF-07-254-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Fermilab's Tevatron proton-antiproton collider continues to improve its luminosity performance at the energy frontier vs = 1.96 TeV. The recent Tevatron operation will be reviewed and notable tasks leading to advancements will be highlighted.

The topics to be covered include: work performed during the 14-week shutdown in 2006, improved helical orbits, automatic orbit stabilization during high-energy physics (HEP) stores, optics corrections, improvements in the quench protection system, and avenues to maximizing the integrated luminosity delivered to the CDF and D0 experiments.
NTIS
Particle Accelerators; Proton-Antiproton Interactions; Superconductivity; Ultrahigh Frequencies

20090030328 Fermi National Accelerator Lab., Batavia, IL, USA
Development of 3D Beam-Beam Simulation for the Tevatron
Stern, E.; Ryne, R.; Quiang, J.; Amudson, J.; Spentzouns, P.; Jun. 01, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922045; FERMILAB-CONF-07-280-AD-CD; No Copyright; Avail.: Department of Energy Information Bridge

We present status of development of a 3D Beam-Beam simulation code for simulating the Fermilab Tevatron collider. The essential features of the code are 3D particle-in-cell Poisson solver for calculating the Beam-Beam electromagnetic interactions with additional modules for linear optics, machine impedance and chromaticity, and multiple bunch tracking. The simulations match synchrobetatron oscillations measured at the VEPP-2M collider. The impedance calculations show beam instability development consistent with analytic expressions.
NTIS
Electromagnetic Interactions; Particle Accelerators; Simulation; Beam Interactions

20090030333 Fermi National Accelerator Lab., Batavia, IL, USA; Brookhaven National Lab., Upton, NY USA
8 GeV H- Multi-Turn Injection System for the Fermilab Main Injector
Johnson, D. E.; Yoon, P.; Liaw, C. J.; Raparia, D.; Bebee-Wang, J.; Jun. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76CH03000
Report No.(s): DE2008-922006; FERMILAB-CONF-07-287-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

An 8 GeV superconducting linear accelerator (SCL) has been proposed as a single stage H- injector into the Main Injector (MI) synchrotron . This would be the highest energy H- multi-turn injection system in the world. The conceptual design of an injection system has been further refined by addressing transverse phase space painting issues, chicane dipole fields and foil location, foil temperature issues, and initial longitudinal phase space painting simulations. We present the current state of design.
NTIS
Injection; Injectors; Linear Accelerators; Superconductivity; Synchrotrons

20090030366 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Existence of Mesons After Deconfinement
Brau, F.; Buisseret, F.; Dec. 2007; 12 pp.; In English
Report No.(s): PB2008-108728; MAS-E0718; Copyright; Avail.: National Technical Information Service (NTIS)

We investigate the possibility for a quark-antiquark pair to form a bound state at temperatures higher than the critical one ($T>T(underline)c$), thus after deconfinement. Our main goal is to find analytical criteria constraining the existence of such mesons. Our formalism relies on a Schrodinger equation for which we study the physical consequences of both using the free energy and the internal energy as potential term, assuming a widely accepted temperature-dependent Yukawa form for the free energy and a recently proposed nonperturbative form for the screening mass. We show that using the free energy only allows for the $1S$ bottomonium to be bound above $T(underline)c$, with a dissociation temperature around $1.5 times T(underline)c$. The situation is very different with the internal energy, where we show that no bound states at all can exist in the deconfined phase. But, in this last case, quasi-bound states could be present at higher temperatures because of a positive barrier appearing in the potential.
NTIS
Mesons; Plasmas (Physics); Free Energy

20090030375; Brookhaven National Lab., Upton, NY USA
Constraints on rhobar, etabar from B to K*pi
Gronau, M.; Soni, A.; Pirjol, D.; Zupan, J.; Jan. 14, 2008; 5 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922206; SLAC-PUB-13022; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
High Energy Interactions; Standard Model (Particle Physics); Quantum Chromodynamics

20090030390 Fermi National Accelerator Lab., Batavia, IL, USA; Lancaster Univ., UK; Zurich Univ., Switzerland
Precision Measurement of a Particle Mass at the Linear Collider
Milstene, C.; Freitas, A.; Schmitt, M.; Sopczak, A.; January 2007; 7 pp.; In English
Report No.(s): DE2008-919937; FERMILAB-CONF-07-184-E; No Copyright; Avail.: National Technical Information Service (NTIS)
Precision measurement of the stop mass at the ILC is done in a method based on cross-sections measurements at two different center-of-mass energies. This allows to minimize both the statistical and systematic errors. In the framework of the MSSM, a light stop, compatible with electro-weak baryogenesis, is studied in its decay into a charm jet and neutralino, the Lightest Supersymmetric Particle(LSP), as a candidate of dark matter. This takes place for a small stop-neutralino mass difference.
NTIS
Particle Mass; Precision; Supersymmetry

20090030442 Stanford Linear Accelerator Center, CA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
B to (rho/omega)gamma at BaBar
Koeneke, K.; Jan. 2008; 207 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF0015
Report No.(s): DE2008-923304; SLAC/R-891; No Copyright; Avail.: National Technical Information Service (NTIS)
This document describes the measurements of the branching fractions and isospin violations of the radiative electroweak penguin decays B (yields) ((rho)/(omega))(gamma) at the asymmetric-energy e(sup +)e(sup -) PEP-II collider with the BABAR detector. Together with the previously measured branching fractions of the decays B (yields) K*(gamma) the ratio of CKM-matrix elements 'V(sub td)/V(sub ts)' are extracted and the length of the far side of the unitarity triangle is determined.
NTIS
Isotopic Spin; CP Violation

20090030447 Michigan State Univ., East Lansing, MI, USA
Measurement of the Top Quark's Charge
Uoenalan, Z. G.; Jan. 2007; 242 pp.; In English
Report No.(s): DE2008-923065; No Copyright; Avail.: National Technical Information Service (NTIS)
The top quark was discovered in 1995 at the Fermilab National Accelerator Laboratory (Fermilab). One way to conrm if the observed top quark is really the top quark posited in the Standard Model (SM) is to measure its electric charge. In the Standard Model the top quark is the isospin partner of the bottom quark and is expected to have a charge of +2/3. However, an alternative 'exotic' model has been proposed with a fourth generation exotic quark that has the same characteristics, such as mass, as our observed top but with a charge of -4/3. This thesis presents the rst CDF measurement of the top quark's charge via its decay products, a W boson and a bottom quark, using approx. 1 fb(sup 1) of data.
NTIS
Quarks; Electric Charge; Standard Model (Particle Physics)

20090030536 Stanford Linear Accelerator Center, CA, USA
Search for B+ to K+ Nu and Anti-Nu
Jackson, P. D.; Jan. 2007; 163 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922227; SLAC-R-889; No Copyright; Avail.: National Technical Information Service (NTIS)
A search for the rare, flavour-changing neutral current decay B(sup +) (yields) K(sup +) (nu)(bar (nu)) is presented using

81.9 fb(sup -1) of data collected at the (Upsilon)(4S) resonance by the BABAR experiment. Signal candidate events are selected through the identification of a high momentum charged kaon and significant missing energy, where the companion B(sup -) in the event has decayed semileptonically via B(sup -) (yields) D(sup 0)(ell)(sup -)(bar (nu)) X and X is kinematically constrained to be either nothing or a low momentum transition photon or (pi)(sup 0). The analysis was performed blind and 6 candidates were selected with a background expectation of 3.4 (+-) 1.2. This leads to a limit on the branching fraction of (Beta) (B(sup +) (yields) K(sup +) (nu)(bar (nu))) < 7.2 x 10(sup -5) at 90% confidence level. We also search for the reaction B(sup +) (yields) (pi)(sup +)(nu)(bar (nu)) and extract a limit on the branching fraction of (Beta)(B(sup +) (yields) (pi)(sup +)(nu)(bar (nu))) < 2.5 x 10(sup -4) at 90% confidence level.
NTIS
Kaons; Mesons; Particle Decay; Antineutrinos; Neutrinos

