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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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- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

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

Introduction

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

The NASA STI Program

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.

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

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.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the 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 301-621-0390. 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.

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

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** 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

Personal Author Index

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.

20080016501 National Academy of Sciences - National Research Council, Washington, DC, USA
NASA Aeronautics Research: An Assessment
[2008]; 125 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-03009; Copyright; Avail.: Other Sources

The U.S. air transportation system is vital to the economic well-being and security of the USA. To support continued U.S. leadership in aviation, Congress and NASA requested that the National Research Council undertake a decadal survey of civil aeronautics research and technology (R&T) priorities that would help NASA fulfill its responsibility to preserve U.S. leadership in aeronautics technology. In 2006, the National Research Council published the Decadal Survey of Civil Aeronautics. That report presented a set of six strategic objectives for the next decade of aeronautics R&T, and it described 51 high-priority R&T challenges--characterized by five common themes--for both NASA and non-NASA researchers. The National Research Council produced the present report, which assesses NASA's Aeronautics Research Program, in response to the National Aeronautics and Space Administration Authorization Act of 2005 (Public Law 109-155). This report focuses on three sets of questions: 1. How well does NASA's research portfolio implement appropriate recommendations and address relevant high-priority research and technology challenges identified in the Decadal Survey of Civil Aeronautics? If gaps are found, what steps should be taken by the federal government to eliminate them? 2. How well does NASA's aeronautics research portfolio address the aeronautics research requirements of NASA, particularly for robotic and human space exploration? How well does NASA's aeronautics research portfolio address other federal government department/agency non-civil aeronautics research needs? If gaps are found, what steps should be taken by NASA and/or other parts of the federal government to eliminate them? 3. Will the nation have a skilled research workforce and research facilities commensurate with the requirements in (1) and (2) above? What critical improvements in workforce expertise and research facilities, if any, should NASA and the nation make to achieve the goals of NASA's research program? This report continues the good work begun by the Decadal Survey of Civil Aeronautics, and it expands that work to consider in more depth NASA aeronautics research issues related to the space program, non-civil applications, workforce, and facilities.
Author
Aeronautical Engineering; Air Transportation; NASA Programs; Public Law; Aerodynamics; Aircraft Industry; Research; Assessments; Evaluation

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.

20080015731 NASA Glenn Research Center, Cleveland, OH, USA
Blade-to-Blade Variations in Shocks Upstream of Both a Forward-swept and an Aft-Swept Fan. [Supplemental Figures]
Podboy, Gary G.; October 2006; 517 pp.; In English; See also 20080014309; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2006-213445/SUPPL; No Copyright; Avail.: CASI: C01, CD-ROM: A22, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015731

Presents supplemental figures to the original report of the same name. The original report detailed laser Doppler

velocimeter (LDV) flow field measurements made upstream of two fans, one forward-swept and one aft-swept, in order to learn more about the shocks which propagate upstream of these rotors when they are operated at supersonic tip speeds. The LDV data illustrated how the perturbations in the upstream flow field created by the rotating blades varied with axial position, radial position and rotor speed. As expected, at the highest tested speed the forward-swept fan swallowed the shocks which occured in the tip region, whereas the aftswept fan did not. This resulted in a much smaller flow disturbance just upstream of the tip of the forward-swept fan. Nevertheless, further upstream the two fan flows were much more similar.
Derived from text
Laser Doppler Velocimeters; Perturbation; Rotor Speed; Supersonic Speed; Velocity Measurement; Upstream; Flow Distribution; Mach Number

20080015840 NASA Dryden Flight Research Facility, Edwards, CA, USA
Aerodynamic Effects of a 24-foot Multisegmented Telescoping Nose Boom on an F-15B Airplane
Cumming, Stephen B.; Smith, Mark S.; Frederick, Michael A.; April 2008; 27 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-214634; H-2809; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015840

An experimental multisegmented telescoping nose boom has been installed on an F-15B airplane to be tested in a flight environment. The experimental nose boom is representative of one that could be used to tailor the sonic boom signature of an airplane such as a supersonic business jet. The nose boom consists of multiple sections and could be extended during flight to a length of 24 ft. The preliminary analyses indicate that the addition of the experimental nose boom could adversely affect vehicle flight characteristics and air data systems. Before the boom was added, a series of flights was conducted to update the aerodynamic model and characterize the air data systems of the baseline airplane. The baseline results have been used in conjunction with estimates of the nose boom's influence to prepare for a series of research flights conducted with the nose boom installed. Data from these flights indicate that the presence of the experimental boom reduced the static pitch and yaw stability of the airplane. The boom also adversely affected the static-position error of the airplane but did not significantly affect angle-of-attack or angle-of-sideslip measurements. The research flight series has been successfully completed.
Author
F-15 Aircraft; Flight Characteristics; Sonic Booms; Static Stability; Aerodynamic Characteristics; Attitude Stability; Yaw; Air Data Systems

20080015860 NASA Langley Research Center, Hampton, VA, USA
Designing and Testing a Blended Wing Body with Boundary Layer Ingestion Nacelles
Carter, Melissa B.; Campbell, Richard L.; Pendergraft, Odis C.; Underwood, Pamela J.; Friedman, Douglas M.; Serrano, Leonel; September 2006; 26 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07; Copyright; Avail.: CASI: A03, Hardcopy

A knowledge-based aerodynamic design method coupled with an unstructured grid Navier-Stokes flow solver was used to improve the propulsion/airframe integration for a Blended Wing Body with boundary-layer ingestion nacelles. A new zonal design capability was used that significantly reduced the time required to achieve a successful design for each nacelle and the elevon between them. A wind tunnel model was built with interchangeable parts reflecting the baseline and redesigned configurations and tested in the National Transonic Facility (NTF). Most of the testing was done at the cruise design conditions (Mach number = 0.85, Reynolds number = 75 million). In general, the predicted improvements in forces and moments as well as the changes in wing pressures between the baseline and redesign were confirmed by the wind tunnel results. The effectiveness of elevons between the nacelles was also predicted surprisingly well considering the crudeness in the modeling of the control surfaces in the flow code.
Author
Blended-Wing-Body Configurations; Nacelles; Boundary Layers; Ingestion (Engines); Reynolds Number; Wind Tunnel Tests; Unstructured Grids (Mathematics)

20080015880 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics and & Astronautics, Volume 39, Number 2, April 2007
Hong, N.; Apr. 2007; 146 pp.; In Chinese
Report No.(s): PB2007-107352; Copyright; Avail.: National Technical Information Service (NTIS)
;Partial Contents: Attitude Algorithm with Incremental Angle of RLG SINS; Reduced-Dynamic Orbit Determination

Using Dual-Frequency Onboard GPS Observations; Electronic Jamming Exercises Influence on Flight Path Planning of Low Observation Aircraft; Delay-Dependent Robust Ho, Controller Design for a Class of Nonlinear Uncertainty Time-Delay Systems with Input Delay; Application of Digital Control Technology for Power Factor Correcting; Clustering Gene Expression Data Using Minimum Spanning Trees; Finite Element Analysis of Light Propagation in Tissue; Fast Image Interpolation Algorithms Based on Improved Definition of Profiles on Images; Image Edge Detection Based on B-Spline Interpolation; Parallel Factor Analysis Based Space-Time Multiuser Detection for CDMA System with Larger Delay Spread; Performance Analysis of EASTAP Based on Measured Ed-Beam Antenna Pattern; Optimized Design of Improved TOP-HAT Filter Based on Genetic Algorithms of Neural Network; New Measurement Method for Impedance Parameters Based on Digital Signal Processing; Multi-Pattern High Probable Quantum Search Algorithm; Novel Distributed Intrusion Detection Method Based on Neural Network Ensemble; Aeroengine PID Control over Whole Envelope Based on Neural Network; Microstructure and Durability Forming Mechanism of High Performance Concrete; Modeling of NiMH Power Battery Pack; Fault Prediction Method Based on RBF Network On-Line Learning.
NTIS
Aircraft Engines; Antenna Radiation Patterns; Reliability Analysis; Aeronautics; Jamming; Global Positioning System; Attitude (Inclination)

20080016493 Minnesota Univ., Minneapolis, MN, USA
Experimental Investigation of Transition to Turbulence as Affected by Passing Wakes: Effects of High FSTI and Increased Rod Spacing. Animations and Data Files
Kaszeta, Richard W.; Simon, Terrence W.; Jiang, Nan; Ottaviani, Federico; March 2007; In English; See also 20070017313; Original contains color illustrations
Contract(s)/Grant(s): NCC3-652
Report No.(s): NASA/CR-2007-214678; No Copyright; Avail.: CASI: C01, CD-ROM
No abstract available
Turbulence; Spacing; Turbulent Wakes; Rods; Boundary Layer Transition

20080016494 NASA Glenn Research Center, Cleveland, OH, USA
A Spreadsheet for the Mixing of Rows of Jets with a Confined Crossflow in a Rectangular Duct: Supplement to NASA/TM-2006-214226
Holdeman, James D.; Clisset, James R.; Moder, Jeffrey P.; Lear, William E.; October 2006; In English; See also 20080014219
Contract(s)/Grant(s): WU-22-066-10-12
Report No.(s): NASA/TM-2006-214226/SUPPL1; E-15473; Copyright; Avail.: CASI: C01, CD-ROM
No abstract available
Jet Flow; Cross Flow; Ducts; Spreadsheets; Jet Mixing Flow

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.

20080015746 NASA Langley Research Center, Hampton, VA, USA
Damage Diagnosis in Semiconductive Materials Using Electrical Impedance Measurements
Ross, Richard W.; Hinton, Yolanda L.; April 07, 2008; 9 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015746
Recent aerospace industry trends have resulted in an increased demand for real-time, effective techniques for in-flight structural health monitoring. A promising technique for damage diagnosis uses electrical impedance measurements of semiconductive materials. By applying a small electrical current into a material specimen and measuring the corresponding voltages at various locations on the specimen, changes in the electrical characteristics due to the presence of damage can be assessed. An artificial neural network uses these changes in electrical properties to provide an inverse solution that estimates

the location and magnitude of the damage. The advantage of the electrical impedance method over other damage diagnosis techniques is that it uses the material as the sensor. Simple voltage measurements can be used instead of discrete sensors, resulting in a reduction in weight and system complexity. This research effort extends previous work by employing finite element method models to improve accuracy of complex models with anisotropic conductivities and by enhancing the computational efficiency of the inverse techniques. The paper demonstrates a proof of concept of a damage diagnosis approach using electrical impedance methods and a neural network as an effective tool for in-flight diagnosis of structural damage to aircraft components.
Author
Aerospace Industry; Real Time Operation; Systems Health Monitoring; Damage Assessment; Impedance Measurement; Electrical Measurement; Semiconductors (Materials); Aircraft Maintenance; Aircraft Safety

20080015972 National Inst. of Aerospace, Hampton, VA, USA
Autonomous Civil Aircraft-Are They the Future of Aviation?
Herman A. Rediess; Garg, Sanjay; December 2006; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 732759.03.01.02.17
Report No.(s): NASA/TM-2006-214474; E-15766; Copyright; Avail.: Other Sources

As the Commission on the Future of the U.S. Aerospace Industry prepared to make its final recommendations, the Hon. Robert Walker, Chairman of the Commission, stated that the nation should consider possibilities that are too radical for current lawmakers to openly discuss-- 'As an example, I would hope that in our vision we would talk about the idea of maybe flying passengers on [pilotless] aircraft in the future... and having an air traffic management system which is so robust that it makes that possible.' This article tries to address the issue of whether autonomous civil aircraft are the future of aviation? What is meant by the term 'autonomous civil aircraft' is described followed by the discussion of the case 'for' and 'against' such aircraft. The technology and operational challenges to enable autonomous civil aircraft are then described. The article concludes with a suggested roadmap for making this future vision a reality.
Author
Autonomy; Civil Aviation; Passenger Aircraft; Aircraft Communication; Aircraft Guidance; Flight Control

20080015997 NASA Ames Research Center, Moffett Field, CA, USA
An Overview of the NASA Aviation Safety Program (AVSP) Systemwide Accident Prevention (SWAP) Human Performance Modeling (HPM) Element
Foyle, David C.; Goodman, Allen; Hooley, Becky L.; November 14, 2003; 10 pp.; In English; Original contains color and black and white illustrations
Report No.(s): RTOP 728-20-10; Copyright; Avail.: CASI: A02, Hardcopy

An overview is provided of the Human Performance Modeling (HPM) element within the NASA Aviation Safety Program (AvSP). Two separate model development tracks for performance modeling of real-world aviation environments are described: the first focuses on the advancement of cognitive modeling tools for system design, while the second centers on a prescriptive engineering model of activity tracking for error detection and analysis. A progressive implementation strategy for both tracks is discussed in which increasingly more complex, safety-relevant applications are undertaken to extend the state-of-the-art, as well as to reveal potential human-system vulnerabilities in the aviation domain. Of particular interest is the ability to predict the precursors to error and to assess potential mitigation strategies associated with the operational use of future flight deck technologies.
Author
Aircraft Safety; Human Performance; Performance Prediction; Systems Engineering; Flight Safety; Errors; Detection; Accident Prevention

20080016482 National Academy of Sciences - National Research Council, Washington, DC, USA
Wake Turbulence: An Obstacle to Increased Air Traffic Capacity
[2008]; 103 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-03009; Copyright; Avail.: Other Sources

Wingtip vortices were first described by British aerodynamicist F.W. Lanchester in 1907. A product of lift on a finite-span wing, these counterrotating masses of air trail behind an aircraft, gradually diffusing while convecting downward and moving about under mutual induction and the influence of wind and stratification. Should a smaller aircraft happen to be following the first aircraft, it could be buffeted and even flipped if it flew into the vortex, with dangerous consequences. Given the amount

of air traffic in 1907, the wake vortex hazard was not initially much of a concern. The demand for air transportation continues to increase, and it is estimated that demand could double or even triple by 2025. One factor in the capacity of the air transportation system is wake turbulence and the consequent separation distances that must be maintained between aircraft to ensure safety.
Derived from text
Air Traffic; Air Transportation; Turbulence; Vortices; Flight Safety; Wing Tip Vortices; Vortex Alleviation; Aircraft Wakes; Turbulent Wakes; Flight Hazards; Aircraft Hazards; Aircraft Approach Spacing

20080016503 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Use of Weather Information by General Aviation Pilots, Part I, Quantitative: Reported Use and Value of Providers and Products
Knecht, William R.; March 2008; 23 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-A-02-HRR-521
Report No.(s): DOT/FAA/AM-08/6; No Copyright; Avail.: CASI: A03, Hardcopy

Data obtained from 221 general aviation (GA) pilots were examined to determine their usage patterns for weather information. Weather products, providers, and en-route information sources were ranked according to relative use and rated by perceived information value, frequency of use, and time invested per usage. The measures were highly correlated. Conclusion #1: A small fraction of pilots show sparse use patterns and these may be at risk for flying with inadequate preparation. Conclusion #2: There seems to be a strong tendency for many pilots to prefer relatively simple forms of information (e.g., METARS). This may present a problem, given the often-complex nature of weather.
Author
Aircraft Pilots; Aviation Meteorology; Meteorological Services; Weather; Flight Conditions; Weather Forecasting

20080016537 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Use of Weather Information by General Aviation Pilots, Part II, Qualitative: Exploring Factors Involved in Weather-Related Decision Making
Knecht, William R.; March 2008; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): DOT/FAA/AM-08/7; No Copyright; Avail.: CASI: A03, Hardcopy

Interview data obtained from 221 general aviation (GA) pilots are qualitatively scored for factors which influence weather-related decision making. Factors finding relatively strong support are (a) the specific type of weather to be faced (storms, ice, visibility, and cloud ceiling are of greatest concern to GA pilots), (b) type of flight (IFR vs. VFR), (c) pilot physiological state (primarily disorientation), and (d) the inherent uncertainty of weather and the resultant cognitive difficulty of understanding this uncertainty. Factors finding more modest support are (a) social and/or economic pressures, and (b) impulsive behavior. Additionally, relatively strong support is found in previously unpublished data for the influence of mission goals. Research directions, remediations, and the value of qualitative analysis are discussed.
Author
Decision Making; General Aviation Aircraft; Aviation Meteorology; Aircraft Pilots; Flight Conditions; Flight Hazards; Flight Safety

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.