20090030537 Stanford Linear Accelerator Center, CA, USA
Study of Factorization and a Measurement of CP Violation
Dahmes, B.; Dec. 2006; 220 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922228; SLAC-R-888; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on a study of the decay (bar B)(sup 0) (yields) D*(sup +) (omega)(pi)(sup -) with the BABAR detector at the PEP-II B-factory at the Stanford Linear Accelerator Center. Based on a sample of 232 million B(sup 0)(bar B)(sup 0) decays collected between 1999 and 2004, we measure the branching fraction (Beta)((bar B)(sup 0) (yields) D*(sup +) (omega)(pi)(sup -)) = (2.88 (+-) 0.21(stat.) (+-) 0.31(syst.)) x 10(sup -3). We study the invariant mass spectrum of the (omega)(pi)(sup -) system in this decay. This spectrum is in good agreement with expectations based on factorization and the measured spectrum in (tau)(sup -) (yields) (omega)(pi)(sup -) (nu)(sub (tau)). We also measure the polarization of the D*(sup +) as a function of the (omega)(pi)(sup -) mass. In the mass region 1.1 to 1.9 GeV we measure the fraction of longitudinal polarization of the D*(sup +) to be (Lambda)(sub L)/(Lambda) = 0.654 (+-) 0.042(stat.) (+-) 0.016(syst.). This is in agreement with the expectations from heavy-quark effective theory and factorization assuming that the decay proceeds as (bar B)(sup 0) (yields) D*(sup +) (rho)(1450)(sup -), (rho)(1450)(sup -) (yields) (omega)(pi)(sup -). Furthermore, we present the results on the time-dependent CP asymmetry in neutral B meson decays to the CP eigenstate J/(psi)K(sub L). The measurements use a data sample of about 88 million (Upsilon)(4S) (yields) B(bar B) decays collected between 1999 and 2002 with the BABAR detector. We study events in which one neutral B meson is fully reconstructed in the J/(psi)K(sub L) final state and the other B meson is determined to be either a B(sup 0) or a (bar B)(sup 0) from its decay products. The amplitude of the CP asymmetry, which in the Standard Model is proportional to sin 2(beta), is derived from the decay-time distributions in such events. We measure sin 2(beta) = 0.723 (+-) 0.158(stat.) (+-) 0.086(syst.), which is consistent with Standard Model expectations.
NTIS
CP Violation; Factorization; Particle Decay

20090030538 Stanford Linear Accelerator Center, CA, USA
Simultaneous Measurement of the Branching Fractions of Ten B to Double Charm Decays
Khim Lae, C.; Jan. 2007; 161 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922229; SLAC-R-875; No Copyright; Avail.: National Technical Information Service (NTIS)

Since the dawn of civilization, man has wondered about the building blocks of nature: Is the world made of some elementary particles that cannot be divided further. What are these particles and how do we build matter from them. Are there rules that govern the behavior of these particles. For more than 2000 years, we have been pursuing the answers to these questions. Today, physicists have a picture of the fundamental world. This picture is called the Standard Model.
NTIS
Mesons; Standard Model (Particle Physics); Particle Decay

20090030747 Brookhaven National Lab., Upton, NY USA
Recent Lattice Results on Finite Temperature and Density QCD \, Part 1
Karsch, F.; Jul. 2007; 13 pp.; In English; 4th International Workshop on Critical Point and Onset of Deconfinement, GSI, 9-13 Jul. 2007, Darmstadt, Germany
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921920; BNL-79531-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We discuss recent progress made studies of bulk thermodynamics of strongly interacting matter through lattice

simulations of QCD with an almost physical light and strange quark mass spectrum. We present results on the QCD equation of state at vanishing and non-vanishing quark chemical potential and show first results on baryon number and strangeness fluctuations, which might be measured in event-by-event fluctuations in low energy runs at RHIC as well as at FAIR.
NTIS
Quantum Chromodynamics; Simulation; Thermodynamics

20090030748 Brookhaven National Lab., Upton, NY USA
Strageness Production as a Function of System Size and Energy at RHIC
Lamont, M. A.; Jul. 2007; 7 pp.; In English; HEP 2007 International Europhysics Conference on High Energy Physics, 19-25 Jul. 2007, Manchester, UK
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-921919; BNL-79526-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we report on strangeness measurements in p+p, Au+Au and Cu+Cu collisions at different energies in the STAR detector at RHIC. We will focus on two momentum regions in particular: Firstly we look at strangeness enhancement in A+A collisions with respect to p+p. These yields are dominated by low transverse momentum. We compare the enhancements from Au+Au and Cu+Cu data at (radical)s(sub NN) = 200 GeV with Pb+Pb data at (radical)s(sub NN) = 17.2 GeV and find that the enhancement does not scale with N(sub part) as expected, but rather scales with N(sub part)(sup 1/3), where N(sub part) represents the number of participants; We then examine (Lambda)/K(sub S)(sup 0) ratios at intermediate transverse momentum in both Au+Au and Cu+Cu data where we find a greater enhancement in Cu+Cu compared to Au+Au data when we compare integrated ratios between 1.5 < p(sub T) < 3.5 GeV/c.
NTIS
Elementary Particles; Strangeness; Elementary Particle Interactions

20090030798 Stanford Linear Accelerator Center, CA, USA; Rome Univ., Rome, Italy
Time Dependent CP Asymmetries and Branching Ratio Measurements in Charmless Three Body B Decays at BABAR
Di Marco, E.; Jul. 17, 2007; 355 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922604; SLAC-R-864; No Copyright; Avail.: National Technical Information Service (NTIS)

The existing theory of fundamental sub-atomic particle interactions (the Standard Model) accounts for a difference in the interactions between matter and anti-matter through a phenomenon known as CP violation. From this model we can derive how such a difference leads to the dominance of matter in the Universe. From experiments of the past and, with larger accuracy from modern experiments, such as the B-factories, this difference has been found to be smaller, by orders of magnitude, than the observed matter asymmetry in the Universe. This is one of the most evident inconsistencies of the Standard Model in describing the fundamental laws that lead to the actual Universe.
NTIS
Asymmetry; Particle Interactions; Time Dependence; CP Violation; Universe; Standard Model (Particle Physics); Matter (Physics)

20090031000 Fermi National Accelerator Lab., Batavia, IL, USA; Stanford Linear Accelerator Center, CA, USA
Parallel Code for Lifetime Simulations in Hadron Storage Rings in the Presence of Parasitic Beam-Beam Interactions
Kabel, A.; Cai, Y.; Erdelyi, B.; Sen, T.; Jan. 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00515
Report No.(s): DE2008-925786; SLAC/PUB-13170; No Copyright; Avail.: National Technical Information Service (NTIS)

The usual approach to predict particle loss in storage rings in the presence of nonlinearities consists in the determination of the dynamic aperture of the machine. This method, however, will not directly predict the lifetimes of beams. We have developed a code which can, by parallelization and careful speed optimization, predict lifetimes in the presence of 100 parasitic beam-beam crossings by tracking > 10(exp 10) particles-turns. An application of this code to the anti-proton lifetime in the Tevatron at injection is discussed.
NTIS
Beam Interactions; Hadrons; Simulation; Storage Rings (Particle Accelerators)

20090031004 Fermi National Accelerator Lab., Batavia, IL, USA
Parallel Simulation Algorithms for the Three-Dimensional Strong-Strong Beam-Beam Interaction
Kabel, A. C.; Jan. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00515
Report No.(s): DE2008-925787; SLAC/PUB-13169; No Copyright; Avail.: National Technical Information Service (NTIS)

The strong-strong beam-beam effect is one of the most important effects limiting the luminosity of ring colliders. Little is known about it analytically, so most studies utilize numeric simulations. The two-dimensional realm is readily accessible to workstation-class computers (cf.,e.g.,(1, 2)), while three dimensions, which add effects such as phase averaging and the hourglass effect, require vastly higher amounts of CPU time. Thus, parallelization of three dimensional simulation techniques is imperative; in the following we discuss parallelization strategies and describe the algorithms used in our simulation code, which will reach almost linear scaling of performance vs. number of CPUs for typical setups.
NTIS
Algorithms; Beam Interactions; Luminosity

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20090030148 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Jefferson Lab Accelerator Operations Training and Development Program
Epps, M. A.; Jan. 23, 2008; 13 pp.; In English
Contract(s)/Grant(s): AC05-06OR23177
Report No.(s): DE2008-922271; JLAB-ACO-07-768; DOE/OR/23177-0290; No Copyright; Avail.: Department of Energy Information Bridge

The mission of the Jefferson Lab Operations Group is to provide safe and efficient delivery of high quality electron beam for Jefferson Laboratory's nuclear and accelerator physics programs. The Operations staff must be able to setup, transport, maintain, and troubleshoot beam to all three experimental halls in a safe, efficient, and expeditious manner. Due to the nature of shift work, high employee turnover is always as issue. This creates a unique situation where highly trained staff members must quickly be produced and maintained in order to meet the needs of the Laboratory. Some methods used to address this problem will be presented here.
NTIS
Education; Electron Beams; Personnel; Laboratories

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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*.