20080015830 Diversitech, Inc., OH, USA
Initial Noise Assessment of an Embedded-wing-propulsion Concept Vehicle
Stone, James R.; Krejsa, Eugene A.; April 2008; 71 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05VD49P; WBS 561581.02.08.03.07.01
Report No.(s): NASA/CR--2008-215140; E-16302; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015830

Vehicle acoustic requirements are considered for a Cruise-Efficient Short Take-Off and Landing (CESTOL) vehicle concept using an Embedded-Wing-Propulsion (EWP) system based on a review of the literature. Successful development of

such vehicles would enable more efficient use of existing airports in accommodating the anticipated growth in air traffic while at the same time reducing the noise impact on the community around the airport. A noise prediction capability for CESTOL-EWP aircraft is developed, based largely on NASA's FOOTPR code and other published methods, with new relations for high aspect ratio slot nozzles and wing shielding. The predictive model is applied to a preliminary concept developed by Boeing for NASA GRC. Significant noise reduction for such an aircraft relative to the current state-of-the-art is predicted, and technology issues are identified which should be addressed to assure that the potential of this design concept is fully achieved with minimum technical risk.
Author
Noise Prediction; Takeoff; Noise Reduction; High Aspect Ratio; Embedding; Airports; Air Traffic

20080015836 Boeing Phantom Works, Huntington Beach, CA, USA
Quiet Cruise Efficient Short Take-off and Landing Subsonic Transport System
Kawai, Ron; March 2008; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-01140; Task Order 28
Report No.(s): NASA/CR--2008-215141; E-16301; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015836

This NASA funded study conceived a revolutionary airplane concept to enable future traffic growth by using regional air space. This requires a very quiet airplane with STOL capability. Starting with a Blended Wing Body that is cruise efficient with inherent low noise characteristics from forward noise shielding and void of aft downward noise reflections, integration of embedded distributed propulsion enables incorporation of the revolutionary concept for jet noise shielding. Embedded distributed propulsion also enables incorporation of a fan bleed internally blown flap for quiet powered lift. The powered lift provides STOL capability for operation at regional airports with rapid take-off and descent to further reduce flyover noise. This study focused on configuring the total engine noise shielding STOL concept with a BWB airplane using the Boeing Phantom Works WingMOD multidisciplinary optimization code to define a planform that is pitch controllable. The configuration was then sized and mission data developed to enable NASA to assess the flyover and sideline noise. The foundational technologies needed are identified including military dual use benefits.
Author
Blended-Wing-Body Configurations; Noise Measurement; Jet Aircraft Noise; Externally Blown Flaps; Embedding; Low Noise; Aerodynamic Noise

20080015841 Auckland Univ., New Zealand
Non-Gaussian Analysis of Turbulent Boundary Layer Fluctuating Pressure on Aircraft Skin Panels
Rizzi, Stephen A.; Steinwolf, Alexander; December 9, 2005; 24 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 537-06-37-20; Copyright; Avail.: CASI: A03, Hardcopy

The purpose of the study is to investigate the probability density function (PDF) of turbulent boundary layer fluctuating pressures measured on the outer sidewall of a supersonic transport aircraft and to approximate these PDFs by analytical models. Experimental flight results show that the fluctuating pressure PDFs differ from the Gaussian distribution even for standard smooth surface conditions. The PDF tails are wider and longer than those of the Gaussian model. For pressure fluctuations in front of forward-facing step discontinuities, deviations from the Gaussian model are more significant and the PDFs become asymmetrical. There is a certain spatial pattern of the skewness and kurtosis behavior depending on the distance upstream from the step. All characteristics related to non-Gaussian behavior are highly dependent upon the distance from the step and the step height, less dependent on aircraft speed, and not dependent on the fuselage location. A Hermite polynomial transform model and a piecewise-Gaussian model fit the flight data well both for the smooth and stepped conditions. The piecewise-Gaussian approximation can be additionally regarded for convenience in usage after the model is constructed.
Author
Panels; Turbulent Boundary Layer; Skin (Structural Member); Pressure Distribution; Mathematical Models; Aircraft Design

20080015923 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Flutter of High-Speed Civil Transport Flexible Semispan Model: Time-Frequency Analysis
Chabalko, Christopher C.; Hajj, Muhammad R.; Silva, Walter A.; Journal of Aircraft; May 2006; Volume 43, No. 3, pp. 743-748; In English; Original contains black and white illustrations
Contract(s)/Grant(s): F49620-03-1-0206; VT-03-01
Report No.(s): AIAA Paper 2004-1856; Copyright; Avail.: Other Sources

Time/frequency analysis of fluctuations measured by pressure taps and strain gauges in the experimental studies of the

flexible semispan model of a high-speed civil transport wing configuration is performed. The interest is in determining the coupling between the aerodynamic loads and structural motions that led to the hard flutter conditions and loss of the model. The results show that, away from the hard flutter point, the aerodynamic loads at all pressure taps near the wing tip and the structural motions contained the same frequency components. On the other hand, in the flow conditions leading to the hard flutter, the frequency content of the pressure fluctuations near the leading and trailing edges varied significantly. This led to contribution to the structural motions over two frequency ranges. The ratio of these ranges was near 2:1, which suggests the possibility of nonlinear structural coupling.
Author
Aeroelasticity; Semispan Models; Flutter; Time Series Analysis; Oscillations; Aerodynamic Loads; Structural Strain

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.

20080015697 Bachman and Lapointe, P.C., New Haven, CT, USA
Fanned Trailing Edge Teardrop Array
Mongillo, M. J., Inventor; Chon, Y. H., Inventor; Kulak, R., Inventor; Kulak, E., Inventor; 9 Jun 04; 6 pp.; In English
Contract(s)/Grant(s): N00019-02-C-3003
Patent Info.: Filed Filed 9 Jun 04; US-Patent-Appl-SN-10-754 265
Report No.(s): PB2007-106021; No Copyright; Avail.: CASI: A02, Hardcopy

A component for use in a gas turbine engine is provided. The component has an airfoil portion with a plurality of internal cooling passages and a non-linear trailing edge. The component further has a non-linear array of teardrop shaped assemblies which form a plurality of injection slots for injecting a coolant fluid into a fluid passing over the airfoil portion. The teardrop shaped assemblies are designed to maximize thermal performance of the component by reducing a relative diffusion angle between the injected coolant flow and the streamline direction of the fluid passing over the airfoil portion.
NTIS
Airfoils; Gas Turbine Engines; Patent Applications; Trailing Edges

20080015823 NASA Glenn Research Center, Cleveland, OH, USA
Preliminary Analysis for an Optimized Oil-Free Rotorcraft Engine Concept
Howard, Samuel A.; Bruckner, Robert J.; DellaCorte, Christopher; Radil, Kevin C.; March 2008; 16 pp.; In English; American Helicopter Society 63rd Annual Forum and Technology Display, 1-3 May 2007, Virginia Beach, VA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 877868.02.07.03.01.01
Report No.(s): NASA/TM-2008-215064; ARL-TR-4398; E-16290; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015823

Recent developments in gas foil bearing technology have led to numerous advanced high-speed rotating system concepts, many of which have become either commercial products or experimental test articles. Examples include Oil-Free microturbines, motors, generators and turbochargers. The driving forces for integrating gas foil bearings into these high-speed systems are the benefits promised by removing the oil lubrication system. Elimination of the oil system leads to reduced emissions, increased reliability, and decreased maintenance costs. Another benefit is reduced power plant weight. For rotorcraft applications, this would be a major advantage, as every pound removed from the propulsion system results in a payload benefit. Implementing foil gas bearings throughout a rotorcraft gas turbine engine is an important long-term goal that requires overcoming numerous technological hurdles. Adequate thrust bearing load capacity and potentially large gearbox applied radial loads are among them. However, by replacing the turbine end, or hot section, rolling element bearing with a gas foil bearing many of the above benefits can be realized. To this end, engine manufacturers are beginning to explore the possibilities of hot section gas foil bearings in propulsion engines. This paper presents a logical follow-on activity by analyzing a conceptual rotorcraft engine to determine the feasibility of a foil bearing supported core. Using a combination of rotordynamic analyses and a load capacity model, it is shown to be reasonable to consider a gas foil bearing core section.
Author
Rotary Wing Aircraft; Turbocompressors; Foil Bearings; Gas Turbine Engines; Engine Design

20080015827 NASA Glenn Research Center, Cleveland, OH, USA

Comparison of Far-field Noise for Three Significantly Different Model Turbofans

Woodward, Richard P.; April 2008; 22 pp.; In English; 46th Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.18.03

Report No.(s): NASA/TM--2008-215136; AIAA-2008-0049; E-16299-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015827

Far-field noise sound power level (PWL) spectra and overall sound pressure level (OASPL) directivities were compared for three significantly different model fan stages which were tested in the NASA Glenn 9 15 Low Speed Wind Tunnel. The test fans included the Advanced Ducted Propulsor (ADP) Fan1, the baseline Source Diagnostic Test (SDT) fan, and the Quiet High Speed Fan2 (QHSF2). These fans had design rotor tangential tip speeds from 840 to 1474 ft/s and stage pressure ratios from 1.29 to 1.82. Additional parameters included rotor-stator spacing, stator sweep, and downstream support struts. Acoustic comparison points were selected on the basis of stage thrust. Acoustic results for the low tip speed/low pressure ratio fan (ADP Fan1) were thrust-adjusted to show how a geometrically-scaled version of this fan might compare at the higher design thrust levels of the other two fans. Lowest noise levels were typically observed for ADP Fan1 (which had a radial stator) and for the intermediate tip speed fan (Source Diagnostics Test, SDT, R4 rotor) with a swept stator. Projected noise levels for the ADP fan to the SDT swept stator configuration at design point conditions showed the fans to have similar noise levels. However, it is possible that the ADP fan could be 2 to 3 dB quieter with incorporation of a swept stator. Benefits of a scaled ADP fan include avoidance of multiple pure tones associated with transonic and higher blade tip speeds. Penalties of a larger size ADP fan would include increased nacelle size and drag.

Author

Low Speed Wind Tunnels; Noise Intensity; Sound Pressure; Turbofans; Far Fields; Blade Tips

20080015839 NASA Glenn Research Center, Cleveland, OH, USA

Misalignment in Gas Foil Journal Bearings: An Experimental Study

Howard, Samuel A.; [2008]; 17 pp.; In English; Original contains color and black and white illustrations

Report No.(s): GTP-08-1072; No Copyright; Avail.: Other Sources

As gas foil journal bearings become more prevalent in production machines, such as small gas turbine propulsion systems and microturbines, system level performance issues must be identified and quantified in order to provide for successful design practices. Several examples of system level design parameters that are not fully understood in foil bearing systems are thermal management schemes, alignment requirements, balance requirements, thrust load balancing, and others. In order to address some of these deficiencies and begin to develop guidelines, this paper presents a preliminary experimental investigation of the misalignment tolerance of gas foil journal bearing systems. Using a notional gas foil bearing supported rotor and a laser-based shaft alignment system, increasing levels of misalignment are imparted to the bearing supports while monitoring temperature at the bearing edges. The amount of misalignment that induces bearing failure is identified and compared to other conventional bearing types such as cylindrical roller bearings and angular contact ball bearings. Additionally, the dynamic response of the rotor indicates that the gas foil bearing force coefficients may be affected by misalignment. Keywords: Bearing, Rotordynamics, Foil bearing, Gas bearing

Author

Foil Bearings; Gas Bearings; Gas Turbines; Propulsion System Configurations; Systems Engineering; Propulsion System Performance; Design Analysis; Rotor Dynamics

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*.

20080015934 ISRO Satellite Centre, Peenya, Bangalore, India

Journal of Spacecraft Technology, Volume 17, No. 2

Thygaragan, K., Editor; July 2007; ISSN 0971-1600; 55 pp.; In English; See also 20080015935 - 20080015940; Original contains color illustrations; Copyright; Avail.: Other Sources

The Journal of Spacecraft Technology is a biannual publication of ISRO Satellite Centre, Bangalore, India. It is devoted

exclusively to research and development in the fields of space and spacecraft technology and is meant for circulation amongst the professionals in the field. The topics include: (1) Effect of Solar Array Deployment on Spacecraft Attitude, (2) Parametric Studies on Damper for Solar Array Deployment Mechanism, (3) Interoperable Three-Tier Database Model, (4) Design and Implementation of Peripheral Component Interconnect and Direct Digital Synthesizer-based Universal Encoder for Multiple Spacecraft Command, (5) Dynamic Position Correction Mechanism of Sub-reflect, and (6) Yaw Determination using Sun-Vector and Earth Sensor.
Derived from text
ISRO; Spacecraft; Indian Space Program; Spacecraft Design; Technology Utilization; India

20080015936 ISRO Satellite Centre, Peenya, Bangalore, India
Parametric Studies on Damper for Solar Array Deployment Mechanism
Balaji, K.; Kumar, Suresha; Nataraju, B. S.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 9-15; In English; See also 20080015934; Copyright; Avail.: Other Sources

Deployment of appendages is a mission critical activity. The appendages get the deployment energy from preloaded springs mounted at the hinges. To ensure deployment, a minimum spring margin of 1 is provided while designing the springs. This would result in an increased latch up velocity for the deploying appendage leading to higher latch up shock loads. A damper is used in a deployment mechanism to bring down the latch up velocity within acceptable limits. An eddy current damper is used on the solar array deployment mechanism. The damping rate offred by the damper is directly proportional to the angular velocity of its rotating disc which in turn is dependent on the payout velocity of the wire rope. The location of the damper relative to the anchor point of the wire rope determines the payout velocity. The damping rate is influenced by the properties like magnetic .flux density, the thickness of the disc etc. This paper presents the influence of variations in damper parameters on the deployment dynamics of the solar array.
Author
Appendages; Damping; Deployment; Solar Arrays; Spacecraft Control

20080015939 ISRO Satellite Centre, Peenya, Bangalore, India
Yaw Determination Using Sun-Vector and Earth Sensor
Ramachandran, M. P.; Kannan, S.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 38-44; In English; See also 20080015934; Copyright; Avail.: Other Sources

The earth sensor in geo-stationary satellites gives instantaneous roll and pitch axes information. Yaw is indirectly controlled through a roll yaw coupling over an orbit. An additional sun sensor enables realization of the sun vector in the satellite internal coordinate system. This paper proposes a simple algorithm for obtaining instantaneous yaw in closed form. It uses the attitude information from the Earth scan sensor and the sun vector measurement to explicitly determine the yaw over an orbit of a satellite.
Author
Algorithms; Solar Sensors; Yaw; Synchronous Satellites; Stationkeeping; Spacecraft Control; Attitude (Inclination); Spacecraft Guidance

20080015940 ISRO Satellite Centre, Peenya, Bangalore, India
Dynamic Position Correction Mechanism of Sub-Reflector
Satapathy, Malaya Ranjan; Balareddy, Pramod B.; Hathwar, G. R.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 30-37; In English; See also 20080015934; Copyright; Avail.: Other Sources

ISTRAC is installing 32m diameter deep space network (DSN) Antenna for data reception from the Chandrayaan-I satellite for its up-coming moon mission. Stringent pointing accuracy requirements for tracking a far-off object in space call for a 5-axis dynamic pointing mechanism for the sub-reflector for alignment of the sub-reflector axis with the feed axis and phage centre. Misalignment of the sub-reflector is caused due to gravity droop, thermal and wind effects at various elevation angles.
Author
Alignment; Subreflectors; Deep Space Network; Antennas; Antenna Design; Directors (Antenna Elements)

13
ASTRODYNAMICS

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

20080015935 B.M. Sreenivasaiah College of Engineering, Bangalore, India

Effect of Solar Array Deployment on Spacecraft Attitude

Kote, Aditya; Balaji, K.; Aralimatti, V. C.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 1-8; In English; See also 20080015934; Copyright; Avail.: Other Sources

Deployable mechanisms are integral part of modern spacecrafts due to space limitations imposed by the launch vehicle. The solar panels are folded during the launch phase and deployed when the spacecraft reaches desired orbit using deployable mechanism. Due to deployment of solar array the spacecraft attitude gets disturbed. The spacecraft may have certain body rates at the time of dep1oyment. The deployment of solar arrays influenced by these spacecraft body rates and may lead to undesirable rotations of deploying array about its axis. This may even lead to interference of the deploying array with any projecting elements nearby. Prediction of this disturbance before launch is essential in order to plan for corrective actions during the orbital motion. In this paper the influence of deployment and latching of solar array on spacecraft's attitude is dealt with. The dynamics of spacecraft body and deploying solar array is evaluated by deriving the equations of motion using Lagrangian formulations and are solved using numerical method. In addition, the rotation of solar array about pitch axis also modeled. The equations representing the system are non-linear, coupled ordinary differentia1 equations. A generalized program is developed to estimate the disturbance on spacecraft body. This formulation is validated by the energy balance and momentum balance. A few case studies like when the satellite with/without body rates when solar array deployed are discussed in the results.

Author

Attitude (Inclination); Deployment; Rotation; Solar Arrays; Spacecraft Guidance; Spacecraft Motion; Spacecraft Stability; Spacecraft Structures; Folding Structures

20080015975 NASA Johnson Space Center, Houston, TX, USA

CEV Trajectory Design Considerations for Lunar Missions

Condon, Gerald L.; Dawn, Timothy; Merriam, Robert S.; Sostaric, Ronald; Westhelle, Carlos H.; [2007]; 22 pp.; In English; 2007 AAS Guidance and Control Conference, 3-7 Feb. 2007, Breckenridge, CO, USA; Original contains color illustrations

Contract(s)/Grant(s): CEV 644423.02.36.15.10

Report No.(s): AAS 07-075; No Copyright; Avail.: CASI: A03, Hardcopy

The Crew Exploration Vehicle (CEV) translational maneuver Delta-V budget must support both the successful completion of a nominal lunar mission and an 'anytime' emergency crew return with the potential for much more demanding orbital maneuvers. This translational Delta-V budget accounts for Earth-based LEO rendezvous with the lunar surface access module (LSAM)/Earth departure stage (EDS) stack, orbit maintenance during the lunar surface stay, an on-orbit plane change to align the CEV orbit for an in-plane LSAM ascent, and the Moon-to-Earth trans-Earth injection (TEI) maneuver sequence as well as post-TEI TCMs. Additionally, the CEV will have to execute TEI maneuver sequences while observing Earth atmospheric entry interface objectives for lunar high-latitude to equatorial sortie missions as well as near-polar sortie and long duration missions. The combination of these objectives places a premium on appropriately designed trajectories both to and from the Moon to accurately size the translational V and associated propellant mass in the CEV reference configuration and to demonstrate the feasibility of anytime Earth return for all lunar missions. This report examines the design of the primary CEV translational maneuvers (or maneuver sequences) including associated mission design philosophy, associated assumptions, and methodology for lunar sortie missions with up to a 7-day surface stay and with global lunar landing site access as well as for long duration (outpost) missions with up to a 210-day surface stay at or near the polar regions. The analyses presented in this report supports the Constellation Program and CEV project requirement for nominal and anytime abort (early return) by providing for minimum wedge angles, lunar orbit maintenance maneuvers, phasing orbit inclination changes, and lunar departure maneuvers for a CEV supporting an LSAM launch and subsequent CEV TEI to Earth return, anytime during the lunar surface stay.

Author

Mission Planning; Orbital Maneuvers; Circumlunar Trajectories; Earth-Moon Trajectories; Moon-Earth Trajectories; Crew Exploration Vehicle; Lunar Flight

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*.

20080016502 National Academy of Sciences - National Research Council, Washington, DC, USA
Review of NASA's Exploration Technology Development Program: An Interim Report
[2008]; 84 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNH05CC16C; Copyright; Avail.: Other Sources

NASA requested that a committee under the auspices of the National Research Council's Aeronautics and Space Engineering Board carry out an assessment of NASA's Exploration Technology Development Program (ETDP). Organizationally, this program functions under the direction of NASA's Exploration Systems Mission Directorate and is charged with developing new technologies that will enable NASA to conduct future human and robotic exploration missions, while reducing mission risk and cost. The Committee to Review NASA's Exploration Technology Development Program has been tasked to examine how well the program is aligned with the stated objectives of the President's Vision for Space Exploration (VSE), to identify gaps in the program, and to assess the quality of the research. The full statement of task is given in Appendix A. The committee consists of 25 members and includes a cross section of senior executives, engineers, researchers, and other aerospace professionals drawn from industry, universities, and government agencies with expertise in virtually all the technical fields represented within the program.
Derived from text
Aerospace Engineering; Aerospace Industry; Space Exploration; Technology Assessment; Manned Space Flight; Constellation Program

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*.

20080015739 NASA Marshall Space Flight Center, Huntsville, AL, USA
On the Shoulders of Giants - Apollo's Contribution to Ares
Cook, Stephen A.; February 26, 2008; 1 pp.; In English; NASA Project Manager's Challenge, 26-27 Feb. 2008, Daytona Beach, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

It has been over 35 years since NASA developed new human spaceflight capabilities. As NASA builds vehicles to once again venture beyond Earth's orbit, it has the advantage of a powerful legacy of seasoned professionals who have already been there. Apollo-era veterans are lending their knowledge and expertise to nearly every aspect of the new Ares I crew launch vehicle and the Ares V cargo launch vehicle, from management to design and manufacturing techniques. Through group discussions, personal interviews, and consultant relationships, these talented individuals are sharing their 'lessons lived' to help a new generation of engineers repeat the successes and avoid some of the pitfalls of America's first journeys to the Moon. In addition to learning from resident and retired experts, Ares will draw on legacy facilities, tooling, and hardware like the J-2 engine from the Apollo era and the Reusable Solid Rocket Boosters from the Space Shuttle Program. NASA needs to re-learn the skills required to send astronauts to the Moon, Mars, and beyond. The new Ares team is training with the best and building on the work of their eminent predecessors. They are standing on the shoulders of giants to see a future that is bright with possibilities on the space frontier.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Booster Rocket Engines; Solid Propellant Rocket Engines; Space Shuttle Boosters; J-2 Engine; Engineers; Human Performance

20080015885 Hamilton Sundstrand Corp., Houston, TX, USA
Challenges of Roll Orientation with Respect to Vehicle Heading at Touchdown for the Orion Command Module
Gay, Robert S.; Bihari, Brian D.; February 2008; 22 pp.; In English; 31st Annual AAS Guidance and Control Conference, 1-6 Feb. 2008, Breckenridge, CO, USA; Original contains color and black and white illustrations
Report No.(s): AAS 08-068; Copyright; Avail.: CASI: A03, Hardcopy

Due to mass constraints, the Orion Command Module landing attention system requires that the capsule be oriented in

a specific direction with respect to the horizontal surface-relative velocity (Heading) at touchdown in order to keep crew and vehicle loads within specifications. These constraints apply to both land and water landings. In fact, water landings are even more constrained with the addition of impact angle requirements necessary to slice through the water. There are two primary challenges with achieving this touchdown orientation: 1. Navigation knowledge of velocity (needed to determine Heading) with and without GPS, including the effects of the Heading angle itself becoming undefined as horizontal velocity decreases, and 2. Controlling to the desired orientation in the presences of chute torque and wind gusts that may change the Heading just prior to touchdown. This paper will discuss the design and performance of the current Orion navigation and control system used to achieve the desired orientation at touchdown.
Author
Touchdown; Command Modules; Water Landing; Landing Aids; Loads (Forces); Global Positioning System; Guidance (Motion)

20080015895 Airborne Systems North America, Santa Ana, CA, USA
A Status Report on the Parachute Development for NASA's Next Manned Spacecraft
Sinclair, Robert; [2008]; 26 pp.; In English; Safety and Flight Equipment Symposium (SAFE), 31 Mar. - 2 Apr. 2008, Geneva, Switzerland; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015895

NASA has determined that the parachute portion of the Landing System for the Crew Exploration Vehicle (CEV) will be Government Furnished Equipment (GFE). The Earth Landing System has been designated CEV Parachute Assembly System (CPAS). Thus a program team was developed consisting of NASA Johnson Space Center (JSC) and Jacobs Engineering through their Engineering and Science Contract Group (ESCG). Following a rigorous competitive phase, Airborne Systems North America was selected to provide the parachute design, testing and manufacturing role to support this team. The development program has begun with some early flight testing of a Generation 1 parachute system. Future testing will continue to refine the design and complete a qualification phase prior to manned flight of the spacecraft. The program team will also support early spacecraft system testing, including a Pad Abort Flight Test in the Fall of 2008
Derived from text
Parachutes; Manned Spacecraft; Landing Aids; Flight Tests; Support Systems; Parachute Descent

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20080015715 Daly, Crowley and Mofford, LLP, Canton, MA, USA
Method and Apparatus for Wide Area Augmentation System having GEO Uplink Subsystem with Enhanced Clock Steering
Hsu, P. H., Inventor; Grewal, M. S., Inventor; 23 Feb 05; 9 pp.; In English
Contract(s)/Grant(s): FAA-DR145940; DTFA01-03-C-00059
Patent Info.: Filed Filed 23 Feb 05; US-Patent-Appl-SN-11-063 782
Report No.(s): PB2007-106029; No Copyright; Avail.: CASI: A02, Hardcopy

A system to provide navigation signals to a space vehicle includes an uplink system for a geostationary earth satellite having clock steering derived from smoothed receiver clock error, long term clock error average, and long term clock offset average information. A proportional-integral-differential controller can be used to generate clock adjustment commands to a frequency standard clock.
NTIS
Augmentation; Geosynchronous Orbits; Synchronous Platforms; Uplinking; Spacecraft Guidance; Space Navigation; Clocks

20080015740 NASA Marshall Space Flight Center, Huntsville, AL, USA
High-Performance, Radiation-Hardened Electronics for Space and Lunar Environments
Keys, Andrew S.; Adams, James H.; Cressler, John D.; Darty, Ronald C.; Johnson, Michael A.; Patrick, Marshall C.; February 10, 2008; 8 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The Radiation Hardened Electronics for Space Environments (RHESE) project develops advanced technologies needed

for high performance electronic devices that will be capable of operating within the demanding radiation and thermal extremes of the space, lunar, and Martian environment. The technologies developed under this project enhance and enable avionics within multiple mission elements of NASA's Vision for Space Exploration. including the Constellation program's Orion Crew Exploration Vehicle. the Lunar Lander project, Lunar Outpost elements, and Extra Vehicular Activity (EVA) elements. This paper provides an overview of the RHESE project and its multiple task tasks, their technical approaches, and their targeted benefits as applied to NASA missions.
Author
Radiation Hardening; Avionics; Crew Exploration Vehicle; Lunar Environment; Mars Environment; Lunar Bases

20
SPACECRAFT PROPULSION AND POWER

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

20080015727 Woodcock Washburn, LLP, Philadelphia, PA, USA
Systems and Methods for Varying the Thrust of Rocket Motors and Engines while Maintaining Higher Efficiency Using Moveable Plug Nozzles
Nyberg, D. G., Inventor; Groudle, T. A., Inventor; Smith, R. D., Inventor; Feb. 28, 2005; 10 pp.; In English
Contract(s)/Grant(s): W31P4Q-04-C-R112
Patent Info.: Filed Filed 28 Feb 05; US-Patent-Appl-SN-11-066 412
Report No.(s): PB2007-106015; No Copyright; Avail.: CASI: A02, Hardcopy

The thrust of a rocket motor can be varied while maintaining efficiency over a range of pressure ratios using a design that allows for changing the relative position of a plug and a combustion chamber exit. The plug or the chamber exit may be attached to an adaptive control system for position modification. The plug may be positioned in a plug nozzle configuration or in an expansion-deflection (ED) configuration. In either configuration, the elongated downstream portion of the plug allows for efficiency over a wide range of pressure ratios, while ability to change plug position with respect to the chamber exit allows adjustment of rocket thrust.
NTIS
Plug Nozzles; Rocket Engines; Rocket Thrust; Combustion Chambers

20080015822 NASA Glenn Research Center, Cleveland, OH, USA
Overview of Multi-Kilowatt Free-Piston Stirling Power Conversion Research at Glenn Research Center
Geng, Steven M.; Mason, Lee S.; Dyson, Rodger W.; Penswick, L. Barry; March 2008; 15 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 138494.04.01.01
Report No.(s): NASA/TM-2008-215061; E-16285; Copyright; Avail.: CASI: A03, Hardcopy

As a step towards development of Stirling power conversion for potential use in Fission Surface Power (FSP) systems, a pair of commercially available 1 kW class free-piston Stirling convertors and a pair of commercially available pressure wave generators (which will be plumbed together to create a high power Stirling linear alternator test rig) have been procured for in-house testing at Glenn Research Center (GRC). Delivery of both the Stirling convertors and the linear alternator test rig is expected by October 2007. The 1 kW class free-piston Stirling convertors will be tested at GRC to map and verify performance. The convertors will later be modified to operate with a NaK liquid metal pumped loop for thermal energy input. The high power linear alternator test rig will be used to map and verify high power Stirling linear alternator performance and to develop power management and distribution (PMAD) methods and techniques. This paper provides an overview of the multi-kilowatt free-piston Stirling power conversion work being performed at GRC.
Author
Stirling Cycle; Stirling Engines; Thermal Energy; Piston Engines; Linear Alternators

20080015824 NASA Glenn Research Center, Cleveland, OH, USA

Low Cost Electric Propulsion Thruster for Deep Space Robotic Science Missions

Manzella, David; March 2008; 12 pp.; In English; 2007 NASA Science and Technology Conference (NSTC-07), 19-21 Jun. 2007, College Park, MD, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 346620.04.05.03.15

Report No.(s): NASA/TM-2008-215067; E-16288; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015824

Electric Propulsion (EP) has found widespread acceptance by commercial satellite providers for on-orbit station keeping due to the total life cycle cost advantages these systems offer. NASA has also sought to benefit from the use of EP for primary propulsion onboard the Deep Space-1 and DAWN spacecraft. These applications utilized EP systems based on gridded ion thrusters, which offer performance unequaled by other electric propulsion thrusters. Through the In-Space Propulsion Project, a lower cost thruster technology is currently under development designed to make electric propulsion intended for primary propulsion applications cost competitive with chemical propulsion systems. The basis for this new technology is a very reliable electric propulsion thruster called the Hall thruster. Hall thrusters, which have been flown by the Russians dating back to the 1970s, have been used by the Europeans on the SMART-1 lunar orbiter and currently employed by 15 other geostationary spacecraft. Since the inception of the Hall thruster, over 100 of these devices have been used with no known failures. This paper describes the latest accomplishments of a development task that seeks to improve Hall thruster technology by increasing its specific impulse, throttle-ability, and lifetime to make this type of electric propulsion thruster applicable to NASA deep space science missions. In addition to discussing recent progress on this task, this paper describes the performance and cost benefits projected to result from the use of advanced Hall thrusters for deep space science missions.

Author

Hall Thrusters; Electric Propulsion; Life Cycle Costs; Propulsion System Configurations; Deep Space 1 Mission; Chemical Propulsion; Ion Engines

20080015847 NASA Langley Research Center, Hampton, VA, USA

In-Vacuum Photogrammetry of a Ten-Meter Square Solar Sail

Pappa, Richard S.; Jones, Thomas W.; Lunsford, Charles B.; Meyer, Christopher G.; May 2006; 6 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 23-800-53-02; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1111/j.1747-1567.2006.00042.x

Solar sailing is a promising, future in-space propulsion method that uses the small force of reflecting sunlight to accelerate a large, reflective membrane without expendable propellants. One of two solar sail configurations under development by NASA is a striped net approach by L'Garde, Inc. This design uses four inflatably deployed, lightweight booms supporting a network of thin strings onto which four quadrants of ultrathin aluminized membranes are attached. The NASA Langley Research Center (LaRC) provided both experimental and analytical support to L'Garde for validating the structural characteristics of this unique, ultralightweight spacecraft concept. One of LaRC's responsibilities was to develop and apply photogrammetric methods to measure sail shape. The deployed shape provides important information for validating the accuracy of finite-element modeling techniques. Photogrammetry is the science and art of calculating 3D coordinates of targets or other distinguishing features on structures using images. A minimum of two camera views of each target is required for 3D determination, but having four or more camera views is preferable for improved reliability and accuracy. Using retroreflective circular targets typically provides the highest measurement accuracy and automation. References 3 and 4 provide details of photogrammetry technology, and reference 5 discusses previous experiences with photogrammetry for measuring gossamer spacecraft structures such as solar sails. This paper discusses the experimental techniques used to measure a L Garde 10-m solar sail test in vacuum with photogrammetry. The test was conducted at the NASA-Glenn Space Power Facility (SPF) located at Plum Brook Station in Sandusky, Ohio. The SPF is the largest vacuum chamber in the USA, measuring 30 m in diameter by 37 m in height. High vacuum levels (10(exp -6) torr) can be maintained inside the chamber, and cold environments (-195 C) are possible using variable-geometry cryogenic cold walls. This test used a vacuum level of approximately 1 torr (sufficient for structural static/dynamic characterization) and instead of using the cryogenic cold walls, used local LN2 cold plates underneath each of the four cold-rigidizable solar sail booms instead.

Author

Photogrammetry; Solar Sails; Spacecraft Structures; Vacuum Chambers; Spacecraft Propulsion

20080015891 NASA Stennis Space Center, Stennis Space Center, MS, USA

Integrated System Health Management (ISHM) for Test Stand and J-2X Engine: Core Implementation

Figueroa, Jorge F.; Schmalzel, John L.; Aguilar, Robert; Shwabacher, Mark; Morris, Jon; [2008]; 4 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNS04AB67T; NAS13-02014

Report No.(s): SSTI-2200-0092; Copyright; Avail.: CASI: A01, Hardcopy

ISHM capability enables a system to detect anomalies, determine causes and effects, predict future anomalies, and provides an integrated awareness of the health of the system to users (operators, customers, management, etc.). NASA Stennis Space Center, NASA Ames Research Center, and Pratt & Whitney Rocketdyne have implemented a core ISHM capability that encompasses the A1 Test Stand and the J-2X Engine. The implementation incorporates all aspects of ISHM; from anomaly detection (e.g. leaks) to root-cause-analysis based on failure mode and effects analysis (FMEA), to a user interface for an integrated visualization of the health of the system (Test Stand and Engine). The implementation provides a low functional capability level (FCL) in that it is populated with few algorithms and approaches for anomaly detection, and root-cause trees from a limited FMEA effort. However, it is a demonstration of a credible ISHM capability, and it is inherently designed for continuous and systematic augmentation of the capability. The ISHM capability is grounded on an integrating software environment used to create an ISHM model of the system. The ISHM model follows an object-oriented approach: includes all elements of the system (from schematics) and provides for compartmentalized storage of information associated with each element. For instance, a sensor object contains a transducer electronic data sheet (TEDS) with information that might be used by algorithms and approaches for anomaly detection, diagnostics, etc. Similarly, a component, such as a tank, contains a Component Electronic Data Sheet (CEDS). Each element also includes a Health Electronic Data Sheet (HEDS) that contains health-related information such as anomalies and health state. Some practical aspects of the implementation include: (1) near real-time data flow from the test stand data acquisition system through the ISHM model, for near real-time detection of anomalies and diagnostics, (2) insertion of the J-2X predictive model providing predicted sensor values for comparison with measured values and use in anomaly detection and diagnostics, and (3) insertion of third-party anomaly detection algorithms into the integrated ISHM model.