20090030112 National Inst. of Building Sciences, Washington, DC, USA
Flood Information Tool User Manual. Revision 7
Apr. 01, 2003; 104 pp.; In English
Report No.(s): PB2008-106011; No Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Emergency Management Agency (FEMA), under a cooperative agreement with the National Institute of Building Sciences (NIBS), has developed a standardized, nationally-applicable natural hazards loss estimation methodology. This methodology is implemented through PC-based geographic information system (GIS) software called HAZUSMH. HAZUSMH applies a multi-hazard methodology, with models for estimating potential losses from earthquake, flood (riverine and coastal), and wind (hurricanes) hazards. The flood loss estimation methodology consists of two basic analytical processes: flood hazard analysis and flood loss estimation analysis. Flood hazards in the FIT are divided into riverine and coastal. In the riverine hazard module, characteristics such as frequency, discharge, and terrain elevation are used to model the spatial variation in flood elevation and flood depth. In the coastal hazard module, characteristics such as frequency, stillwater elevations, wave conditions, and terrain information are used to model the spatial variation in flood-induced erosion, flood elevation, and flood depth. The Flood Information Tool (FIT) is an ArcGIS extension designed to process user-supplied flood

hazard data into the format required by the HAZUSMH Flood Model. The FIT, when given user-supplied inputs (e.g., ground elevations, flood elevations, and floodplain boundary information), computes the extent, depth and elevation of flooding for riverine and coastal hazards.
NTIS
Disasters; Estimating; Floods; Hazards; Losses; Flood Damage

20090030114 Geological Survey, Denver, CO USA; Scofield Business Services, Denver, CO, USA
Database of Geoscientific References Through 2007 for Afghanistan, Version 2
Eppinger, R. G.; Sipeki, J.; Scofield, M. L.; Jan. 2007; 12 pp.; In English
Report No.(s): PB2008-106931; USGS/OFR-2007-1297; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes an accompanying database of geoscientific references for the country of Afghanistan. The reference compilation is part of a larger joint study of Afghanistan's energy, mineral, and water resources, and geologic hazards, currently underway by the U.S. Geological Survey, the British Geological Survey, and the Afghanistan Geological Survey. The compilation of geoscientific references was initially planned to contain only mineral-resource-related references. However, the effort soon grew to encompass references related to water resources, energy resources, geologic hazards, and other geoscientific disciplines. Version 1 of the reference database (Eppinger and Sipeki, 2006) contained 1,157 published and 168 unpublished references, and was available online only. The superseding version 2 was compiled through September 2007, and the number of published references is more than doubled at over 2,400.
NTIS
Afghanistan; Data Bases; Surveys

20090030117 Government Accountability Office, Washington, DC, USA
Environmental Protection: EPA Needs to Ensure That Best Practices and Procedures Are Followed When Making Further Changes to Its Library Network
Feb. 2008; 60 pp.; In English
Report No.(s): PB2008-107337; GAO-08-304; No Copyright; Avail.: CASI: A04, Hardcopy

Established in 1971, the Environmental Protection Agency's (EPA) library network provides staff and the public with access to environmental information. Its 26 libraries contain a wide range of information and resources and are located at headquarters, regional offices, research centers, and laboratories nationwide. In 2006, EPA issued a plan to reorganize the network beginning in fiscal year 2007. The plan proposed closing libraries and dispersing, disposing of, and digitizing library materials. GAO was asked to assess (1) the status of, and plans for, the network reorganization; (2) EPA's rationale for reorganizing the network; (3) the extent to which EPA has communicated with and solicited the views of EPA staff and external stakeholders in conducting the reorganization; (4) EPA's steps to maintain the quality of library services after the reorganization; and (5) how EPA is funding the network and its reorganization. For this study, GAO reviewed pertinent EPA documents and interviewed EPA officials and staff from each of the libraries.
NTIS
Environment Protection; Libraries; Management Planning; Procedures

20090030119 Minority Business Development Agency, Washington, DC USA
Minority Exporters: A Resource Guide '99
Jan. 1999; 239 pp.; In English
Report No.(s): PB2008-107640; No Copyright; Avail.: CASI: A11, Hardcopy

Aggressive internationalization and the globalization of markets have heightened attention to the export challenge and spawned a growing array of export assistance services designed to help even the smallest businesses become global competitors. Some of these initiatives are new and untested; others are well established. There are so many initiatives it is difficult to navigate through the maze of them to get to what is needed. The Minority Exporters: A Resource Guide O99 is a navigational tool to help minority firms identify different resources for different needs. It anticipates some of the critical questions minority-owned firms have about the export process, regardless of their overall development, and provides a comprehensive reference guide of sources of information and assistance for firms.
NTIS
International Trade; Market Research

20090030126 Farm Credit Administration, McLean, VA, USA
Farm Credit Administration Agreed-Upon Procedures: GISRA Review
Aug. 31, 2001; 33 pp.; In English
Report No.(s): PB2008-108035; No Copyright; Avail.: CASI: A03, Hardcopy

FCA is an independent agency in the executive branch of the U. S. Government. It is responsible for the regulation and examination of the banks, associations, and related entities that collectively comprise what is known as the Farm Credit System (System). FCA promulgates regulations to implement the Farm Credit Act of 1971, and examines System institutions for compliance with the Act, regulations, and safe and sound banking practices. The Farm Credit Administration has approximately 300 employees. The Agency headquarters are in McLean, Virginia. It has field examination offices in McLean, Virginia; Bloomington, Minnesota; Dallas, Texas; Denver, Colorado; and Sacramento, California. Mission critical systems are defined as any telecommunications or information system used or operated by an agency or by a contractor of an agency, or organization on behalf of an agency that processes any information, the loss, misuse, disclosure, or unauthorized access to or modification of, would have a debilitating impact on the mission of an agency.
NTIS
Agriculture; Security

20090030146 Health Resources and Services Administration, Bethesda, MD, USA
Public Health and Information Technology at the USA-Mexico Border: Examples Show Potential
Feb. 2007; 63 pp.; In English
Report No.(s): PB2008-108318; No Copyright; Avail.: National Technical Information Service (NTIS)

This report will explore the current status of HIT technologies in the USA-Mexico border region. The region is characterized by predominantly frontier geography; dynamic and diverse populations; special health care needs with relatively poor access to health services; and relatively poor access to broadband information networks. This context creates unique challenges, opportunities, and uncertainties for the deployment of HIT by public health and healthcare agencies within the region. Examples of State, county, and local efforts to improve quality of care using HIT in public health organizations will be drawn from California, Arizona, New Mexico, and Texas in the U.S.; integration with public health efforts in the Mexican States of Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas will also be considered.
NTIS
Health; Information Systems; Public Health; United States

20090030174 Texas A&M Univ., College Station, TX USA
Development of a Database for Surface Energy of Aggregates and Asphalt Binders
Howson, J.; Bhasin, A.; Masad, E.; Lytton, R.; Little, D.; Jul. 2009; 76 pp.; In English
Report No.(s): PB2009-113222; REPT-5-4524-01-1; No Copyright; Avail.: CASI: A05, Hardcopy

TxDOT project 0-4524 evaluated the influence of surface energy of aggregates and binders on the resistance of asphalt mixtures to moisture damage. The results from this research lead to the development of a threetier approach to assess the moisture damage resistance of asphalt mixtures. This approach is based on testing and evaluating the physical and/or mechanical properties of the constituent materials, the fine aggregate mixture, and full asphalt mixture. In the first tier, an energy-based parameter termed the energy ratio (ER) is calculated using the surface energy measurements. This parameter is used as a screening tool to select binders and aggregates that have good resistance to moisture damage. The second and third tiers rely on measuring the mechanical properties of the fine aggregate mixture and full asphalt mixture, respectively. This report documents the results of an implementation project of the testing methods and analysis approaches of the 0-4524 project. This implementation project included (a) providing training on the developed experimental and analysis methods, (b) conducting measurements of the surface energy of binders, additives, and aggregates, and (c) developing a database of surface energy measurements. This database will be useful as a diagnostic tool for finding the cause of poor moisture damage resistance in mixes and to suggest remedies through modification with anti-strip agents, lime, polymers, other additives, or through a change of materials in extreme cases.
NTIS
Aggregates; Asphalt; Binders (Materials); Data Bases; Surface Energy

20090030253 Government Accountability Office, Washington, DC, USA
Grants Management: Grants.gov Has Systemic Weaknesses That Require Attention
Jul. 2009; 47 pp.; In English
Report No.(s): PB2009-113243; GAO-09-589; No Copyright; Avail.: CASI: A03, Hardcopy

In response to the Federal Financial Assistance Management Improvement Act of 1999, the Office of Management and