Author

Data Acquisition; Real Time Operation; Test Stands; J-2 Engine; Failure Analysis; Failure Modes; Systems Integration

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*.

20080015696 Los Alamos National Lab., NM USA

Synthesis and Characterization of Nonbanded U-Nb Plate Material

Hackenberg, R. E.; Aikin, R. M.; Balog, J. A.; Bingham, B. L.; Hammon, D. L.; Jan. 2007; 44 pp.; In English

Report No.(s): DE2007-902465; LA-14316; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the synthesis and characterization of four plates, two each of U-5.5Nb and U-7.5Nb (nominal wt%) for aging studies described elsewhere. The plates were induction melted and cast into graphite molds that were unheated and approx. 0.5 inches thick to maximize the cooling rate and minimize large length-scale Nb segregation (banding). Microstructural images and electron microprobe traces observed after various processing stages, including casting, hot rolling, and homogenizing are documented. The as-cast microsegregation assumed the form of an isotropic cellular structure, with an amplitude of 315 wt% Nb and 4050 micron-length scales. Subsequent thermomechanical processing was shown to be sufficient to attain Nb compositional homogeneity on local scales of hundreds of microns. The results of chemical analysis and other characterization methods are given. The principal impurity elements (of the 40+ elements measured) were carbon, boron, oxygen, tantalum, and iron. In all four plates, after homogenization, the Nb distribution across the entire plate cross-section showed minima at the plate faces and a broad maximum in the center, the differential being 0.50.7 wt% in U-7.5Nb and 0.20.5 wt% in U-5.5Nb. None of the impurity elements showed statistically significant variations between the center 50% of the plate volume vs the outer 25%. These plates were considered nonbanded and compositionally homogeneous for their proposed use because the required tensile, metallographic, and dilatometer specimens could be extracted from the fairly homogeneous center portion of the plate cross-section. Characterization of the phases and their transition temperatures by x-ray diffraction

and dilatometry in rapidly quenched specimens from the final product confirmed that the microstructure of this plate material was suitable for the intended aging studies. The as-quenched tensile response from multiple specimens taken from each plate showed some variability, especially in the ultimate tensile strength and elongation to failure.
NTIS
Metal Plates; Alloys; Chemical Analysis; Niobium Compounds; Uranium Compounds

20080016467 Wolf Greenfield and Sacks, P.C., Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Living Olefin Polymerization Processes
Schrock, R. R., Inventor; Baumann, R., Inventor; 3 Dec 04; 11 pp.; In English
Contract(s)/Grant(s): DE-FG02-86ER13564
Patent Info.: Filed Filed 3 Dec 04; US-Patent-Appl-SN-11-004 038
Report No.(s): PB2007-108825; No Copyright; Avail.: CASI: A03, Hardcopy

Processes for the living polymerization of olefin monomers with terminal carbon-carbon double bonds are disclosed. The processes employ initiators that include a metal atom and a ligand having two group 15 atoms and a group 16 atom or three group 15 atoms. The ligand is bonded to the metal atom through two anionic or covalent bonds and a dative bond. The initiators are particularly stable under reaction conditions in the absence of olefin monomer. The processes provide polymers having low polydispersities, especially block copolymers having low polydispersities. It is an additional advantage of these processes that, during block copolymer synthesis, a relatively small amount of homopolymer is formed.
NTIS
Alkenes; Bonding; Carbon; Monomers; Polymerization

20080016469 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Novel Curcumin Analogues and Uses Thereof
Lee, K. H., Inventor; Lin, L., Inventor; Shih, C. C. Y., Inventor; Su, C. Y., Inventor; 15 Oct 04; 27 pp.; In English
Contract(s)/Grant(s): CA-17625; CA-55639
Patent Info.: Filed Filed 15 Oct 04; US-Patent-Appl-SN-10-966 723
Report No.(s): PB2007-108822; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to compounds capable of acting as androgen receptor antagonists, pharmaceutical formulations containing the same, and methods of use thereof. Such uses include, but are not limited to, use as antitumor agents, particularly for the treatment of cancers such as colon, skin and prostate cancer and to induce androgen receptor antagonist activity in a subject afflicted with an androgen-related affliction. Examples of androgen-related afflictions include, but are not limited to, baldness, hirsutism, behavioral disorders, acne, and uninhibited spermatogenesis wherein inhibition of spermatogenesis is so desired.
NTIS
Analogs; Spermatogenesis; Prostate Gland; Intestines

20080016470 Fennemore Craig, P. C., Phoenix, AZ, USA; Arizona Univ. Board of Regents, Mesa, AZ, USA
Aaptamine and Isoaaptamine and Structural Modifications Thereof
Pettit, G. R., Inventor; Herald, D. L., Inventor; Hoffman, H., Inventor; 23 Feb 05; 23 pp.; In English
Contract(s)/Grant(s): NCI-CA44344-01-12; NCI-CA44344-01A1-12
Patent Info.: Filed Filed 23 Feb 05; US-Patent-Appl-SN-11-064 654
Report No.(s): PB2007-108821; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed herein is the isolation and elucidation of the structure of isoaptamine (2), and its conversion to numerous novel related compounds, which appear to have antimicrobial and/or cancer fighting properties. Also disclosed is the conversion of isoaaptamine (2) to the phosphate prodrug hystatin 1 (11), as well as the conversion of aaptamine to numerous compounds, including but not limited to: 9-demethyloxyaaptamine (3); 4-methylaaptamine (4); 1,4-dimethylaaptamine iodide (5); 4-N-methyl-8,9-dihydroxy-4H benzo(de)(1,6)naphthyridine (7); 4-N-methyl-8 methoxy-9 hydroxy-4H benzo(de)(1,6) naphthyridine (8); 1-H-Benzo(de)(1-6)naphthyridinium salts (9a-c); hystatin 2 (10a); and others.
NTIS
Methyl Compounds; Methoxy Systems; Iodides; Phosphates

20080016471 Evans and Molinelli, P.L.L.C, Clifton, VA, USA
Use of Purine Nucleosides to Stimulate Na/K ATPase and to Treat or Prevent Shock
Gann, D. S., Inventor; Darlington, D. N., Inventor; 19 Feb 05; 30 pp.; In English
Contract(s)/Grant(s): NIH-RO1-HL57490

Patent Info.: Filed Filed 19 Feb 05; US-Patent-Appl-SN-11-061 938
Report No.(s): PB2007-108816; No Copyright; Avail.: CASI: A03, Hardcopy

This invention relates to methods of treating or preventing hemorrhagic and septic shock in an animal by administering inosine, guanosine, deoxyinosine, deoxyguanosine or a mixture thereof. Other purine nucleosides or analogs are described that have therapeutic use in treating or preventing shock. The invention also describes methods for increasing Na/K ATPase activity in erythrocytes or other cells in an animal having below normal activity of this enzyme by administering inosine, guanosine, deoxyinosine, deoxyguanosine or a mixture thereof.

NTIS

Adenosine Triphosphate; Animals; Enzyme Activity; Nucleosides; Prevention; Purines; Shock (Physiology)

20080016529 North Carolina State Univ., Raleigh, NC USA; Appalachian State Univ., Boone, NC, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

TEM and SIMS Analysis of (100), (110), and (111) Single Crystal Niobium

Batchelor, A. D.; Leonard, D. N.; Russell, P. E.; Stevie, F. A.; Griffis, D. P.; January 2006; 12 pp.; In English

Report No.(s): DE2007-901539; No Copyright; Avail.: National Technical Information Service (NTIS)

Single crystal niobium specimens of (100), (110) and (111) crystal orientations have been analyzed using TEM and SIMS. The TEM specimens were prepared using Focused Ion Beam (FIB) and show niobium oxide thicknesses ranging from 4.9 to 8.3 nm for the three specimens after buffer chemical polishing. The oxide layers appear uniform and no significant sub-oxide region was noted. SIMS analysis was made for all three orientations on hydrogen, carbon, and oxygen before and after heat treatments at 90, 600, and 1250 C. Hydrogen is at a high level between the oxide layer and niobium, but at a relatively low level in the oxide. No high oxygen concentration region was noted in the niobium below the oxide. C contamination on the surface is detected mainly at the surface. Analysis after heat treatments showed some decrease in hydrogen after the 600oC heat treatment, and significant oxidation of the niobium after the 1250oC heat treatment.

NTIS

Niobium; Secondary Ion Mass Spectrometry; Single Crystals; Transmission Electron Microscopy

20080016535 Stanford Linear Accelerator Center, Stanford, CA, USA

Development of Gas Cluster Ion Beam Surface Treatments for Reducing Field Emission and Breakdown in RF Cavities

Swenson, D. R.; Wu, A. T.; Begenkolb, E.; Insepov, Z.; January 2007; 8 pp.; In English

Report No.(s): DE2007-901586; No Copyright; Avail.: National Technical Information Service (NTIS)

Sub-micron-scale surface roughness and contamination cause field emission that can lead to high voltage breakdown of electrodes, and these are limiting factors in the development of high gradient RF technology. We are studying various Gas Cluster Ion Beam (GCIB) treatments to smooth, clean, etch and/or chemically alter electrode surfaces to allow higher fields and accelerating gradients, and to reduce the time and cost of conditioning high voltage electrodes. For this paper, we have processed Nb, Stainless Steel, and Ti electrode materials using beams of Ar, O2, or NF3 +O2 clusters with accelerating potentials up to 35 kV. Using a Scanning Field Emission Microscope (SFEM), we have repeatedly seen a dramatic reduction in the number of field emission sites on Nb coupons treated with GCIB. Smoothing effects on Stainless steel and Ti substrates have been evaluated using AFM imaging and show that 200-nm wide polishing scratch marks are greatly attenuated. A 150-mm diameter GCIB treated stainless steel electrode has now shown virtually no DC field emission current at gradients over 20 MV/m.

NTIS

Cavities; Field Emission; Ion Beams; Surface Treatment; Surface Roughness; Niobium; Stainless Steels; Titanium; Electrode Materials

20080016536 Houston Univ., TX, USA

New Cathode Materials for Intermediate Temperature Solid Oxide Fuel Cells. (Quarterly Report for March 31, 2006 to June 30, 2006)

Jacobson, A. J.; May 17, 2006; 10 pp.; In English

Contract(s)/Grant(s): DE-FC26-03NT41960

Report No.(s): DE2007-901628; No Copyright; Avail.: Department of Energy Information Bridge

Operation of SOFCs at intermediate temperatures (500-800 degrees C) requires new combinations of electrolyte and electrode materials that will provide both rapid ion transport across the electrolyte and electrode - electrolyte interfaces and efficient electrocatalysis of the oxygen reduction and fuel oxidation reactions. This project concentrates on materials and issues

associated with cathode performance that are known to become limiting factors as the operating temperature is reduced. The specific objectives of the proposed research are to develop cathode materials that meet the electrode performance targets of 1.0 W/cm(sup 2) at 0.7 V in combination with YSZ at 700 degrees C and with GDC, LSGM or bismuth oxide based electrolytes at 600 degrees C. The performance targets imply an area specific resistance of approximately 0.5 Ocm(sup 2) for the total cell. The research strategy is to investigate both established classes of materials and new candidates as cathodes, to determine fundamental performance parameters such as bulk diffusion, surface reactivity and interfacial transfer, and to couple these parameters to performance in single cell tests. In this report, further measurements of the oxygen deficient double perovskite PrBaCo(sub 2)O(sub 5.5+8) are reported. The high electronic conductivity and rapid diffusion and surface exchange kinetics of PBCO suggest its application as cathode material in intermediate temperature solid oxide fuel cells. Preliminary measurements in symmetric cells have shown low ASR values at 600 degrees C. Here we describe the first complete cell measurements on Ni/CGO/CGO/PBCO/CGO cells.
NTIS
Cathodic Coatings; Solid Oxide Fuel Cells; Cathodes; Electrocatalysts; Electrodes; Electrolytes; Performance Tests

24
COMPOSITE MATERIALS

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

20080015744 General Dynamics Advanced Information Systems, Chantilly, VA, USA
Factors Influencing Progressive Failure Analysis Predictions for Laminated Composite Structure
Knight, Norman F., Jr.; April 07, 2008; 25 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Progressive failure material modeling methods used for structural analysis including failure initiation and material degradation are presented. Different failure initiation criteria and material degradation models are described that define progressive failure formulations. These progressive failure formulations are implemented in a user-defined material model for use with a nonlinear finite element analysis tool. The failure initiation criteria include the maximum stress criteria, maximum strain criteria, the Tsai-Wu failure polynomial, and the Hashin criteria. The material degradation model is based on the ply-discounting approach where the local material constitutive coefficients are degraded. Applications and extensions of the progressive failure analysis material model address two-dimensional plate and shell finite elements and three-dimensional solid finite elements. Implementation details are described in the present paper. Parametric studies for laminated composite structures are discussed to illustrate the features of the progressive failure modeling methods that have been implemented and to demonstrate their influence on progressive failure analysis predictions.
Author
Failure Analysis; Composite Structures; Structural Analysis; Stress-Strain Relationships; Finite Element Method; Degradation; Laminates

20080015747 NASA Langley Research Center, Hampton, VA, USA
Lessons Learned from Recent Failure and Incident Investigations of Composite Structures
Ransom, J. B.; Glaessgen, E. H.; Raju, L. S.; Knight, N. F., Jr.; Reeder, J. R.; April 07, 2008; 11 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

During the past few decades, NASA Langley Research Center (LaRC) has supported several large-scale failure and incident investigations and numerous requests for engineering consultations. Although various extenuating circumstances contributed to each of these incidents, in all cases, the failure resulted from accumulation and/or propagation of damage that reduced the load carrying capability of the structure to a level below that which was needed to sustain structural loads. A brief overview of various failure and incident investigations supported by LaRC, including some of the computational and experimental methodologies that have been applied, is presented. An important outcome of many of these failure and incident investigations is the development of an improved understanding of not only the state-of-the-art in experimental and analytical methods but also the state-of-the-art in the design and manufacturing processes that may contribute to such failures. In order to provide insight into such large-scale investigations, a series of lessons learned were captured. Awareness of these lessons learned is highly beneficial to engineers involved in similar investigations. Therefore, it is prudent that the lessons learned are

disseminated such that they can be built upon in other investigations and in ensuing research and development activities.
Author
Composite Structures; Failure Analysis; Accident Investigation; Damage Assessment; Lessons Learned; Structural Engineering; Structural Failure; Aerospace Engineering; Aeronautical Engineering

20080015749 NASA Langley Research Center, Hampton, VA, USA
Deformation and Failure of a Multi-Wall Carbon Nanotube Yarn Composite
Gates, Thomas S.; Jefferson, Gail D.; Frankland, Sarah-Jane V.; April 07, 2008; 12 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Forests of multi-walled carbon nanotubes can be twisted and manipulated into continuous fibers or yarns that exhibit many of the characteristics of traditional textiles. Macro-scale analysis and test may provide strength and stiffness predictions for a composite composed of a polymer matrix and low-volume fraction yarns. However, due to the nano-scale of the carbon nanotubes, it is desirable to use atomistic calculations to consider tube-tube interactions and the influence of simulated twist on the effective friction coefficient. This paper reports laboratory test data on the mechanical response of a multi-walled, carbon nanotube yarn/polymer composite from both dynamic and quasi-static tensile tests. Macroscale and nano-scale analysis methods are explored and used to define some of the key structure-property relationships. The measured influence of hot-wet aging on the tensile properties is also reported.
Author
Carbon Nanotubes; Yarns; Fiber Strength; Tensile Strength; Polymer Matrix Composites; Deformation; Failure; Tensile Tests; Structural Strain

20080015886 National Inst. of Aerospace, Hampton, VA, USA
An Approach for Assessing Delamination Propagation Capabilities in Commercial Finite Element Codes
Krueger, Ronald; September 17, 2007; 30 pp.; In English; 22nd Annual Technical Conference of the American Society for Composites, 9-17 Sept. 2007, Seattle, WA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.09; Copyright; Avail.: CASI: A03, Hardcopy

An approach to assessing the delamination propagation capabilities in commercial finite element codes is presented and demonstrated for one code. For this investigation, the Double Cantilever Beam (DCB) specimen and the Single Leg Bending (SLB) specimen were chosen for full three-dimensional finite element simulations. First, benchmark results were created for both specimens. Second, starting from an initially straight front, the delamination was allowed to propagate. Good agreement between the load-displacement relationship obtained from the propagation analysis results and the benchmark results could be achieved by selecting the appropriate input parameters. Selecting the appropriate input parameters, however, was not straightforward and often required an iterative procedure. Qualitatively, the delamination front computed for the DCB specimen did not take the shape of a curved front as expected. However, the analysis of the SLB specimen yielded a curved front as may be expected from the distribution of the energy release rate and the failure index across the width of the specimen. Overall, the results are encouraging but further assessment on a structural level is required.
Author
Delaminating; Finite Element Method; Composite Structures; Three Dimensional Models; Cantilever Beams

20080015893 NASA Glenn Research Center, Cleveland, OH, USA
Microstructure, Physical Properties and Tribological Characteristics of Composite Solid Lubricant Coatings with Gas Atomized BaF2-CaF2
Stanford, Malcolm K.; January 2008; 16 pp.; In English
Contract(s)/Grant(s): WBS 561581.02.07.03; No Copyright; Avail.: Other Sources

PS304 is a NASA-developed composite solid lubricant for friction and wear reduction at high temperatures. The microstructure, physical properties and tribological performance of PS304 using standard comminuted BaF2-CaF2 and novel gas atomized BaF2-CaF2 were compared. Two atomized BaF2-CaF2 particle size distributions were used. Overall, feedstock powder with atomized BaF2-CaF2 flowed more freely than standard PS304 feedstock. The cohesion strength of coatings with atomized BaF2-CaF2 was lower than that of standard PS304, while the hardness of all of the studied coatings was essentially the same (approximately 58 HRA). Other than pin wear, which was lower against the new coatings, tribometer disk coating wear and coefficients of friction were essentially the same for all coatings. These results indicate that atomized BaF2-CaF2

can be substituted for comminuted BaF2-CaF2, providing a high volume BaF2-CaF2 fabrication technique to reduce the cost of PS304 and improve its commercial availability.
Author
Barium Fluorides; Calcium Fluorides; Composite Materials; Solid Lubricants; Gas Atomization; Friction Reduction; Wear; Coatings

20080015985 Oak Ridge Associated Universities, Inc., USA
Synthesis of Metal Nanoparticle-decorated Carbon Nanotubes under Ambient Conditions
Lin, Yi; Watson, Kent A.; Ghose, Sayata; Smith, Joseph G.; Connell, John W.; April 06, 2008; 15 pp.; In English; 235th American Chemical Society National Meeting and Exposition, 6-10 Apr. 2008, New Orleans, LA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 092837.04.02.01.04
Report No.(s): LAR-17267-1; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews the production of Metal Nanoparticle-decorated carbon Nanotubes. Multi-walled carbon nanotubes (MWCNTs) were efficiently decorated with metal nanoparticles (e.g. Ag, Pt, etc.) using the corresponding metal acetate in a simple mixing process without the need of chemical reagents or further processing. The conversion of acetate compounds to the corresponding metal reached over 90%, forming nanoparticles with average diameters less than 10 nm under certain conditions. The process was readily scalable allowing for the convenient preparation of multi-gram quantities of metal nanoparticle-decorated MWCNTs in a matter of a few minutes. These materials are under evaluation for a variety of electrical and catalytic applications. The preparation and characterization of these materials will be presented. The microscopic views of the processed MWCNTs are shown
CASI
Carbon Nanotubes; Forming Techniques; Nanoparticles; Nanotechnology; Nanostructure Growth; Nanostructure (Characteristics)

25
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*.

20080015699 Los Alamos National Lab., NM USA
Heat Transfer Analysis and Assessment of Kinetics Systems for PBX 9501
Jorenby, J. W.; Jul. 2006; 156 pp.; In English
Report No.(s): DE2007-902466; LA-14259-T; No Copyright; Avail.: National Technical Information Service (NTIS)

The study of thermal decomposition in high explosive (HE) charges has been an ongoing process since the early 1900s. This work is specifically directed towards the analysis of PBX 9501. In the early 1970s, Dwight Jaeger of Los Alamos National Laboratory (LANL) developed a single-step, two-species kinetics system that was used in the development of one of the first finite element codes for thermal analyses known as EXPLO. Jaegers research focused on unconfined spherical samples of HE charges to determine if varied heating ramps would cause detonation or deflagration. Tarver and McGuire of Lawrence Livermore National Laboratory (LLNL) followed soon after with a three-step, four-species kinetics system that was developed for confined spheres under relatively fast heating conditions. Peter Dickson et al. of LANL then introduced a kinetics system with four steps and five species that included bimolecular products to capture the effects of the endothermic phase change that the HE undergoes.
NTIS
Explosives; Heat Transfer; Kinetics

20080015718 Fulbright and Jaworski, LLP, Houston, TX, USA
Ion Mobility Spectrometer
Fuhrer, K., Inventor; Gonin, M., Inventor; Schultz, J. A., Inventor; 18 Feb 05; 38 pp.; In English
Patent Info.: Filed Filed 18 Feb 05; US-Patent-Appl-SN-11-061 158
Report No.(s): PB2007-106036; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to an improved ion mobility spectrometer and method for the analysis of chemical samples.

The improvements are realized in the optimization of resolution and sensitivity. Increases in sensitivity are realized by preserving a narrow spatial distribution of migrating ions through the use of periodic/hyperbolic field focusing. Use of a plurality of drift cells and a new RF field focusing interface are discussed.
NTIS
Ion Mobility Spectroscopy; Mobility; Patent Applications; Spectrometers

20080015763 Savannah River National Lab., Aiken, SC, USA
Effect of Electrolyzer Configuration and Performance on Hybrid Sulfur Process Net Thermal Efficiency
Gorensek, M. B.; May 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-901320; No Copyright; Avail.: National Technical Information Service (NTIS)

The Hybrid Sulfur cycle is gaining popularity as a possible means for massive production of hydrogen from nuclear energy. Several different ways of carrying out the SO2-depolarized electrolysis step are being pursued by a number of researchers. These alternatives are evaluated with complete flowsheet simulations and on a common design basis using Aspen Plus. Sensitivity analyses are performed to assess the performance potential of each configuration, and the flowsheets are optimized for energy recovery. Net thermal efficiencies are calculated for the best set of operating conditions for each flowsheet and the results compared. This will help focus attention on the most promising electrolysis alternatives. The sensitivity analyses should also help identify those features that offer the greatest potential for improvement.
NTIS
Electrolysis; Hydrogen; Sulfides; Nuclear Energy; Thermodynamic Efficiency; Sulfur; Sensitivity Analysis

20080015848 Lawrence Livermore National Lab., Livermore, CA USA
Environmental Cracking of Corrosion Resistant Alloys in the Chemical Process Industry - A Review
Rebak, R. B.; Jan. 03, 2007; 15 pp.; In English
Report No.(s): DE2007-902343; UCRL-CONF-227050; No Copyright; Avail.: Department of Energy Information Bridge

A large variety of corrosion resistant alloys are used regularly in the chemical process industry (CPI). The most common family of alloys include the iron (Fe)-based stainless steels, nickel (Ni) alloys and titanium (Ti) alloys. There also other corrosion resistant alloys but their family of alloys is not as large as for the three groups mentioned above. All ranges of corrosive environments can be found in the CPI, from caustic solutions to hot acidic environments, from highly reducing to highly oxidizing. Stainless steels are ubiquitous since numerous types of stainless steels exist, each type tailored for specific applications. In general, stainless steels suffer stress corrosion cracking (SCC) in hot chloride environments while high Ni alloys are practically immune to this type of attack. High nickel alloys are also resistant to caustic cracking. Ti alloys find application in highly oxidizing solutions. Solutions containing fluoride ions, especially acid, seem to be aggressive to almost all corrosion resistant alloys.
NTIS
Chemical Reactions; Corrosion Resistance; Industries

20080015872 Lawrence Livermore National Lab., Livermore, CA USA
Environmental and Geometrical Conditions to Sustain Crevice Corrosion in Alloy 22
Carranza, R. M.; Rodriguez, M. A.; Rebak, R. B.; Nov. 13, 2006; 30 pp.; In English
Report No.(s): DE2007-902359; UCRL-CONF-226068; No Copyright; Avail.: National Technical Information Service (NTIS)

Alloy 22 (N06022) is highly resistant to localized corrosion. Under aggressive environmental conditions Alloy 22 may be susceptible to crevice corrosion in hot chloride (Cl-) solutions. The objective of the present work was to explore the environmental and geometrical conditions for crevice corrosion to occur. Electrochemical tests were performed using PCA and prismatic mill annealed Alloy 22 specimens in chloride solutions. Crevice corrosion current density was found to be a function of applied potential. iCREV values ranged from 40 iA/cm2 to 20 mA/cm2. Such low values of current density explained the absence of pitting corrosion in Alloy 22 at any potential. Decreasing of the effective diffusion distance in a propagating crevice is thought to cause crevice corrosion stifling or repassivation after long anodic polarization. Crevice corrosion breakdown potential is expected to decrease with potential scan rate, approaching repassivation potential for low scan rates. The lowest corrosion potential of Alloy 22 in hydrochloric acid solutions at which active corrosion exists was proposed as the lowest possible repassivation potential for crevice corrosion.
NTIS
Corrosion; Cracks

20080016468 Dorsey and Whitney, LLP, New York, NY, USA
Regulation of Phospholipase D Activity
Serhan, C. N., Inventor; 13 Apr 05; 25 pp.; In English
Contract(s)/Grant(s): NIH-GM-38765; NIH-DK-50305
Patent Info.: Filed Filed 13 Apr 05; US-Patent-Appl-SN-11-105 803
Report No.(s): PB2007-108824; No Copyright; Avail.: CASI: A03, Hardcopy

Novel inhibitors of polyisoprenyl phosphate signaling regulates phopholipase D activity.

NTIS
Inhibitors; Phosphates

26
METALS AND METALLIC MATERIALS

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

20080015674 Oak Ridge National Lab., TN USA
Tensile and Creep-Rupture Evaluation of a New Heat of Haynes Alloy 25
Shingledecker, J. P.; Glanton, D. B.; Martin, R. L.; Sparks, B. L.; Swindeman, R. W.; Feb. 2007; 213 pp.; In English
Report No.(s): DE2007-901496; ORNL/TM-2006/609; No Copyright; Avail.: National Technical Information Service (NTIS)

From 1999 to 2006, a program was undertaken within the Materials Science and Technology Division, formerly the Metals and Ceramics Division, of Oak Ridge National Laboratory to characterize the tensile and creep-rupture properties of a newly produced heat of Haynes alloy 25 (L-605). Tensile properties from room temperature to 1100 degrees C were evaluated for base material and welded joints aged up to 12,000 hours at 675 degrees C. Creep and creep-rupture tests were conducted on base metal and cross-weldments from 650 to 950 degrees C. Pressurized tubular creep tests were conducted to evaluate multiaxial creep-rupture response of the material. Over 800,000 hours of creep test data were generated during the test program with the longest rupture tests extending beyond 38,000 hours, and the longest creep-rate experiments exceeding 40,000 hours.

NTIS
Creep Properties; Creep Rupture Strength; Tensile Properties

20080015874 Lawrence Livermore National Lab., Livermore, CA USA
Influence of Composition upon Surface Degradation and Stress Corrosion Cracking of the Ni-Cr-Mo Alloys in Wet Hydrofluoric Acid
Crook, P.; Meck, N. S.; Rebak, R. B.; Dec. 06, 2006; 15 pp.; In English
Report No.(s): DE2007-902361; UCRL-CONF-226569; No Copyright; Avail.: Department of Energy Information Bridge

At concentrations below 60%, wet hydrofluoric acid (HF) is extremely corrosive to steels, stainless steels and reactive metals, such as titanium, zirconium, and tantalum. In fact, only a few metallic materials will withstand wet HF at temperatures above ambient. Among these are the nickelcopper (Ni-Cu) and nickel-chromium-molybdenum (Ni-Cr-Mo) alloys. Previous work has shown that, even with these materials, there are complicating factors. For example, under certain conditions, internal attack and stress corrosion cracking (SCC) are possible with the Ni-Cr-Mo alloys, and the Ni-Cu materials can suffer intergranular attack when exposed to wet HF vapors. The purpose of this work was to study further the response of the Ni-Cr-Mo alloys to HF, in particular their external corrosion rates, susceptibility to internal attack and susceptibility to HF-induced SCC, as a function of alloy composition. As a side experiment, one of the alloys was tested in two microstructural conditions, i.e. solution annealed (the usual condition for materials of this type) and long-range ordered (this being a means of strengthening the alloy in question). The study of external corrosion rates over wide ranges of concentration and temperature revealed a strong beneficial influence of molybdenum content. However, tungsten, which is used as a partial replacement for molybdenum in some Ni-Cr-Mo alloys, appears to render the alloys more prone to internal attack.

NTIS
Hydrofluoric Acid; Stress Corrosion; Stress Corrosion Cracking; Nickel Alloys; Composition (Property); Degradation; Mechanical Properties

20080015878 Lawrence Livermore National Lab., Livermore, CA USA

Physical Property Changes in Plutonium from Accelerated Aging using Pu-238 Enrichment

Chung, B. W.; Choi, B. W.; Saw, C. K.; Thompson, S. R.; Woods, C. H.; Dec. 27, 2006; 7 pp.; In English

Report No.(s): DE2007-902342; UCRL-PROC-226996; No Copyright; Avail.: Department of Energy Information Bridge

We present changes in volume, immersion density, and tensile properties observed from accelerated aged plutonium alloys. Accelerated alloys (or spiked alloys) are plutonium alloys enriched with approximately 7.5 weight percent of the faster-decaying 238Pu to accelerate the aging process by approximately 17 times the rate of unaged weapons-grade plutonium. After sixty equivalent years of aging on spiked alloys, the dilatometry shows the samples at 35DGC have swelled in volume by 0.15 to 0.17 % and now exhibit a near linear volume increase due to helium in-growth. The immersion density of spiked alloys shows a decrease in density, similar normalized volumetric changes (expansion) for spiked alloys. Tensile tests show increasing yield and engineering ultimate strength as spiked alloys are aged.

NTIS

Accelerated Life Tests; Aging (Materials); Enrichment; Plutonium; Plutonium 238

20080015892 NASA Langley Research Center, Hampton, VA, USA

Dependence of Microelastic-plastic Nonlinearity of Martensitic Stainless Steel on Fatigue Damage Accumulation

Cantrell, John H.; September 2006; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 561581.02.08.07; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015892

Self-organized substructural arrangements of dislocations formed in wavy slip metals during cyclic stress-induced fatigue produce substantial changes in the material microelastic-plastic nonlinearity, a quantitative measure of which is the nonlinearity parameter Beta extracted from acoustic harmonic generation measurements. The contributions to Beta from the substructural evolution of dislocations and crack growth for fatigued martensitic 410Cb stainless steel are calculated from the Cantrell model as a function of percent full fatigue life to fracture. A wave interaction factor f(sub WI) is introduced into the model to account experimentally for the relative volume of material fatigue damage included in the volume of material swept out by an interrogating acoustic wave. For cyclic stress-controlled loading at 551 MPa and f(sub WI) = 0.013 the model predicts a monotonic increase in Beta from dislocation substructures of almost 100 percent from the virgin state to roughly 95 percent full life. Negligible contributions from cracks are predicted in this range of fatigue life. However, over the last five percent of fatigue life the model predicts a rapid monotonic increase of Beta by several thousand percent that is dominated by crack growth. The theoretical predictions are in good agreement with experimental measurements of 410Cb stainless steel samples fatigued in uniaxial, stress-controlled cyclic loading at 551 MPa from zero to full tensile load with a measured f(sub WI) of 0.013.