Budget (OMB), among other things, developed Grants.gov as the central grant identification and application portal for federal grant programs. OMB oversees the initiative and named the Department of Health and Human Services (HHS) its managing partner. Grants.gov officials have acknowledged noticeably degraded system performance, and grantees have reported difficulties submitting applications that have in some cases led to late or incomplete submissions and lost opportunities for both grantees and populations served. Through analysis of agency documents, a Web-based survey of federal grant-making officials, and interviews with agency officials and grantee associations, this requested report examines (1) the benefits of Grants.gov and applicant experiences with submitting applications, (2) the governance structure of Grants.gov, and (3) the range of agency policies for processing Grants.gov applications. Grants.gov has made it easier for applicants to find grant opportunities and grantors to process applications faster, but applicants continue to describe difficulties registering with and using Grants.gov, which sometimes result in late submissions. Grants.gov customer service staff do not always resolve these issues, especially during off-peak hours and peak submission periods. Clear roles and responsibilities for the Grants.gov oversight entities and coordination among them are critical, yet insufficient, and there are no written policies for how these entities are to work with each other.
NTIS
Financial Management; Policies; Medical Services

20090030396 SRI International Corp., Menlo Park, CA USA
Political, Military, Economic, Social, Infrastructure, Information (PMESII) Effects Forecasting for Course of Action (COA) Evaluation
Lawrence, John D.; Murdock, Janet L.; Jun 2009; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-08-C-0104; FA8750-06-C-0071; Proj-459S
Report No.(s): AD-A501499; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA501499

Comprehensive effects-based planning requires that diplomatic, information, military, and economic (DIME) options be considered, along with their potential impacts on the political, military, economic, social, infrastructure, and information (PMESII) environment. Given that the cause-effect relationships among these are not well understood, modeling these relationships and using them to forecast plausible outcomes is a challenging technical problem. This effort developed a Probative Rapid Interactive Modeling Environment (PRIME) software tool for effects forecasting to support analysts and strategy planners in allowing them to directly explore the full range of consequences associated with candidate courses of action (COAs). The full chain of reasoning, from actions taken, to intended and unintended effects, is explained through narratives, grounded in explanations of modeled cause-effect relationships. The models themselves are directly accessible and modifiable by those engaged in the strategy planning.
DTIC
Economics; Forecasting; Software Development Tools

20090030424 Minority Business Development Agency, Washington, DC USA
Federal Datalink: A Guide to Federal County-Level Data
Stoops, N.; Sep. 1999; 100 pp.; In English
Report No.(s): PB2008-107739; No Copyright; Avail.: CASI: A05, Hardcopy

Federal Datalink is a guide to Federal county-level data and was prepared by the U.S. Census Bureau, Population Division with funding support from the Minority Business Development Agency (MBDA), Department of Commerce. The purpose of this guide is to collect and document available county-level statistical data from the U.S. Census Bureau and other Federal Agencies for years since 1980. Inclusion in this guide was determined, in part, by consideration of each datasets relevance to the interests and needs of the MBDA. In particular, this guide includes demographic data and other data that have been cross-classified by race and Hispanic origin or include race detail. Historical data products pertaining to specific datasets included in this guide may be available prior to 1980, but are not covered by the scope of this guide. Also, the primary focus of the Federal Datalink is to provide information on data produced by Federal agencies that is available at the county-level and is available in electronic form (e.g., CD-ROM, tape, and/or downloadable files). Hence, county-level datasets only available in printed form are not included, with the exception of selected 1980s datasets for which later versions are available in electronic format. Users of this guide should be aware that all of the links and information contained in this document are current as of April 1999 and are subject to change.
NTIS
Census; Data Links

20090030429 Commerce Dept., Washington, DC, USA; Department of Education, Washington, DC, USA; Information Technology Association of America, Arlington, VA, USA; California Univ., Berkeley, CA USA

Sampling of Paartnership Programs that Address the Information Technology Skills Gap

Jan. 1998; 59 pp.; In English; National Information Technology Workforce Convocation held on January 12-13-, 1998 at Bekeley, CA, 12-13 Jan. 1998, Berkeley, CA, USA

Report No.(s): PB2008-105772; No Copyright; Avail.: CASI: A04, Hardcopy

The Applied Information Management Institute (AIM) is a membership organization supporting and promoting business growth related to Information Technology. AIM was created in 1992 as a 501(c) (3) non-profit corporation. Members are representatives from major interest groups including: Corporate members (provide financial support-both in cash and in-kind); Academic members; Greater Omaha Chamber of Commerce; and Nebraska Department of Economic Development. AIM was created following several studies addressing future economic development for the Greater Omaha area. These studies had one common theme-Information Technology is key to future economic development. AIM's structure, governance, and mission arose from these studies.

NTIS

Economic Development; Information Management; Information Systems; Management Planning; Sampling

20090030465 Congressional Research Service, Washington, DC, USA

Security Classification Policy and Procedure: E.O.12958, As Amended (June 4, 2009)

Kosar, K. R.; Jun. 04, 2009; 11 pp.; In English

Report No.(s): PB2009-113123; No Copyright; Avail.: CASI: A03, Hardcopy

Largely prescribed in a series of successive presidential executive orders issued over the past 50 years, security classification policy and procedure provide the rationale and arrangements for designating information officially secret for reasons of national security, and for its declassification as well. President Franklin D. Roosevelt issued the first executive order (E.O. 8381) in 1940. Current security classification policy may be found in Executive Order 12958, which was signed by President William Clinton on April 17, 1995. It prescribes a uniform system for classifying, safeguarding, and declassifying national security information. As issued, E.O. 12958 declared, If there is significant doubt about the need to classify information, it shall not be classified. Additionally, the order stated If there is significant doubt about the appropriate level of classification, it shall be classified at the lower level. President George W. Bush amended Executive Order 12958 via Executive Order 13292 on March 25, 2003. E.O. 13292 made many changes to E.O. 12958, and eliminated both of the aforementioned significant doubt provisions. On May 27, 2009, President Barack Obama ordered a review of E.O. 12958. The assistant to the President for National Security Affairs (commonly known as the National Security Advisor) is required to submit to the President recommendations and proposed revisions to E.O. 12958 within 90 days. This report will be updated to reflect further presidential or congressional action.

NTIS

Classifications; Policies; Security; United States

20090030580 Tennessee Univ., Knoxville, TN USA

Advanced Computing Architectures for Cognitive Processing

Peterson, Gregory D.; Jul. 2009; 123 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-1-0185; Proj-459T

Report No.(s): AD-A502522; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the research results of the Advanced Computing Architectures for Cognitive Processing project. Cognitive processing algorithms promise to transform Air Force mission capabilities if practical, deployable systems can be created. Advanced computing architectures based on approaches such as polygranular parallel processing (e.g., high performance reconfigurable computing), data intensive systems (e.g., processors in memory or intelligent RAM), configurable/morphable processors, DNA computing, and quantum computing could make embedded cognitive processing feasible. Given the diverse new computational technologies that are now emerging, this report presents an assessment of the effectiveness of various types of computational architectures for cognitive processing for Air Force systems acquisition.

DTIC

Architecture (Computers); Cognition; Data Processing; Information Systems

20090030670 Air Force Research Lab., Mesa, AZ USA
Behavioral and Psychosocial Considerations in Intelligence Analysis: A Preliminary Review of Literature on Critical Thinking Skills
Tam, Chin K.; Mar 2009; 17 pp.; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A502215; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502215

As a response to Air Combat Command (ACC/A2RT), the 711HPW/RHAS reviewed published literature on critical thinking skills and training to enhance skills as they relate to improving performance of intelligence analysts. While there are many critical training curriculums available in the intelligence community, current literature shows a lack of empirical evidence correlating critical thinking and intelligence analysis. This report suggests some considerations for an effective critical thinking curriculum as it relates to intelligence analysis.
DTIC
Education; Intelligence; Leadership; Surveys

20090030730 Federal Emergency Management Agency, Washington, DC USA
Using and Obtaining NFIP (National Flood Insurance Program) Maps and Data
Sep. 2007; 48 pp.; In English
Report No.(s): PB2008-107829; No Copyright; Avail.: National Technical Information Service (NTIS)

This document advises customers how to find FEMA flood hazard products and use them to locate the required information.
NTIS
Data Bases; Floods; Insurance (Contracts)

20090030751 National Defense Univ., Washington, DC USA
Computer Science Research Funding: How Much Is Too Little?
Zimet, Elihu; Starr, Stuart; Lau, Clifford; Ghosh, Anup; Jun. 2009; 23 pp.; In English
Report No.(s): AD-A502135; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA502135