Author

Elastic Properties; Fatigue (Materials); Martensitic Stainless Steels; Metal Fatigue; Micromechanics; Nonlinearity

20080015988 NASA Langley Research Center, Hampton, VA, USA

Materials

Glaessgen, Edward H.; Schoeppner, Gregory A.; December 2006; 4 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 732759.07.09; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015988

NASA Langley Research Center has successfully developed an electron beam freeform fabrication (EBF3) process, a rapid metal deposition process that works efficiently with a variety of weldable alloys. The EBF3 process can be used to build a complex, unitized part in a layer-additive fashion, although the more immediate payoff is for use as a manufacturing process for adding details to components fabricated from simplified castings and forgings or plate products. The EBF3 process produces structural metallic parts with strengths comparable to that of wrought product forms and has been demonstrated on aluminum, titanium, and nickel-based alloys to date. The EBF3 process introduces metal wire feedstock into a molten pool that is created and sustained using a focused electron beam in a vacuum environment. Operation in a vacuum ensures a clean process environment and eliminates the need for a consumable shield gas. Advanced metal manufacturing methods such as EBF3 are being explored for fabrication and repair of aerospace structures, offering potential for improvements in cost, weight, and performance to enhance mission success for aircraft, launch vehicles, and spacecraft. Near-term applications of the EBF3 process are most likely to be implemented for cost reduction and lead time reduction through addition of details onto simplified preforms (casting or forging). This is particularly attractive for components with protruding details that would require a significantly large volume of material to be machined away from an oversized forging, offering significant reductions to the buy-to-fly ratio. Future far-term applications promise improved structural efficiency through reduced weight and improved

performance by exploiting the layer-additive nature of the EBF3 process to fabricate tailored unitized structures with functionally graded microstructures and compositions.
Author
Aircraft Structures; Aluminum Alloys; Wrought Alloys; Nickel Alloys; Fabrication; Manufacturing; Metallizing; Titanium Alloys

27
NONMETALLIC MATERIALS

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

20080015721 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Conjugated Polymer Doped Nanocomposite Silica Thin Films
Dattelbaum, A. M., Inventor; Shreve, A. P., Inventor; Wang, H. L., Inventor; 27 Feb 04; 10 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-36
Patent Info.: Filed Filed 27 Feb 04; US-Patent-Appl-SN-10-789 588
Report No.(s): PB2007-106045; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention discloses a composite structure including an inorganic thin film having a defined mesostructure formed in a surfactant based formation process including a non-cationic surfactant template material, and, a conjugated polymer immobilized within the mesostructured inorganic thin film. A sensor using such a composite structure as a responsive element and a method of detecting trace amounts of nitro-containing organic species are also disclosed.
NTIS
Conjugation; Doped Crystals; Nanocomposites; Patent Applications; Silicon Dioxide; Thin Films

20080015854 NASA Langley Research Center, Hampton, VA, USA
Thermal Conductivity of Ultem(TradeMark)/Carbon Nanofiller Blends
Ghose, S.; Watson, K. A.; Delozier, D. M.; Working, D. C.; Connell, J. W.; Smith, J. G., Jr.; Sun, Y. P.; Lin, Y.; [2006]; 21 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In an effort to improve polymer thermal conductivity (TC), Ultem(TradeMark) 1000 was compounded with nano-fillers of carbon allotropes. Ultem(TradeMark) 1000 was selected since it is both solution and melt processable. As-received and modified multiwalled carbon nanotubes (MWCNTs), vapor grown carbon nanofibers (CNF) and expanded graphite (EG) were investigated. MWCNTs were modified by functionalizing the surface through oxidization with concentrated acids, mixing with an alkyl bromide, and addition of alkyl and phosphorus compounds after initial treatment with n-butyl lithium. Functionalization was performed to improve the TC compatibility between the resin and MWCNTs. It was postulated that this may provide an improved interface between the MWCNT and the polymer which would result in enhanced TC. The nano-fillers were mixed with Ultem(TradeMark) 1000 in the melt and in solution at concentrations ranging from 5 to 40 wt%. Ribbons were extruded from the blends to form samples where the nano-fillers were aligned to some degree in the extrusion direction. Samples were also fabricated by compression molding resulting in random orientation of the nano-fillers. Thermal properties of the samples were evaluated by Differential Scanning Calorimetry (DSC) and Thermal Gravimetric Analyzer (TGA). Tensile properties of aligned samples were determined at room temperature. The specimens were cut from the ribbons in the extrusion direction; hence the nano-fillers are somewhat aligned in the direction of stress. Typically it was observed that melt mixed samples exhibited superior mechanical properties compared to solution mixed samples. As expected, increased filler loading led to increased modulus and decreased elongation with respect to the neat polymer. The degree of dispersion and alignment of the nano-fillers was determined by high-resolution scanning electron microscopy (HRSEM). HRSEM of the ribbons revealed that the MWCNTs and CNFs were predominantly aligned in the flow direction. The TC of the samples was measured using a Nanoflash(TradeMark) instrument. Since the MWCNTs and CNF are anisotropic, the TC was expected to be different in the longitudinal (parallel to the nanotube and fiber axis) and transverse (perpendicular to the nanotube and fiber axis) directions. The extruded ribbons provided samples for transverse TC measurements. However, to determine the TC in the longitudinal direction, the ribbons needed to be stacked and molded under 1.7 MPa and 270 C. Samples were then obtained by cutting the molded block with a diamond saw. The largest TC improvement was achieved for aligned samples when the measurement was performed in the direction of MWCNT and CNF alignment (i.e. longitudinal axis). Unaligned samples also

showed a significant improvement in TC and may be potentially useful in applications when it is not possible to align the nano-filler. The results of this study will be presented.
Author
Polymers; Polyimide Resins; Thermal Conductivity; Fillers; Nanoparticles; Nanocomposites; Nanotechnology; Polymer Matrix Composites; Thermodynamic Properties; Mechanical Properties

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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*.

20080015693 Kushman (Brooks), P.C., Southfield, MI, USA
System and Method for Establishing Network Connection with Unknown Network and/or User Device
Short, J. E., Inventor; Kleinrock, L., Inventor; 1 Apr 05; 24 pp.; In English
Contract(s)/Grant(s): DARP-DAAH01-97-C-R179
Patent Info.: Filed Filed 1 Apr 05; US-Patent-Appl-SN-11-097 925
Report No.(s): PB2007-106012; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for connecting a user device to a network where the user device settings, the network settings, or both are unknown include intercepting packets transmitted by the user device and modifying the packets to be compatible with the network. The system and method are particularly suited for use by mobile computers, such as laptop computers, which are connected to various foreign networks. Depending upon the particular application, a device may be carried with the mobile computer, or attached as a node on the network. The device automatically determines the network settings of the user device and/or the network and modifies packets appropriately so that the user device can communicate over the network without having to reconfigure the user device with appropriate settings for each network it may encounter. Communication settings such as network address, gateway, proxy address, etc. are automatically determined using various techniques.
NTIS
Communication Networks; Packet Transmission; Personal Computers

20080015695 Siemens Corp. Research, Princeton, NJ, USA
Method and System for Off-Line, On-Line, and Instant-Message-Based Multimedia Collaboration
Vdaygiri, S., Inventor; Pizano, A., Inventor; Sastry, C. R., Inventor; 25 Nov 03; 13 pp.; In English
Patent Info.: Filed Filed 25 Nov 03; US-Patent-Appl-SN-10-221 982
Report No.(s): PB2007-105301; No Copyright; Avail.: CASI: A03, Hardcopy

A method for multimedia collaboration between a plurality of users including a host of a collaboration event includes storing an interface representative of the plurality of users in a memory location commonly accessible to the users; creating a composite document from selected source materials; selectively annotating the composite document; and personalizing the composite document with browser based annotations to form a collaboration document. A step of selecting a collaboration mode includes selecting a plurality of offline, near real time, real time, and disconnected modes and causing a selective seamless transition from one selected mode to another.
NTIS
Multimedia; On-Line Systems; Patent Applications; Telecommunication

20080015714 International Business Machines Corp., USA; International Business Machines Corp., Yorktown Heights, USA
Method and Allocation Device for Allocating Pending Requests for Data Packet Transmission at a Number of Inputs to a Number of Outputs of a Packet Switching Device in Successive Time Slots
Abel, F., Inventor; Iliadis, I., Inventor; Minkenberg, C. J. A., Inventor; 27 Feb 04; 16 pp.; In English
Contract(s)/Grant(s): B527064
Patent Info.: Filed Filed 27 Feb 04; US-Patent-Appl-SN-10-789 254
Report No.(s): PB2007-106026; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is related to a method for allocating pending requests for data packet transmission at a number of inputs to a number of outputs of a switching system in successive time slots, wherein according to a matching method the

allocation of the pending requests is optimized, wherein the matching method includes a number of steps for incrementally allocating the requests, wherein as a result of each step a matching information is provided, wherein in each time slot a request information is provided, the request information indicating the data packets at the inputs requesting transmission to respective outputs, the matching method comprising the steps of providing a first request information in a first time slot, performing a first step in the first time slot depending on the first request information to obtain a first matching information; providing a last request information in a last time slot successive the first time slot; performing a last step in the last time slot depending on the last request information and depending on the first matching information to obtain a final matching information; and assigning the pending data packets at the number of inputs to the number of outputs in dependence on the final matching information.
NTIS
Data Transmission; Packet Switching; Packet Transmission; Slots

20080015720 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA
Radiofrequency Attenuator and Method
Warner, B. P., Inventor; McCleskey, T. M., Inventor; Burrell, A. K., Inventor; Agrawa, A., Inventor; Hall, S. B., Inventor; 28 Mar 05; 7 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-36
Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-101 666
Report No.(s): PB2007-106043; No Copyright; Avail.: CASI: A02, Hardcopy

Radiofrequency attenuator and method. The attenuator includes a pair of transparent windows. A chamber between the windows is filled with molten salt. Preferred molten salts include quarternary ammonium cations and fluorine-containing anions such as tetrafluoroborate (BF(sub 4)(sup -)),hexafluorophosphate (PF(sub 6)(sup -)), hexafluoroarsenate (AsF(sub 6)(sup -)), trifluoromethylsulfonate (CF(sub 3)(sub SO3)(sup -)), bis(trifluoromethylsulfonyl)imide ((CF(sub 3)(sub SO2))(sub 2)(sub N)(sup -)), bis(perfluoroethylsulfonyl)imide ((CF(sub 3)CF(sub 2)SO(sub 2))(sub 2N) (sup -)) and tris(trifluoromethy lsulfonyl)methide ((CF(sub 3)SO(sub 2))(sub 3) C(sup -)). Radicals or radical cations may be added to or electrochemically generated in the molten salt to enhance the RF attenuation.
NTIS
Attenuators; Radio Frequencies; Electrochemistry

20080015837 ITT Corp., Herndon, VA, USA
Future Aeronautical Communication Infrastructure Technology Investigation
Gilbert, Tricia; Jin, Jenny; Bergerm Jason; Henriksen, Steven; April 2008; 222 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05CA85C; WBS 561581.02.08.03.11.01
Report No.(s): NASA/CR--2008-215144; TR07040; E-16306; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015837

This National Aeronautics and Space Administration (NASA) Contractor Report summarizes and documents the work performed to investigate technologies that could support long-term aeronautical mobile communications operating concepts for air traffic management (ATM) in the timeframe of 2020 and beyond, and includes the associated findings and recommendations made by ITT Corporation and NASA Glenn Research Center to the Federal Aviation Administration (FAA). The work was completed as the final phase of a multiyear NASA contract in support of the Future Communication Study (FCS), a cooperative research and development program of the USA FAA, NASA, and EUROCONTROL. This final report focuses on an assessment of final five candidate technologies, and also provides an overview of the entire technology assessment process, including final recommendations.
Author
Aircraft Communication; Mobile Communication Systems; Air Traffic Control

20080015943 National Inst. of Information and Communications Technology, Japan
Space Weather Study Using the HF Radar in King Salmon, Alaska
KIKUCHI Takashi; HASHIMOTO K. Kumiko; SHINOHARA Manabu; NOZAKI Kenro; Bristow, B.; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 113-121; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Earth orbiting and geostationary satellites often suffered from damages caused by space storms, of which energy is

produced by the interaction between the solar wind and magnetosphere. In particular, the energy transmission to the inner magnetosphere and low latitude ionosphere is a critical issue in the space weather study. To monitor the electromagnetic energy coming into the magnetosphere and ionosphere, we built an HF radar in King Salmon, Alaska, and operated it as a part of the SuperDARN radar network. Combining with magnetometer data from the low latitude and equator, we revealed new aspects of the energy transmission to the equatorial ionosphere. Here we report the radar system and initial results basing on the radar and magnetometer observations.
Author
Space Weather; High Frequencies; Radar Tracking; Radar Networks; Solar Wind; Storms; Magnetometers; Energy Transfer

20080015953 National Inst. of Information and Communications Technology, Japan
A Comparative Study of the Electron Density Estimated with MF Radar DAE Method and Cosmic Noise Absorption at Poker Flat, Alaska
KAWAMURA, Seiji; MORI, Hirotaka; MURAYAMA, Yasuhiro; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 51-58; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

The method to estimate electron density from partial reflection of medium or high frequency radio waves from the ionospheric D-region was proposed in 1950s and established in 1970s. This method, which is applied for MF (medium frequency) radar observations, is called Differential Absorption Experiment (DAE), and is now used without significant improvements though many years have passed. In this paper, we compare the electron density from MF radar and Cosmic Noise Absorption (CNA) from imaging riometer, both instruments are installed at Poker Frat, Alaska. The accuracy and validity of electron density estimated with the MF radar are discussed.
Author
Electron Density (Concentration); Cosmic Noise; High Frequencies; Radio Waves; Riometers; Radar Tracking

20080015954 National Inst. of Information and Communications Technology, Japan
Artificial Ionospheric Irregularities Measured with the MUIR (Modular UHF Ionospheric Radar) at HAARP (High Frequency Active Auroral Research Program)
OHYAMA Shin-ichiro; Watkins, B. J.; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007; ISSN 1349-3191, pp. 95-102; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Many experiments involving the modification of the ionosphere with high-power, high-frequency (HF) radio waves have been performed since 1970s. HAARP (High Frequency Active Auroral Research Program) presented in this paper plays important roles in this field. Recently MUIR (Modular UHF Ionospheric Radar; 446 MHz) was installed, and the radar started the operation from February 2005. The strongest advantage of this radar is the phased array system, which can quickly change the beam direction. The radar has obtained important data sets during many HF ionospheric modification experiments. In this paper we present (1) HF-induced ion line and plasma line, (2) overshoot, and (3) Langmuir waves generation in the first I00 ms after HF turn-on.
Author
Phased Arrays; High Frequencies; Radio Waves; Ultrahigh Frequencies; Ionospheric Disturbances

20080016475 Space Environment Technologies, Pacific Palisades, CA, USA
Mitigating Aviation Communication and Satellite Orbit Operations Surprises from Adverse Space Weather
Tobiska, W. Kent; January 2008; 1 pp.; In English; Fifth Symposium on Space Weather, 20-24 Jan. 2008, New Orleans, LA, USA
Contract(s)/Grant(s): NNH05CD15C; NAG5-11408; Copyright; Avail.: Other Sources; Abstract Only

Adverse space weather affects operational activities in aviation and satellite systems. For example, large solar flares create highly variable enhanced neutral atmosphere and ionosphere electron density regions. These regions impact aviation communication frequencies as well as precision orbit determination. The natural space environment, with its dynamic space weather variability, is additionally changed by human activity. The increase in orbital debris in low Earth orbit (LEO), combined with lower atmosphere CO2 that rises into the lower thermosphere and causes increased cooling that results in increased debris lifetime, adds to the environmental hazards of navigating in near-Earth space. This is at a time when commercial space endeavors are posed to begin more missions to LEO during the rise of the solar activity cycle toward the next maximum (2012). For satellite and aviation operators, adverse space weather results in greater expenses for orbit

management, more communication outages or aviation and ground-based high frequency radio used, and an inability to effectively plan missions or service customers with space-based communication, imagery, and data transferal during time-critical activities. Examples of some revenue-impacting conditions and solutions for mitigating adverse space weather are offered.
Derived from text
Space Weather; Aircraft Communication; Satellite Orbits; Operational Hazards; Satellite Communication; Operational Problems

20080016539 Research and Technology Organization, Neuilly-sur-Seine, France
Information Management over Disadvantaged Grids. Final Report of the RTO Information Systems Technology Panel Task Group IST-030/RTG-012
December 2007; 94 pp.; In English; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): RTO-TR-IST-030; AC/323(IST-030)TP/33; Copyright; Avail.: CASI: C01, CD-ROM: A05, Hardcopy

This report summarizes a four-year study carried out by NATO RTG-012/IST-030 Research Task Group on the problem of 'Information Management over Disadvantaged Grids'. Such disadvantaged grids (e.g., tactical ad hoc military radio networks) are characterized by low bandwidth, variable throughput, unreliable connectivity, and energy constraints imposed by the wireless communications grid that links the nodes. The scope of this study was limited to land-based digital data exchange below brigade level where all nodes are mobile and the exchange medium is combat net radio. Managed information exchange in this communications environment was analyzed from three different perspectives within a system architecture: the application level, the middleware level and the network level. Due to the highly variable quality of the tactical communications channels and the unpredictable nature of the tactical battlefield, it was concluded that dynamic adaptation to rapid changes in either the communications or battlefield environment, without user intervention, was key to achieving optimum information exchange. This report identifies functional and performance objectives for the application, middleware and network levels that enable the levels to cooperate to detect and adapt to those changing environments in a way that will enhance delivery of data of highest operational importance.
Author
Bandwidth; Channels (Data Transmission); Information Management; Wireless Communication; Data Links; Communication Networks; Data Transmission; Information Transfer

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

20080015671 Mark A. Wurm, Clifton, VA, USA; BAE Systems and Technology, Nashua, NH, USA
Module Inspection Fixture
Houston, C. R., Inventor; 28 Feb 05; 5 pp.; In English
Contract(s)/Grant(s): 54272DDP2S
Patent Info.: Filed Filed 28 Feb 05; US-Patent-Appl-SN-11-067 846
Report No.(s): PB2007-106032; No Copyright; Avail.: CASI: A01, Hardcopy

An apparatus for inspecting semiconductor module packages which includes a cylindrical base section, a truncated spherical section superimposed on the cylindrical base capable of being rotated and tilted on the cylindrical base section, and a tray section superimposed on the truncated section.
NTIS
Fixtures; Inspection; Patent Applications; Semiconductors (Materials)

20080015691 Intellectual Property/Technology Law, Research Triangle Park, NC, USA
Apparatus and Process for Sensing Fluoro Species in Semiconductor Processing Systems
Dimeo, F., Inventor; Chen, P. S. H., Inventor; Neuner, J. W., Inventor; Welch, J., Inventor; Stawasz, M., Inventor; 14 Feb 05; 34 pp.; In English
Contract(s)/Grant(s): NIST-70NANB9H3018

Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057 734
Report No.(s): PB2007-104794; No Copyright; Avail.: CASI: A03, Hardcopy

A gas detector and process for detecting a fluorine-containing species in a gas containing same, e.g., an effluent of a semiconductor processing tool undergoing etch cleaning with HF, NF(sub 3), etc. The detector in a preferred structural arrangement employs a microelectromechanical system (MEMS)-based device structure and/or a free-standing metal element that functions as a sensing component and optionally as a heat source when elevated temperature sensing is required. The free-standing metal element can be fabricated directly onto a standard chip carrier/device package so that the package becomes a platform of the detector.

NTIS

Detection; Fluorine; Fluoro Compounds; Gas Detectors; Heat Sources; Semiconductors (Materials)

20080015716 Daly, Crowley and Mofford, LLP, Canton, MA, USA

Analog-to-Digital Converter Having Parametric Configurability

Gulati, K., Inventor; Lee, H. S., Inventor; 8 Nov 04; 33 pp.; In English
Contract(s)/Grant(s): DAAL-01-95-K-3526
Patent Info.: Filed Filed 8 Nov 04; US-Patent-Appl-SN-10-983 953
Report No.(s): PB2007-106030; No Copyright; Avail.: CASI: A03, Hardcopy

A reconfigurable ADC includes a plurality of reconfigurable blocks for allowing the ADC to provide a plurality of architectures. In one embodiment, the ADC can be configured to operate in a pipeline mode and a sigma-delta mode. This arrangement provides an ADC having a relatively large range of bandwidth and resolution.

NTIS

Analog to Digital Converters; Digital Electronics; Circuits; Computer Components

20080015717 Birch Stewart Kolasch and Birch, Falls Church, VA, USA

Bonding Arrangement and Method for LTCC Circuitry

Berry, C. W., Inventor; Bailey, A. E., Inventor; 26 Feb 04; 6 pp.; In English
Contract(s)/Grant(s): F33657-97-LTCC-0030
Patent Info.: Filed Filed 26 Feb 04; US-Patent-Appl-SN-10-786 125
Report No.(s): PB2007-106031; No Copyright; Avail.: CASI: A02, Hardcopy

An LTCC (low temperature cofired ceramic) structure which has conductors to which leads are to be bonded for connection to external circuitry. The conductors include additives to promote adhesion to the ceramic layer. The presence of these additives degrade bonding performance. For better bondability of the leads, a pure conductor metal layer, devoid of the additives is placed on the conductors in areas where leads are to be bonded. This pure conductor metal layer may be cofired with the stack of ceramic layers or may be post fired after stack firing.

NTIS

Bonding; Ceramics; Circuits; Conductors; Low Temperature

20080015766 NASA Glenn Research Center, Cleveland, OH, USA

Electromagnetic Forces in a Hybrid Magnetic-Bearing Switched-Reluctance Motor

Morrison, Carlos R.; Siebert, Mark W.; Ho, Eric J.; March 2008; 23 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.02
Report No.(s): NASA/TP--2008-214818; E-15821-1; Copyright; Avail.: CASI: A03, Hardcopy

Analysis and experimental measurement of the electromagnetic force loads on the hybrid rotor in a novel hybrid magnetic-bearing switched-reluctance motor (MBSRM) have been performed. A MBSRM has the combined characteristics of a switched-reluctance motor and a magnetic bearing. The MBSRM discussed in this report has an eight-pole stator and a six-pole hybrid rotor, which is composed of circular and scalloped lamination segments. The hybrid rotor is levitated using only one set of four stator poles, while a second set of four stator poles imparts torque to the scalloped portion of the rotor, which is driven in a traditional switched reluctance manner by a processor. Static torque and radial force analysis were done for rotor poles that were oriented to achieve maximum and minimum radial force loads on the rotor. The objective is to assess whether simple one-dimensional magnetic circuit analysis is sufficient for preliminary evaluation of this machine, which may exhibit strong three-dimensional electromagnetic field behavior. Two magnetic circuit geometries, approximating the complex topology of the magnetic fields in and around the hybrid rotor, were employed in formulating the electromagnetic radial force

equations. Reasonable agreement between the experimental and the theoretical radial force loads predictions was obtained with typical magnetic bearing derating factors applied to the predictions.
Author
Reluctance; Electric Motors; Magnetic Bearings; Electromagnetic Fields; Network Analysis; Magnetic Circuits; Rotors; Electric Networks; Magnetic Fields

20080015877 Lawrence Livermore National Lab., Livermore, CA USA
3D Vectorial Time Domain Computational Integrated Photonics
Kallman, J. S.; Bond, T. C.; Koning, J. M.; Stowell, M. L.; Feb. 26, 2007; 52 pp.; In English
Report No.(s): DE2007-902338; UCRL-TR-228339; No Copyright; Avail.: National Technical Information Service (NTIS)
The design of integrated photonic structures poses considerable challenges. 3D-Time- Domain design tools are fundamental in enabling technologies such as all-optical logic, photonic bandgap sensors, THz imaging, and fast radiation diagnostics. Such technologies are essential to LLNL and WFO sponsors for a broad range of applications: encryption for communications and surveillance sensors (NSA, NAI and IDIV/ PAT); high density optical interconnects for high-performance computing (ASCI); high-bandwidth instrumentation for NIF diagnostics; micro-sensor development for weapon miniaturization within the Stockpile Stewardship and DNT programs; and applications within HSO for CBNP detection devices.
NTIS
Optical Equipment; Photonics; Cryptography; Integrated Optics

20080015928 Condition Monitoring and Diagnostic Engineering Management International, Birmingham, UK
International Journal of COMADEM, Vol. 10, No. 2
Rao, B. K. N., Editor; April 2007; ISSN 1363-7681; 56 pp.; In English; See also 20080015929 - 20080015933; Original contains black and white illustrations; Copyright; Avail.: Other Sources
Topics covered include: Stress Fields and Failure Mechanisms in Active Composite Structures; Design of State Feedback Controller for Smart Cantilever Beam Using Interval Method; Dynamic Analysis of Slotted MEMS Cantilevers; Design and Testing of a PVDF Hydrophone; and Modeling and Application of Piezoelectric Materials in Smart Structures.
Derived from text
Cantilever Beams; Control Systems Design; Microelectromechanical Systems; Piezoelectricity; Smart Structures; Stress Distribution; Composite Structures

20080015931 Indian Inst. of Tech., Madras, India
Design and Testing of a PVDF Hydrophone
Raj, R. Vigel; Padmanabhan, C.; Sivakumar, S. M.; Rao, C. Lakshmana; International Journal of COMADEM, Vol. 10, No. 2; April 2007, pp. pp. 20-29; In English; See also 20080015928; Copyright; Avail.: Other Sources
This paper presents a methodology of design for a circular flexural plate PVDF hydrophone taking into consideration the various design parameters such as acoustical parameters, structural requirement and electromechanical properties of the PVDF. Little attention has been paid in the past on a systematic design of a hydrophone considering the various design parameters. Sensitivity and static pressure capability curves obtained in this work will help the designer in selecting an appropriate design for a given application with specific design constraints. Since the support conditions affect the sensitivity drastically, two bounding conditions, namely the simply supported and the clamped boundary conditions were considered for the design. Experiments were conducted to assess the performance of the hydrophones constructed using the proposed design methodology. In addition, theoretical calculations made on the designed hydrophone correlate well with the experimental observations. This demonstrates that the proposed methodology can be directly used for the design of a hydrophone given the design considerations.
Author
Design Analysis; Hydrophones; Piezoelectric Ceramics; Lead Zirconate Titanates

20080015995 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
SiC vs. Si for High Radiation Environments
Harris, Richard D.; February 2008; 24 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001
Report No.(s): JPL Publication 08-6; Copyright; Avail.: CASI: A03, Hardcopy
Commercial silicon carbide and silicon Schottky barrier power diodes have been subjected to 203 MeV proton irradiation,

and the effects of the resultant displacement damage on the I-V characteristics have been observed. Changes in forward bias I-V characteristics are reported for fluences up to 4 1014 p/cm2. For devices of both material types, the series resistance is observed to increase as the fluence increases. The changes in series resistance result from changes in the free carrier concentration due to carrier removal by the defects produced. A simple model is presented that allows calculation of the series resistance of the device and then relates the carrier removal rate to the changes in series resistance. Using this model to calculate the carrier removal rate in both materials reveals that the carrier removal rate in silicon is less than that in silicon carbide, indicating that silicon is the more radiation-tolerant material.
Author
Silicon Carbides; Silicon; Proton Irradiation; Schottky Diodes; Carrier Density (Solid State); Damage

20080016473 Fay, Sharpe, Fagan, Minnich and McKee, LLP, Cleveland, OH, USA
Phosphor and Blends Thereof for Use in LEDs
Setlur, A. A., Inventor; Srivastava, A. M., Inventor; Comanzo, H. A., Inventor; Hancu, D., Inventor; Valyou Briel, L. J., Inventor; 10 Mar 04; 12 pp.; In English
Contract(s)/Grant(s): NIST-70NANB8114022
Patent Info.: Filed Filed 10 Mar 04; US-Patent-Appl-SN-10-797 784
Report No.(s): PB2007-104751; No Copyright; Avail.: CASI: A03, Hardcopy

Phosphor compositions having the formula (Ba,Sr,Ca)SiO(sub 4):Eu and light emitting devices including a semiconductor light source and the above phosphor. Also disclosed are blends of (Ba,Sr,Ca)SiO(sub 4):Eu andone or more additional phosphors and light emitting devices incorporating the same. Preferred blends include (Sr,Ba,Ca)(sub 2)SiO(sub 4):Eu and at least one of (Sr,Mg,Ca,Ba,Zn)(sub 2)P(sub 2)O(sub7):Eu,Mn; (Ca,Sr,Ba,Mg)(sub 5)(PO(sub 4))(sub 3)(Cl,F,OH):Eu,Mn; (Sr,Ba,Ca)MgAl(sub 10)O(sub 17):Eu,Mn; and Mg(sub 4)FGeO(sub 6):Mn(sup 4+); and one or more garnet phosphors having the general formula (Y,Gd,La,Lu,T,Pr, Sm)(sub3)(Al,Ga,In)(sub 5)O(sub 12):Ce.
NTIS
Emitters; Light Emitting Diodes; Mixtures; Patent Applications; Phosphors; Semiconductors (Materials)

20080016474 McLeod and Moyne, P.C., Okekmos, MI, USA; Michigan State Univ., East Lansing, MI, USA
Electrically Conductive Polycrystalline Diamond and Particulate Metal Based Electrodes
Swain, G. M., Inventor; Wang, J., Inventor; 20 Apr 05; 13 pp.; In English
Contract(s)/Grant(s): DE-FG02-01ER15120
Patent Info.: Filed Filed 20 Apr 05; US-Patent-Appl-SN-11-110 083
Report No.(s): PB2007-104750; No Copyright; Avail.: CASI: A03, Hardcopy

An electrically conducting and dimensionally stable diamond (12, 14) and metal particle (13) electrode produced by electrodepositing the metal on the diamond is described. The electrode is particularly useful in harsh chemical environments and at high current densities and potentials. The electrode is particularly useful for generating hydrogen, and for reducing oxygen and oxidizing methanol in reactions which are of importance in fuel cells.
NTIS
Deposition; Diamonds; Electrical Resistivity; Electrodes; Metals; Particulates; Patent Applications; Polycrystals

20080016477 Sacco and Associates, PA, Palm Beach Gardens, FL, USA
Dielectric Substrate with Selectively Controlled Effective Permittivity and Loss Tangent
Tebbe, D., Inventor; Smyth, T., Inventor; Chappell, W. J., Inventor; 29 Apr 05; 9 pp.; In English
Contract(s)/Grant(s): DARP-F005521
Patent Info.: Filed Filed 29 Apr 05; US-Patent-Appl-SN-11-118 445
Report No.(s): PB2007-104748; No Copyright; Avail.: CASI: A02, Hardcopy

A substrate for an RF device includes a plurality of layers of dielectric material cofired in a stack. The plurality of layers is formed from a material having a permittivity. Selected ones of the layers have a pattern of perforations formed in at least one perforated area. The perforated areas are generally aligned with one another in the stack to lower one or more of an effective value of a permittivity and a loss tangent in a least one spatially defined region of the substrate.
NTIS
Circuits; Dielectrics; Losses; Patent Applications; Permittivity; Radio Frequencies; Substrates; Tangents

34
FLUID MECHANICS AND THERMODYNAMICS

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

20080015677 Fluor Daniel Hanford, Inc., Richland, WA, USA

Hanford Double-Shell Tank Thermal and Seismic Project - Dytran Benchmark Analysis of Seismically Induced Fluid Structure Interaction in Flat-Top Tanks

Mackey, T. C.; Feb. 2007; 138 pp.; In English

Report No.(s): DE2007-901434; RPP-RPT-30807; No Copyright; Avail.: National Technical Information Service (NTIS)

The overall scope of the project is to complete an up-to-date comprehensive analysis of record of the DST System at Hanford. The 'Double-Shell Tank (DST) Integrity Project - DST Thermal and Seismic Project' is in support of Tri-Party Agreement Milestone M-48-14.

NTIS

Radioactive Wastes; Seismic Energy; Tanks (Containers)

20080015736 Ecole Centrale de Lyon, Ecully, France; NASA Langley Research Center, Hampton, VA, USA

Anisotropic Developments for Homogeneous Shear Flows

Cambon, Claude; Rubinstein, Robert; January 2006; 27 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

The general decomposition of the spectral correlation tensor R(sub ij)(k) by Cambon et al. (J. Fluid Mech., 202, 295; J. Fluid Mech., 337, 303) into directional and polarization components is applied to the representation of R(sub ij)(k) by spherically averaged quantities. The decomposition splits the deviatoric part H(sub ij)(k) of the spherical average of R(sub ij)(k) into directional and polarization components H(sub ij)(sup e)(k) and H(sub ij)(sup z)(k). A self-consistent representation of the spectral tensor in the limit of weak anisotropy is constructed in terms of these spherically averaged quantities. The directional polarization components must be treated independently: models that attempt the same representation of the spectral tensor using the spherical average H(sub ij)(k) alone prove to be inconsistent with Navier-Stokes dynamics. In particular, a spectral tensor consistent with a prescribed Reynolds stress is not unique. The degree of anisotropy permitted by this theory is restricted by realizability requirements. Since these requirements will be less severe in a more accurate theory, a preliminary account is given of how to generalize the formalism of spherical averages to higher expansion of the spectral tensor. Directionality is described by a conventional expansion in spherical harmonics, but polarization requires an expansion in tensorial spherical harmonics generated by irreducible representations of the spatial rotation group SO(exp 3). These expansions are considered in more detail in the special case of axial symmetry.

Author

Anisotropy; Shear Flow; Homogeneous Turbulence; Velocity Distribution; Computational Fluid Dynamics; Aerodynamics

20080015838 NASA Glenn Research Center, Cleveland, OH, USA

Boiling Experiment Facility for Heat Transfer Studies in Microgravity

Delombard, Richard; McQuillen, John; Chao, David; April 2008; 24 pp.; In English; 46th Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 825080.04.02.20.07

Report No.(s): NASA/TM-2008-215148; AIAA Paper-2008-0814; E-16311; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015838

Pool boiling in microgravity is an area of both scientific and practical interest. By conducting tests in microgravity, it is possible to assess the effect of buoyancy on the overall boiling process and assess the relative magnitude of effects with regards to other 'forces' and phenomena such as Marangoni forces, liquid momentum forces, and microlayer evaporation. The Boiling eXperiment Facility is now being built for the Microgravity Science Glovebox that will use normal perfluorohexane as a test fluid to extend the range of test conditions to include longer test durations and less liquid subcooling. Two experiments, the Microheater Array Boiling Experiment and the Nucleate Pool Boiling eXperiment will use the Boiling eXperiment Facility. The objectives of these studies are to determine the differences in local boiling heat transfer mechanisms in microgravity and normal gravity from nucleate boiling, through critical heat flux and into the transition boiling regime and to examine the bubble nucleation, growth, departure and coalescence processes. Custom-designed heaters will be utilized to achieve these objectives.

Author

Gas-Liquid Interactions; Microgravity; Nucleate Boiling; Heat Transfer; Heat Flux; Gravitation; Fluid Dynamics

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*.

20080015703 Honeywell International, Inc., Morristown, NJ, USA
Fiber Optic Gyroscope using a Narrowband FBG Filter as a Wavelength Reference
Anson, S. A., Inventor; Lange, C. H., Inventor; Greening, T. C., Inventor; 26 Feb 04; 14 pp.; In English
Contract(s)/Grant(s): N0030-01-C-0028
Patent Info.: Filed Filed 26 Feb 04; US-Patent-Appl-SN-10-786 143
Report No.(s): PB2007-106022; No Copyright; Avail.: CASI: A03, Hardcopy

Fiber optic gyroscope architectures that incorporate both (1) a WDM-based wavelength control and (2) a wavelength reference based on a narrowband fiber Bragg grating (FBG), with the latter component providing significant improvement in the stability of the wavelength reference by calibrating out wavelength errors associated with a WDM-based wavelength control scheme.
NTIS
Fiber Optics; Gyroscopes; Narrowband; Wavelengths

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*.