A study of the historical and planned level of Department of Defense (DoD) funding in computer science (CS) research from the 2001-2011 DoD records has provided a top-level view of the current status of investment in this foundational technology. This study was triggered by university and Congressional concern that DoD has been reducing its investment in CS research. The study focused on two issues. First, has DoD CS funding to universities changed substantially year-to-year? Second, what was the trend in DoD funding of CS (e.g., absolute funding and ratio of CS funding to total science and technology (S&T) funding)? While the funding database provided by DoD agencies and components was limited, the study found that DoD maintains a significant and stable investment in CS and the related areas of information science (IS) and network and information technology (NIT). Overall, CS/IS/NIT constitutes 17.4 percent of the entire DoD science and technology (S&T) funding base. While top-line DoD funding shows out-year growth, a primary finding of this study is that the focus of the DoD research investment in NIT has shifted from basic research to more applied DoD applications. It remains to be seen whether the shift from basic CS research funding to applied research and advanced technology development in NIT will result in the kind of fundamental advances in technology enabled by an earlier generation of funding in CS research. However, total funding in NIT research and development from all Federal agencies has grown to over three billion dollars in 2008, with DoD contributing about a third. Current hindrances to academic research in DoD-sponsored NIT research have had the effect of limiting university participation in some DoD contracts and grant programs. These obstacles include prepublication review, International Traffic in Arms Regulations (ITAR) restrictions, and short milestones for go/no-go decisions for program continuation.
DTIC
Computer Networks; Defense Program; Information Systems; Military Technology; Research and Development; Universities

20090030776 Texas A&M Univ., College Station, TX USA
Hamburg Wheel-Tracking Database Analysis
Yildirim, Y.; Jayawickrama, P. W.; Hossain, M. S.; Alhabshi, A.; Yildirim, C.; Nov. 2007; 150 pp.; In English
Report No.(s): PB2008-107693; UTATTI-REPT-0-1707-7; No Copyright; Avail.: National Technical Information Service (NTIS)

This report outlines statistical analyses done to investigate whether the Hamburg wheel-tracking device (HWTD) can be

used to validate durability tests such as the magnesium sulfate soundness (MSS) and Micro-Deval tests. Researchers manipulated and merged the Hamburg test database and aggregate properties database of the Texas Department of Transportation (TxDOT) to provide the basis for statistical analysis. The qualitative visual examinations of plots of aggregate properties and Hamburg wheel-tracking device performance, based on soundness resistance, suggest that MSS and Micro-Deval tests do not correlate well with Hamburg test results. However, single variable correlations between aggregate properties and Hamburg test performance indicate that both soundness and Deval tests have weak correlation with Hamburg test performance in that appropriate trends could be observed with final Hamburg results (deformation or number of wheel passes). These findings suggest that aggregate durability has some influence on the performance of the bituminous mix in the Hamburg test. The effects of aggregate, binder grade, mix type, and additive on HWTD results were also evaluated. The HWTD test parameters investigated included rutting, slope of the rutting curve, and the area beneath the rutting curve at specific cycles. Based on the results of the analysis, it was observed that the dominant factors influencing Hamburg test performance are those that stiffen the mix, particularly stiffer performance grades (PG) and additives such as lime.
NTIS
Aggregates; Data Bases; Pavements; Wheels

20090030777 Alaska Dept. of Transportation and Public Facilities, Anchorage, AK, USA
Alaska Department of Transportation & Public Facilities Intelligent Specialty Vehicle System Pilot Program Report
Mar. 26, 2007; 13 pp.; In English
Report No.(s): PB2008-107231; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents a project overview, challenges and lessons learned from implementation of Intelligent Specialty Vehicle System (ISVS) technologies at the Alaska Department of Transportation & Public Facilities. In completing the assessment process, we reviewed the planning, procurement and implementation process used in completing the ISVS pilot project.
NTIS
Transportation; Smart Materials

20090031785 Government Accountability Office, Washington, DC, USA
Highlights of a Forum Convened By the Comptroller General of the USA. Improving the Federal Government's Financial Management Systems
Apr. 2008; 56 pp.; In English
Report No.(s): PB2008-108281; GAO-08-447SP; No Copyright; Avail.: CASI: A04, Hardcopy

Since the enactment of key financial management reforms, such as the Chief Financial Officers (CFO) Act of 1990 and the Federal Financial Management Improvement Act of 1996 (FFMIA), the federal government has devoted significant resources to improving financial management activities and practices. At the same time, continuing attention is needed to address persistent, long-standing accountability problems and to redefine success for federal financial management. Successfully implementing financial management systems has been a particular challenge to the federal government. Many agency financial management systems do not routinely produce the accurate, timely, and meaningful information needed for management decision making. This forum brought together knowledgeable and recognized financial management leaders from the federal government, including the CFO, Chief Information Officer, and Inspector General communities, and selected other officials with extensive experience in financial management from both the public and private sectors. The forum addressed (1) the future of federal financial management, (2) applying lessons learned from federal financial management system implementations, and (3) strategies for transforming federal financial management culture. These highlights do not necessarily represent the views of the organizations that the participants represent, including GAO.
NTIS
Governments; Management Systems; Systems Management; United States

20090031786 National Inst. for Occupational Safety and Health, Washington, DC, USA
Guidelines for the Development of a New Miner Training Curriculum
Vaught, C.; Mallett, L. G.; Jan. 2008; 30 pp.; In English
Report No.(s): PB2008-108288; DHHS/PUB/NIOSH-2008-105; No Copyright; Avail.: CASI: A03, Hardcopy

This report is intended to help mine safety trainers better prepare to teach the influx of new underground coal miners who are entering the industry. This is done by identifying two different approaches to instruction and discussing the ways they may affect how well prepared new hires are to deal with a dynamic and hazardous workplace. One approach is based on the use

of a syllabus. Those using a syllabus are more likely to rely on lecturing or direct instruction. This is a good way to get across factual information, but does not provide a context within which miners can fit the discrete facts so that they form an integrated whole set of concepts, principles, and skills. The other approach is based on the use of a curriculum. Those using a curriculum may be more likely to help miners integrate concepts and skills that give them an overall picture of the complex mining environment and how they fit into the workplace. This will better prepare them for the decision-making and problem-solving activities that will help them work safely and productively.
NTIS
Education; Mining

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20090030080 NASA Johnson Space Center, Houston, TX, USA
Controlling Infrastructure Costs: Right-Sizing the Mission Control Facility
Martin, Keith; Sen-Roy, Michael; Heiman, Jennifer; [2009]; 3 pp.; In English; SpaceOps 2010, 25 - 30 Apr. 2010, Hunstville, AL, USA
Report No.(s): JSC-CN-18696; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090030080

Johnson Space Center's Mission Control Center is a space vehicle, space program agnostic facility. The current operational design is essentially identical to the original facility architecture that was developed and deployed in the mid-90's. In an effort to streamline the support costs of the mission critical facility, the Mission Operations Division (MOD) of Johnson Space Center (JSC) has sponsored an exploratory project to evaluate and inject current state-of-the-practice Information Technology (IT) tools, processes and technology into legacy operations. The general push in the IT industry has been trending towards a data-centric computer infrastructure for the past several years. Organizations facing challenges with facility operations costs are turning to creative solutions combining hardware consolidation, virtualization and remote access to meet and exceed performance, security, and availability requirements. The Operations Technology Facility (OTF) organization at the Johnson Space Center has been chartered to build and evaluate a parallel Mission Control infrastructure, replacing the existing, thick-client distributed computing model and network architecture with a data center model utilizing virtualization to provide the MCC Infrastructure as a Service. The OTF will design a replacement architecture for the Mission Control Facility, leveraging hardware consolidation through the use of blade servers, increasing utilization rates for compute platforms through virtualization while expanding connectivity options through the deployment of secure remote access. The architecture demonstrates the maturity of the technologies generally available in industry today and the ability to successfully abstract the tightly coupled relationship between thick-client software and legacy hardware into a hardware agnostic 'Infrastructure as a Service' capability that can scale to meet future requirements of new space programs and spacecraft. This paper discusses the benefits and difficulties that a migration to cloud-based computing philosophies has uncovered when compared to the legacy Mission Control Center architecture. The team consists of system and software engineers with extensive experience with the MCC infrastructure and software currently used to support the International Space Station (ISS) and Space Shuttle program (SSP).
Author
Space Missions; Ground Based Control; Costs; Integrated Mission Control Center; Deployment; Information Systems

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.

20090030554 Department of Energy, Washington, DC, USA
Research Experience with a Plug-In Hybrid Electric Vehicle: Preprint
Markel, T.; Thornton, M.; Nortman, P.; Kelly, K.; Pesaran, A.; Dec. 01, 2007; 15 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922555; NREL/CP-540-42365; No Copyright; Avail.: National Technical Information Service (NTIS)

This technical document reports on the exploratory research conducted by NREL on PHEV technology using a Toyota

Prius that has been converted to a plug-in hybrid electric vehicle. The data includes both controlled dynamometer and on-road test results, particularly for hilly driving. The results highlight the petroleum savings and benefits of PHEV technology.
NTIS
Experimentation; Electric Automobiles; Fuel Consumption; Energy Requirements

20090030557 Department of Energy, Washington, DC, USA
Assessment of Thermal Control Technologies for Cooling Electric Vehicle Power Electronics
O'Keefe, M.; Kelly, K.; Bennion, K.; Abraham, T.; Bharathan, D.; Jan. 01, 2008; 20 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922552; NREL/CP-540-42267; No Copyright; Avail.: National Technical Information Service (NTIS)

NREL is assessing thermal control technologies to improve the thermal performance of power electronics devices for electric vehicles, while reducing the cost, weight, and volume of the system.
NTIS
Cooling; Electric Motor Vehicles; Technology Assessment; Temperature Control

20090030559 Department of Energy, Washington, DC, USA
Feasibility of Thermoelectrics for Waste Heat Recovery in Hybrid Vehicles: Preprint
Smith, K.; Thornton, M.; Dec. 01, 2007; 14 pp.; In English
Contract(s)/Grant(s): AC36-99-GO10337
Report No.(s): DE2008-922548; NREL/CP-540-42256; No Copyright; Avail.: National Technical Information Service (NTIS)

Using advanced materials, thermoelectric conversion of efficiencies on the order of 20% may be possible in the near future. Thermoelectric generators offer potential to increase vehicle fuel economy by recapturing a portion of the waste heat from the engine exhaust and generating electricity to power vehicle accessory or traction loads.
NTIS
Waste Energy Utilization; Waste Heat; Thermoelectric Generators; Automobiles

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*.

20090029998 NASA Johnson Space Center, Houston, TX, USA
International Space Station Science Research Accomplishments During the Assembly Years: An Analysis of Results from 2000-2008
Evans, Cynthia A.; Robinson, Julie A.; Tate-Brown, Judy; Thumm, Tracy; Crespo-Richey, Jessica; Baumann, David; Rhatigan, Jennifer; June 2009; 262 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2009-213146-REVA; S-978; JSC-CN-17592; Copyright; Avail.: CASI: A12, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090029998

This report summarizes research accomplishments on the International Space Station (ISS) through the first 15 Expeditions. When research programs for early Expeditions were established, five administrative organizations were executing research on ISS: bioastronautics research, fundamental space biology, physical science, space product development, and space flight. The Vision for Space Exploration led to changes in NASA's administrative structures, so we have grouped experiments topically by scientific themes human research for exploration, physical and biological sciences, technology development, observing the Earth, and educating and inspiring the next generation even when these do not correspond to the administrative structure at the time at which they were completed. The research organizations at the time at which the experiments flew are preserved in the appendix of this document. These investigations on the ISS have laid the groundwork for research planning for Expeditions to come. Humans performing scientific investigations on ISS serve as a model for the goals of future Exploration missions. The success of a wide variety of investigations is an important hallmark of early research on ISS. Of

the investigations summarized here, some are completed with results released, some are completed with preliminary results, and some remain ongoing.
Author
Bioastronautics; International Space Station; Research Facilities; Exobiology; Expeditions

20090030081 NASA Johnson Space Center, Houston, TX, USA
Observations of Crew Dynamics During Mars Analog Simulations
Cusack, Stacy L.; [2009]; 1 pp.; In English; NASA Project Manage Challenge 2010, 9-10 Feb. 2010, Galveston, TX, USA
Report No.(s): JSC-CN-18698; No Copyright; Avail.: Other Sources; Abstract Only

Crewmembers on Mars missions will face new and unique challenges compared to those in close communications proximity to Mission Control centers. Crews on Mars will likely become more autonomous and responsible for their day-to-day planning. These explorers will need to make frequent real time decisions without the assistance of large ground support teams. Ground-centric control will no longer be an option due to the communications delays. As a result of the new decision making model, crew dynamics and leadership styles of future astronauts may become significantly different from the demands of today. As a volunteer for the Mars Society on two Mars analog missions, this presenter will discuss observations made during isolated, surface exploration simulations. The need for careful crew selections, not just based on individual skill sets, but on overall team interactions becomes apparent very quickly when the crew is planning their own days and deciding their own priorities. Even more important is the selection of a Mission Commander who can lead a team of highly skilled individuals with strong and varied opinions in a way that promotes crew consensus, maintains fairness, and prevents unnecessary crew fatigue.
Author
Mars Missions; Analog Simulation; Real Time Operation; Management Methods; Decision Making; Crews

20090031829 NASA Dryden Flight Research Center, Edwards, CA, USA
Student Opportunities with NASA
Bird, John J.; Waggoner, Erin R.; July 27, 2009; 38 pp.; In English; EAA AireVenture Oshkosh 2009, 27 Jul. - 2 Aug. 2009, Oshkosh, WI, USA; Original contains color illustrations
Report No.(s): DFRC-1043; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090031829

The presentation is intended to interest the next generation in joining the NASA workforce and to inspire them to pursue careers in science and technology and with NASA.
Derived from text
Education; Aerospace Sciences; Technology Utilization; NASA Programs

20090031832 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Onboard Detection of Active Canadian Sulfur Springs: A Europa Analogue
Castano, Rebecca; Wagstaff, Kiri; Gleeson, Damhnait; Pappalardo, Robert; Chien, Steve; Tran, Daniel; Scharenbroich, Lucas; Moghaddam, Baback; Tang, Benyang; Bue, Brian; Doggett, Thomas; Mandl, Dan; Frye, Stuart; February 26, 2008; 8 pp.; In English; International Symposium on Artificial Intelligence, Robotics, and Automation in Space, 26 Feb. 2008, Los Angeles, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41375

We discuss a current, ongoing demonstration of insitu onboard detection in which the Earth Observing-1 spacecraft detects surface sulfur deposits that originate from underlying springs by distinguishing the sulfur from the ice-rich glacial background, a good analogue for the Europan surface. In this paper, we describe the process of developing the onboard classifier for detecting the presence of sulfur in a hyperspectral scene, including the use of a training/testing set that is not exhaustively labeled, i.e.not all true positives are marked, and the selection of 12, out of 242, Hyperion instrument wavelength bands to use in the onboard detector. This study aims to demonstrate the potential for future missions to capture short-lived science events, make decisions onboard, identify high priority data for downlink and perform onboard change detection. In the future, such capability could help maximize the science return of downlink bandwidth-limited missions, addressing a significant constraint in all deep-space missions.
Author
Change Detection; Earth Observing System (EOS); Europa; Sulfur; Glaciers; Classifiers; Deep Space

89
ASTRONOMY

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

20090030394 National Renewable Energy Lab., Golden, CO USA
Solar Position Algorithm for Solar Radiation Application
Reda, I.; Andereas, A.; Jan. 01, 2008; 56 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO1010337
Report No.(s): DE2008-15003974; NREL/TP-560-34302; No Copyright; Avail.: Department of Energy Information Bridge

This report is a step-by-step procedure for implementing an algorithm to calculate the solar zenith and azimuth angles in the period from the year -2000 to 6000, with uncertainties of +/- 0.0003 deg. It is written in a step-by-step format to simplify otherwise complicated steps, with a focus on the sun instead of the planets and stars in general. The algorithm is written in such a way to accommodate solar radiation applications.
NTIS
Algorithms; Solar Position; Solar Radiation

20090031802 NASA Johnson Space Center, Houston, TX, USA
Photometric Studies of GEO Debris
Seitzer, Patrick; Cowardin, Heather M.; Barker, Edwin; Abercromby, Kira J.; Foreman, Gary; Horstman, Matt; [2009]; 8 pp.; In English; 10th Annual AMOS Conference, 1 - 4 Sep. 2009, Maui, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNJ05HI05C; C036-HY00-0100 -ODO
Report No.(s): JSC-CN-18803; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090031802

The photometric signature of a debris object can be useful in determining what the physical characteristics of a piece of debris are. We report on optical observations in multiple filters of debris at geosynchronous Earth orbit (GEO). Our sample is taken from GEO objects discovered in a survey with the University of Michigan's 0.6-m aperture Schmidt telescope MODEST (for Michigan Orbital DEbris Survey Telescope), and then followed up in real-time with the SMARTS (Small and Medium Aperture Research Telescope System) 0.9-m at CTIO for orbits and photometry. Our goal is to determine 6 parameter orbits and measure colors for all objects fainter than R = 15 th magnitude that are discovered in the MODEST survey. At this magnitude the distribution of observed angular rates changes significantly from that of brighter objects. There are two objectives: 1. Estimate the orbital distribution of objects selected on the basis of two observational criteria: brightness (magnitude) and angular rates. 2. Obtain magnitudes and colors in standard astronomical filters (BVRI) for comparison with reflectance spectra of likely spacecraft materials. What is the faint debris likely to be? In this paper we report on the photometric results. For a sample of 50 objects, more than 90 calibrated sequences of R-B-V-I-R magnitudes have been obtained with the CTIO 0.9-m. For objects that do not show large brightness variations, the colors are largely redder than solar in both B-R and R-I. The width of the color distribution may be intrinsic to the nature of the surfaces, but also could be that we are seeing irregularly shaped objects and measuring the colors at different times with just one telescope. For a smaller sample of objects we have observed with synchronized CCD cameras on the two telescopes. The CTIO 0.9-m observes in B, and MODEST in R. The CCD cameras are electronically linked together so that the start time and duration of observations are the same to better than 50 milliseconds. Thus the B-R color is a true measure of the surface of the debris piece facing the telescopes for that observation. Any change in color reflects a real change in the debris surface.
Author
Geosynchronous Orbits; Photometry; Space Debris; Observatories; Telescopes

20090031828 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Astrometric Planet Searches with SIM PlanetQuest
Beichman, Charles A.; Unwin, Stephen C.; Shao, Michael; Tanner, Angelle M.; Catanzarite, Joseph H.; March, Geoffrey W.; Proceedings IAU Symposium 248 - A Giant Step: From Milli- to Micro- Arcsecond Astrometry; October 15, 2007; No. 248; 6 pp.; In English; IAU Symposium 248 - A Giant Step: From Milli- to Micro- Arcsecond Astrometry, 15 - 19 Oct. 2007, Shanghai, China; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41383

SIM will search for planets with masses as small as the Earth's orbiting in the habitable zones' around more than 100 of

the stars and could discover many dozen if Earth-like planets are common. With a planned 'Deep Survey' of 100-450 stars (depending on desired mass sensitivity) SIM will search for terrestrial planets around all of the candidate target stars for future direct detection missions such as Terrestrial Planet Finder and Darwin, SIM's 'Broad Survey' of 2010 stars will characterize single and multiple-planet systems around a wide variety of stellar types, including many now inaccessible with the radial velocity technique. In particular, SIM will search for planets around young stars providing insights into how planetary systems are born and evolve with time.
Author
Astrometry; Planetary Systems; Terrestrial Planets; Stars; Habitability; SIM; Planets

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ASTROPHYSICS

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

20090030491 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Probing the Accretion Disk and Central Engine Structure of the NGC 4258 with Suzaku and XMM-Newton Observations
Reynolds, Christopher S.; Nowak, Michael A.; Markoff, Sera; Tueller, Jack; Wilms, Joern; Young, Andrew; Astrophysical Journal; February 02, 2009; Volume 691, pp. 1159-1167; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX07AE97G; NNX06AI35G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1088/0004-637X/691/2/1159

We present an X-ray study of the low-luminosity active galactic nucleus (AGN) in NGC 4258 using data from Suzaku, XMM-Newton, and the Swift/Burst Alert Telescope survey. We find that signatures of X-ray reprocessing by cold gas are very weak in the spectrum of this Seyfert-2 galaxy; a weak, narrow fluorescent K(alpha) emission line of cod iron is robustly detected in both the Suzaku and XMM-Newton spectra but at a level much below that of most other Seyfert-2 galaxies. We conclude that the circumnuclear environment of this AGN is very 'clean' and lacks the Compton-thick obscuring torus of unified Seyfert schemes. From the narrowness of the iron line, together with evidence of line flux variability between the Suzaku and XMM-Newton observations, we constrain the line emitting region to be between 3 x 10(exp 3)r(sub g) and 4 x 10(exp 4)r(sub g), from the black hole. We show that the observed properties of the iron line can be explained if the line originates from the surface layers of a warped accretion disk. In particular, we present explicit calculations of the expected iron line from a disk warped by Lens-Thirring precession from a misaligned central black hole. Finally, the Suzaku data reveal clear evidence of large amplitude 2-10 keV variability on timescales of 50 ksec and smaller amplitude flares on timescales as short as 5-10 ksec. If associated with accretion disk processes, such rapid variability requires an origin in the innermost regions of the disk (r approx. equals 10(r(sub g) or less). Analysis of the difference spectrum between a high- and low-flux states suggests that the variable component of the X-ray emission is steeper and more absorbed than the average AGN emission, suggesting that the primary X-ray source and absorbing screen have a spatial structure on comparable scales. We note the remarkable similarity between the circumnuclear environment of NGC 4258 and another well studied low-luminosity AGN, M81*.
Author
Accretion Disks; Active Galactic Nuclei; Black Holes (Astronomy); Swift Observatory; Seyfert Galaxies; X Ray Sources; Emission

20090030535 Stanford Linear Accelerator Center, CA, USA; Kyoto Univ., Japan; Kyoto Univ., Uji, Japan
New Prospects for High-Energy Neutrinos from Gamma-Ray Bursts
Murase, K.; Nagataki, S.; Jan. 09, 2008; 2 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-922226; SLAC-PUB-13077; No Copyright; Avail.: Department of Energy Information Bridge

High-energy neutrinos from Gamma-Ray Bursts (GRBs) have been expected since the pre-Swift era. Such signals may be detected by future large neutrino detectors such as IceCube. Recently Swift has shown several novel phenomena. We suggest the new prospects for high-energy neutrino emission in the Swift era. Expected signals, if detected, are useful for revealing of the nature of GRBs.
NTIS
Gamma Ray Bursts; Neutrinos; Gamma Ray Astronomy

20090030680 Stanford Linear Accelerator Center, CA, USA; Observatoire Economique Provence-Alpes-Cote d'Azur, France; Musashi Inst. of Tech., Tokyo, Japan; Japan Aerospace Exploration Agency, Tokyo, Japan
Wide-Range Multiwavelength Observations of Northern TeV Blazars With MAGIC / HESS, Suzaku And KVA
Hayashida, M.; Rugamer, S.; Tavecchio, F.; Wagner, S.; Mazin, D.; Nov. 14, 2007; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-919793; SLAC-PUB-12993; No Copyright; Avail.: Department of Energy Information Bridge

We have conducted multiwavelength observations of several northern TeV blazars employing the ground-based (pi)-ray observatories MAGIC and HESS, the optical KVA telescope, and the Suzaku X-ray satellite. The data taken in 2006 establish measurements of the contemporaneous spectral energy distributions of the rapidly variable blazar emission over a wide range of frequencies. Results allow us to test leptonic and hadronic emission and particle acceleration models which predict different correlations between the optical, X-ray, and very high enery (pi)-ray emissions. In this presentation, we report on the highlights of the results of these observations.
NTIS
Astrophysics; Blazars; Satellites; X Ray Telescopes

20090030703 Stanford Linear Accelerator Center, CA, USA
Parametric Model for Astrophysical Proton-Proton Interactions and Applications
Karlsson, N.; Jan. 2007; 149 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-922952; SLAC-R-890; No Copyright; Avail.: Department of Energy Information Bridge

Observations of gamma-rays have been made from celestial sources such as active galaxies, gamma-ray bursts and supernova remnants as well as the Galactic ridge. The study of gamma rays can provide information about production mechanisms and cosmic-ray acceleration. In the high-energy regime, one of the dominant mechanisms for gamma-ray production is the decay of neutral pions produced in interactions of ultra-relativistic cosmic-ray nuclei and interstellar matter. Presented here is a parametric model for calculations of inclusive cross sections and transverse momentum distributions for secondary particles--gamma rays, e(sup (+-)), (nu)(sub e), (bar (nu))(sub e), (nu)(sub (mu)) and (bar (nu))(sub (mu))--produced in proton-proton interactions. This parametric model is derived on the proton-proton interaction model proposed by Kamae et al.; it includes the diffraction dissociation process, Feynman-scaling violation and the logarithmically rising inelastic proton-proton cross section. To improve fidelity to experimental data for lower energies, two baryon resonance excitation processes were added; one representing the (Delta)(1232) and the other multiple resonances with masses around 1600 MeV/c(sup 2). The model predicts the power-law spectral index for all secondary particle to be about 0.05 lower in absolute value than that of the incident proton and their inclusive cross sections to be larger than those predicted by previous models based on the Feynman-scaling hypothesis. The applications of the presented model in astrophysics are plentiful. It has been implemented into the Galprop code to calculate the contribution due to pion decays in the Galactic plane. The model has also been used to estimate the cosmic-ray flux in the Large Magellanic Cloud based on HI, CO and gamma-ray observations. The transverse momentum distributions enable calculations when the proton distribution is anisotropic. It is shown that the gamma-ray spectrum and flux due to a pencil beam of protons varies drastically with viewing angle. A fanned proton jet with a Gaussian intensity profile impinging on surrounding material is given as a more realistic example. As the observer is moved off the jet axis, the peak of the spectrum is moved to lower energies.
NTIS
Astrophysics; Nucleon-Nucleon Interactions; Protons

20090030710 Stanford Linear Accelerator Center, CA, USA
Cosmological Constant as a Manifestation of the Hierarchy
Chen, P.; Gu, P. A.; Dec. 21, 2007; 4 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2008-921281; SLAC-PUB-13062; No Copyright; Avail.: Department of Energy Information Bridge

There has been the suggestion that the cosmological constant as implied by the dark energy is related to the well-known hierarchy between the Planck scale, M(sub PI), and the Standard Model scale, M(sub SM). Here we further propose that the

same framework that addresses this hierarchy problem must also address the smallness problem of the cosmological constant. Specifically, we investigate the minimal supersymmetric (SUSY) extension of the Randall-Sundrum model where SUSY-breaking is induced on the TeV brane and transmitted into the bulk. We show that the Casimir energy density of the system indeed conforms with the observed dark energy scale.
NTIS
Cosmology; Flux Density; Hierarchies; Supersymmetry

20090031010 Fermi National Accelerator Lab., Batavia, IL, USA; European Organization for Nuclear Research, Geneva, Switzerland
Cosmic Neutrinos
Quigg, C.; Jan. 2007; 27 pp.; In English
Report No.(s): DE2008-925921; FERMILAB-CONF-07-417-T; No Copyright; Avail.: National Technical Information Service (NTIS)

I recall the place of neutrinos in the electroweak theory and summarize what we know about neutrino mass and flavor change. I next review the essential characteristics expected for relic neutrinos and survey what we can say about the neutrino contribution to the dark matter of the Universe. Then I discuss the standard-model interactions of ultrahigh-energy neutrinos, paying attention to the consequences of neutrino oscillations, and illustrate a few topics of interest to neutrino observatories. I conclude with short comments on the remote possibility of detecting relic neutrinos through annihilations of ultrahigh-energy neutrinos at the Z resonance.
NTIS
Neutrinos; Oscillations; Dark Matter; Electroweak Model

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*.

20090031830 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Qualification Testing of Engineering Camera and Platinum Resistance Thermometer (PRT) Sensors for Mars Science Laboratory (MSL) Project under Extreme Temperatures to Assess Reliability and to Enhance Mission Assurance
Ramesham, Rajeshuni; Maki, Justin N.; Cucullu, Gordon C.; January 19, 2008; 10 pp.; In English; SPIE Photonics West - MEMS-MOEMS, 22 - 24 Jan. 2008, San Jose, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/41382

Package Qualification and Verification (PQV) of advanced electronic packaging and interconnect technologies and various other types of qualification hardware for the Mars Exploration Rover/Mars Science Laboratory flight projects has been performed to enhance the mission assurance. The qualification of hardware (Engineering Camera and Platinum Resistance Thermometer, PRT) under extreme cold temperatures has been performed with reference to various project requirements. The flight-like packages, sensors, and subassemblies have been selected for the study to survive three times (3x) the total number of expected temperature cycles resulting from all environmental and operational exposures occurring over the life of the flight hardware including all relevant manufacturing, ground operations and mission phases. Qualification has been performed by subjecting above flight-like qual hardware to the environmental temperature extremes and assessing any structural failures or degradation in electrical performance due to either overstress or thermal cycle fatigue. Experiments of flight like hardware qualification test results have been described in this paper.
Author
Mars Exploration; Resistance Thermometers; Performance Tests; Electronic Packaging; Subassemblies; Thermal Fatigue; Cameras; Proving; Structural Failure

20090031834 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Visual Feedback for Rover-based Coring

Backes, Paul; Helmick, Daniel; Bajracharya, Max; February 26, 2008; 7 pp.; In English; 9th International Symposium on Artificial Intelligence, Robotics and Space, 26 Feb. 2009, Los Angeles, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/41369

Technology for coring from a low-mass rover has been developed to enable core sample acquisition where a planetary rover experiences moderate slip during the coring operation. A new stereo vision technique, Absolute Motion Visual Odometry, is used to measure rover slip during coring and the slip is accommodated through corresponding arm pose updating. Coring rate is controlled by feedback of themeasured force of the coring tool against the environment. Test results in the JPL Marsyard show for the first time that coring from a low-mass rover with slip is feasible.

Author

Roving Vehicles; Planetary Surfaces; Stereoscopic Vision; Cores

20090031836 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Reconnaissance Orbiter In-flight Anomalies and Lessons Learned: An Update

Bayer, Todd J.; March 1, 2008; 11 pp.; In English; 2008 IEEE Aerospace Conference, 1 - 8 Mar. 2008, Big Sky, MT, USA; Original contains color illustrations

Report No.(s): IEEEAC paper 1086; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/41373

The Mars Reconnaissance Orbiter mission has as its primary objectives: advance our understanding of the current Mars climate, the processes that have formed and modified the surface of the planet and the extent to which water has played a role in surface processes; identify sites of possible aqueous activity indicating environments that may have been or are conducive to biological activity; and thus identify and characterize sites for future landed missions; and provide forward and return relay services for current and future Mars landed assets. MRO's crucial role in the long term strategy for Mars exploration requires a high level of reliability during its 5.4 year mission. This requires an architecture which incorporates extensive redundancy and cross-strapping. Because of the distances and hence light-times involved, the spacecraft itself must be able to utilize this redundancy in responding to time-critical failures. For cases where fault protection is unable to recognize a potentially threatening condition, either due to known limitations or software flaws, intervention by ground operations is required. These aspects of MRO's design were discussed in a previous paper [Ref. 1]. This paper provides an update to the original paper, describing MRO's significant in-flight anomalies over the past year, with lessons learned for redundancy and fault protection architectures and for ground operations.

Author

Mars Reconnaissance Orbiter; Mars Environment; Mars Exploration; Planetary Surfaces; Climate; Anomalies; Ground Operational Support System; Water

20090031838 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Keynote Address for 6th International Symposium on Digital Earth

Bambacus, Myra; [2009]; 1 pp.; In English; Sixth International Symposium on Digital Earth: Digital Earth in Action, 9 - 12 Sep. 2009, Beijing, China; No Copyright; Avail.: Other Sources; Abstract Only

NASA is committed to collaborating with not only our National Partners but also with our International Partners to help make our world a better place. We do this through the sharing of our discoveries and working together so that we can address uncertainties in predictions and forecasts that impact how we live on our home planet. NASA is committed to a Digital Earth as it enables our research to focus on cross disciplinary analysis. The mainstream Information Technologies along with the Digital Earth concepts have allowed this interdisciplinary research that is so critical to societal benefits. The technologies have been discovered and in many cases implemented, but we must forge ahead together to continue to advance all that is possible to fully extend our earth observations for the sake of humankind.

Author

Conferences; Earth (Planet); Digital Systems

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*.

20090031771 NASA Johnson Space Center, Houston, TX, USA

3D Visualization of Monte-Carlo Simulation's of HZE Track Structure and Initial Chemical Species

Plante, Ianik; Cucinotta, Francis A.; [2009]; 1 pp.; In English; MICROS 2009 - 15th International Symposium on Microdosimetry, 25 - 30 Oct. 2009, Verona, Italy

Report No.(s): JSC-CN-18763; Copyright; Avail.: Other Sources; Abstract Only

Heavy ions biophysics is important for space radiation risk assessment [1] and hadron-therapy [2]. The characteristic of heavy ions tracks include a very high energy deposition region close to the track (<20 nm) denoted as the track core, and an outer penumbra region consisting of individual secondary electrons (6-rays). A still open question is the radiobiological effects of 6- rays relative to the track core. Of importance is the induction of double-strand breaks (DSB) [3] and oxidative damage to the biomolecules and the tissue matrix, considered the most important lesions for acute and long term effects of radiation. In this work, we have simulated a 56Fe26+ ion track of 1 GeV/amu with our Monte-Carlo code RITRACKS [4]. The simulation results have been used to calculate the energy depiction and initial chemical species in a 'voxelized' space, which is then visualized in 3D. Several voxels with dose >1000 Gy are found in the penumbra, some located ~0.1 mm from the track core. In computational models, the DSB induction probability is calculated with radial dose [6], which may not take into account the higher RBE of electron track ends for DSB induction. Therefore, these simulations should help improve models of DSB induction and our understanding of heavy ions biophysics.

Author

Monte Carlo Method; Biophysics; Energy Transfer; Extraterrestrial Radiation; Relative Biological Effectiveness (RBE); Radiation Effects

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