20080015730 Finnegan, Henderson, Farabow, Garrett, Dunner, LLP, Washington, DC, USA
Doped Stoichiometric Lithium Niobate and Lithium Tantalate for Self-Frequency Conversion Lasers
Scripsick, M. P., Inventor; Wechsler, B. A., Inventor; Jun. 24, 2004; 28 pp.; In English
Contract(s)/Grant(s): NSF-DMI-0215211
Patent Info.: Filed Filed 24 Jun 04; US-Patent-Appl-SN-10-877 805
Report No.(s): PB2007-106025; No Copyright; Avail.: CASI: A03, Hardcopy

In accordance with the present invention, a crystal laser material that is suitable for self doubling is presented. A crystal according to the present invention includes a stoichiometric lithium niobate crystal isomorph host material doped with at least one laser ion. In some embodiments, the stoichiometric lithium niobate crystal isomorph host material is lithium niobate. In some embodiments, the stoichiometric lithium niobate crystal isomorph host material is lithium tantalate. In some embodiments, the at least one laser ion includes Ytterbium. In some embodiments, the at least one laser ion includes a rare-earth ion. In some embodiments, the stoichiometric lithium niobate crystal isomorph host material is periodically poled to provide quasi-phase matching. Additionally, further dopant ions, for example Magnesium, can be included.
NTIS
Crystals; Doped Crystals; Frequency Converters; Lasers; Lithium; Lithium Niobates; Stoichiometry; Tantalum Compounds

20080015855 NASA Langley Research Center, Hampton, VA, USA
Laser Vibrometry Helps to Validate Gossamer Space Structures
Gaspar, James L.; January 2006; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 439432.07.02.07; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015855

NASA is pursuing the development of large ultra-lightweight structures, commonly referred to as gossamer space structures. These structures have large areas and small areal densities, which complicates ground testing significantly as the ground operations interfaces and gravity loading can become cumbersome. Laser vibrometry has proven to be a critical sensing technology for validating the structural characteristics of these gossamer structures, due to its precision, range, and non-contacting nature.
Author
Large Space Structures; Lasers; Spacecraft Structures; Vibration Measurement; Structural Design

20080015875 Lawrence Livermore National Lab., Livermore, CA USA

Injection Laser System on the National Ignition Facility

Bowers, M.; Burkhart, S.; Cohen, S.; Erbert, G.; Heebner, J.; Dec. 21, 2006; 22 pp.; In English

Report No.(s): DE2007-902363; UCRL-PROC-226945; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Ignition Facility (NIF) is currently the largest and most energetic laser system in the world. The main amplifiers are driven by the Injection Laser System comprised of the master oscillators, optical preamplifiers, temporal pulse shaping and spatial beam formatting elements and injection diagnostics. Starting with two fiber oscillators separated by up to a few angstroms, the pulse is phase modulated to suppress SBS and enhance spatial smoothing, amplified, split into 48 individual fibers, and then temporally shaped by an arbitrary waveform generator. Residual amplitude modulation induced in the preamplifiers from the phase modulation is also precompensated in the fiber portion of the system before it is injected into the 48 pre-amplifier modules (PAMs). Each of the PAMs amplifies the light from the 1 nJ fiber injection up to the multi-joule level in two stages. Between the two stages the pre-pulse is suppressed by 60 dB and the beam is spatially formatted to a square aperture with precompensation for the nonuniform gain profile of the main laser. The input sensor package is used to align the output of each PAM to the main laser and acquire energy, power, and spatial profiles for all shots. The beam transport sections split the beam from each PAM into four main laser beams (with optical isolation) forming the 192 beams of the NIF. Optical, electrical, and mechanical design considerations for long term reliability and availability will be discussed.

NTIS

Ignition; Injection Lasers; Lasers

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*.

20080015864 NASA Marshall Space Flight Center, Huntsville, AL, USA

Welding Development: Marshall Space Flight Center

Ding, Jeff; June 27, 2007; 49 pp.; In English; Missile and Space materials Manufacturing Symposium, 25-29 Jun. 2007, Keystone, CO, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015864

This paper presents the basic understanding of the friction stir welding process. It covers process description, pin tool operation and materials, metal flow theory, mechanical properties, and materials welded using the process. It also discusses the thermal stir welding process and the differences between thermal stir and friction stir welding. MSFC weld tools used for development are also presented.

Author

Friction Stir Welding; Mechanical Properties; Metals; Welded Joints

38
QUALITY ASSURANCE AND RELIABILITY

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

20080015748 NASA Langley Research Center, Hampton, VA, USA

An Uncertainty Structure Matrix for Models and Simulations

Green, Lawrence L.; Blattnig, Steve R.; Hemsch, Michael J.; Luckring, James M.; Tripathi, Ram K.; April 07, 2008; 11 pp.; In English; 10th AIAA Non-Deterministic Approaches Conference, 7-10 Apr. 2008, Schaumburg, IL, USA

Report No.(s): AIAA Paper 2008-2154; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015748

Software that is used for aerospace flight control and to display information to pilots and crew is expected to be correct and credible at all times. This type of software is typically developed under strict management processes, which are intended to reduce defects in the software product. However, modeling and simulation (M&S) software may exhibit varying degrees of correctness and credibility, depending on a large and complex set of factors. These factors include its intended use, the

known physics and numerical approximations within the M&S, and the referent data set against which the M&S correctness is compared. The correctness and credibility of an M&S effort is closely correlated to the uncertainty management (UM) practices that are applied to the M&S effort. This paper describes an uncertainty structure matrix for M&S, which provides a set of objective descriptions for the possible states of UM practices within a given M&S effort. The columns in the uncertainty structure matrix contain UM elements or practices that are common across most M&S efforts, and the rows describe the potential levels of achievement in each of the elements. A practitioner can quickly look at the matrix to determine where an M&S effort falls based on a common set of UM practices that are described in absolute terms that can be applied to virtually any M&S effort. The matrix can also be used to plan those steps and resources that would be needed to improve the UM practices for a given M&S effort.
Author
Ambiguity; Software Engineering; Flight Simulation; Aerospace Industry; Models; Quality Control

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*.

20080015741 NASA Langley Research Center, Hampton, VA, USA
Structural Efficiency of Stitched Rod-Stiffened Composite Panels with Stiffener Crippling
Jegley, Dawn C.; Velicki, Alexander; Hansen, Daniel A.; April 07, 2008; 11 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2008-2170; Copyright; Avail.: CASI: A03, Hardcopy

The structural efficiency of rod-stiffened stitched specimens is evaluated to determine their weight saving potential if the stiffeners were allowed to buckle at less than or equal to design ultimate load. Analytical and experimental results from rod-stiffened and blade-stiffened single-stiffener specimens are presented. In both cases, skin and flanges were stitched together through-the-thickness prior to curing. No mechanical fasteners were used for the assembly. Specimens were loaded to failure in axial compression. Failure modes are discussed. Finite element and experimental results agree for the response of the structures. For some specimen configurations, improved structural efficiency can be obtained by allowing stiffeners to buckle at design limit load rather than requiring that buckling not occur prior to design ultimate load. In addition, through-the-thickness stitching can change the failure mechanism by suppressing delamination between skin and flange. A parametric study is presented herein which describes the possible weight savings with this approach.
Author
Composite Structures; Finite Element Method; Stiffening; Rods; Fasteners; Failure Modes; Loads (Forces); Buckling; Rigid Structures

20080015745 Bristol Univ., UK; NASA Langley Research Center, Hampton, VA, USA
Improved Design Formulae for Buckling of Orthotropic Plates under Combined Loading
Weaver, Paul M.; Nemeth, Michael P.; April 07, 2008; 10 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Simple, accurate buckling interaction formulae are presented for long orthotropic plates with either simply supported or clamped longitudinal edges and under combined loading that are suitable for design studies. The loads include 1) combined uniaxial compression (or tension) and shear, 2) combined pure inplane bending and 3) shear and combined uniaxial compression (or tension) and pure inplane bending. The interaction formulae are the results of detailed regression analysis of buckling data obtained from a very accurate Rayleigh-Ritz method.
Author
Buckling; Regression Analysis; Edges; Loads (Forces); Bending

20080015750 NASA Langley Research Center, Hampton, VA, USA

Numerical Characterization of a Composite Bonded Wing-Box

Smeltzer, Stanley S., III; Lovejoy, Andrew E.; Satyanarayana, Arunkumar; April 07, 2008; 12 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The development of composite wing structures has focused on the use of mechanical fasteners to join heavily-loaded areas, while bonded joints have been used only for select locations. The focus of this paper is the examination of the adhesive layer in a generic bonded wing box that represents a 'fastenerless' or unitized structure in order to characterize the general behavior and failure mechanisms. A global/local approach was applied to study the response of the adhesive layer using a global shell model and a local shell/solid model. The wing box was analyzed under load to represent a high-g up-bending condition such that the strains in the composite sandwich face sheets are comparable to an expected design allowable. The global/local analysis indicates that at these wing load levels the strains in the adhesive layer are well within the adhesive's elastic region, such that yielding would not be expected in the adhesive layer. The global/local methodology appears to be a promising approach to evaluate the structural integrity of the adhesively bonded structures.

Author

Composite Structures; Adhesive Bonding; Sandwich Structures; Aircraft Design; Wings; Structural Design; Structural Stability

20080015751 NASA Langley Research Center, Hampton, VA, USA

New Developments in the Embedded Statistical Coupling Method: Atomistic/Continuum Crack Propagation

Saether, E.; Yamakov, V.; Glaessgen, E.; April 07, 2008; 28 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC1-02043; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015751

A concurrent multiscale modeling methodology that embeds a molecular dynamics (MD) region within a finite element (FEM) domain has been enhanced. The concurrent MD-FEM coupling methodology uses statistical averaging of the deformation of the atomistic MD domain to provide interface displacement boundary conditions to the surrounding continuum FEM region, which, in turn, generates interface reaction forces that are applied as piecewise constant traction boundary conditions to the MD domain. The enhancement is based on the addition of molecular dynamics-based cohesive zone model (CZM) elements near the MD-FEM interface. The CZM elements are a continuum interpretation of the traction-displacement relationships taken from MD simulations using Cohesive Zone Volume Elements (CZVE). The addition of CZM elements to the concurrent MD-FEM analysis provides a consistent set of atomistically-based cohesive properties within the finite element region near the growing crack. Another set of CZVEs are then used to extract revised CZM relationships from the enhanced embedded statistical coupling method (ESCM) simulation of an edge crack under uniaxial loading.

Author (revised)

Fracture Mechanics; Cracks; Continuum Mechanics; Finite Element Method; Continuum Modeling; Statistical Analysis; Molecular Dynamics; Atomic Physics; Metals

20080015890 NASA Langley Research Center, Hampton, VA, USA

On the Application of a Response Surface Technique to Analyze Roll-over Stability of Capsules with Airbags Using LS-Dyna

Horta, Lucas G.; Reaves, Mercedes C.; March 2008; 19 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 644423.04.31.04.40.43.20

Report No.(s): NASA/TM-2008-215117; L-19407; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015890

As NASA moves towards developing technologies needed to implement its new Exploration program, studies conducted for Apollo in the 1960's to understand the rollover stability of capsules landing are being revisited. Although rigid body kinematics analyses of the roll-over behavior of capsules on impact provided critical insight to the Apollo problem, extensive ground test programs were also used. For the new Orion spacecraft being developed to implement today's Exploration program, new air-bag designs have improved sufficiently for NASA to consider their use to mitigate landing loads to ensure crew safety and to enable re-usability of the capsule. Simple kinematics models provide only limited understanding of the behavior of these air bag systems, and more sophisticated tools must be used. In particular, NASA and its contractors are using

the LS-Dyna nonlinear simulation code for impact response predictions of the full Orion vehicle with air bags by leveraging the extensive air bag prediction work previously done by the automotive industry. However, even in today's computational environment, these analyses are still high-dimensional, time consuming, and computationally intensive. To alleviate the computational burden, this paper presents an approach that uses deterministic sampling techniques and an adaptive response surface method to not only use existing LS-Dyna solutions but also to interpolate from LS-Dyna solutions to predict the stability boundaries for a capsule on airbags. Results for the stability boundary in terms of impact velocities, capsule attitude, impact plane orientation, and impact surface friction are discussed.
Author
Air Bag Restraint Devices; Body Kinematics; Landing Loads; Impact Velocity; Ground Tests; Attitude (Inclination); Stability; Safety Factors; Rigid Structures; Roll

20080015929 J. J. Coll. of Engineering and Technology, Tiruchirappalli, Tamil Nadu, India
Design of State Feedback Controller for Smart Cantilever Beam Using Interval Method
Neduncheliyan, S.; Umapathy, M.; International Journal of COMADEM, Vol. 10, No. 2; April 2007, pp. pp. 9-12; In English; See also 20080015928; Copyright; Avail.: Other Sources

In this paper, a static feedback controller is designed for a smart cantilever beam model represented in the interval form. The state feedback controller is obtained by simplex method. The performance of the controller is demonstrated with simulation results.
Author
Cantilever Beams; Control Systems Design; Simulation; Smart Structures; Controllers; Feedback; Mathematical Models

20080015930 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick, Germany
Stress Fields and Failure Mechanisms in Active Composite Structures
Piening, Matthias; International Journal of COMADEM, Vol. 10, No. 2; April 2007, pp. pp. 2-8; In English; See also 20080015928; Copyright; Avail.: Other Sources

The design of an actuator system is driven by the ratio of output to input in terms of force and stroke for maximum structural efficiency. In order to avoid local failure and degradation due to fatigue it is necessary to consider the local stress conditions. The adaptive system is composed of the integrated actuator as well as the surrounding body system. Both together are exposed to the stresses and strains caused by the action of the actuator and operational loads which act on the whole system at the same time, i.e., mechanical, thermal or moisture levels. The 2D stress models of today are not well suited for calculating the three dimensional stress distributions within the deformed body system. Neither transverse stresses can be calculated nor the effect of changes in the layer stacking sequence to identify the optimal placement of active layers within the cross section. Hence a 3D solution that satisfies the condition of the Theory of Elasticity is required. The strength behavior of the complex elastic system has to be accounted for in the design process. The 3D solutions correspond extremely well with test results.
Author
Actuators; Composite Structures; Deformation; Elastic Properties; Stress Distribution; Stress Analysis; Three Dimensional Models; Mathematical Models

20080015933 Concordia Univ., Montreal, Quebec, Canada
Dynamic Analysis of Slotted MEMS Cantilevers
Rinaldi, Gino; Packirisamy, Muthukumaran; Stiharu, Ion; International Journal of COMADEM, Vol. 10, No. 2; April 2007, pp. pp. 13-19; In English; See also 20080015928; Copyright; Avail.: Other Sources

An energy based analysis of slotted Micro Electro Mechanical Systems (MEMS) cantilevers is presented. The strain and mass energies of the micro system are a function of the cantilever geometry and slot size. In this work four slot configurations are investigated and compared for a suspended clamped-free silicon cantilever. Mass and stiffness domains of the cantilever are defined through an interpretation of the analytical eigenvalue responsiveness obtained for a given slot configuration. In this regard, the elastic property of the cantilever can be tuned through mass or stiffness reduction in which a particular slot configuration is incorporated into the device geometry. This analysis will contribute to the performance optimization of atomic force microscope (AFM) probes and micro-mechanical resonators. The Rayleigh-Ritz energy method is used for the modeling.
Author
Elastic Properties; Microelectromechanical Systems; Stiffness; Cantilever Beams; Numerical Analysis

42
GEOSCIENCES (GENERAL)

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

20080015862 Alfred-Wegener Inst. for Polar and Marine Research, Potsdam, Germany

Stratospheric Aerosol and Gas Experiment (SAGE) II and III Aerosol Extinction Measurements in the Arctic Middle and Upper Troposphere

Treffeisen, R. E.; Thomason, L. W.; Strom, J.; Herber, A. B.; Burton, S. P.; Yamanouchi, T.; September 2006; 12 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 895632.04.07.01; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2005JD006271

In recent years, substantial effort has been expended toward understanding the impact of tropospheric aerosols on Arctic climate and chemistry. A significant part of this effort has been the collection and documentation of extensive aerosol physical and optical property data sets. However, the data sets present significant interpretive challenges because of the diverse nature of these measurements. Among the longest continuous records is that by the spaceborne Stratospheric Aerosol and Gas Experiment (SAGE) II. Although SAGE tropospheric measurements are restricted to the middle and upper troposphere, they may be able to provide significant insight into the nature and variability of tropospheric aerosol, particularly when combined with ground and airborne observations. This paper demonstrates the capacity of aerosol products from SAGE II and its follow-on experiment SAGE III to describe the temporal and vertical variations of Arctic aerosol characteristics. We find that the measurements from both instruments are consistent enough to be combined. Using this combined data set, we detect a clear annual cycle in the aerosol extinction for the middle and upper Arctic troposphere.

Author

SAGE Satellite; Aerosols; Data Acquisition; Troposphere; Arctic Regions; Clouds; Air Masses; Chemical Composition; Atmospheric Composition; Environmental Monitoring; Satellite Observation; Extinction

20080015925 Reading Univ., UK

Establishing Lagrangian Connections between Observations within Air Masses Crossing the Atlantic during the ICARTT Experiment

Methven, J.; Arnold, S. R.; Stohl, A.; Evans, M. J.; Avery, M.; Law, K.; Lewis, A. C.; Monks, P. S.; Parrish, D.; Reeves, C.; Schlager, H.; Atlas, E.; Blake, D.; Coe, H.; Cohen, R. C.; Crosier, J.; Flocke, F.; Holloway, J. S.; Hopkins, J. R.; Huber, G.; McQuaid, J.; Purvis, R.; Rappengluck, B.; Ryerson, T. B.; Sachse, G. W.; December, 2006; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 281945.02.39.01.04; Copyright; Avail.: CASI: A03, Hardcopy

The International Consortium for Atmospheric Research on Transport and Transformation (ICARTT)-Lagrangian experiment was conceived with an aim to quantify the effects of photochemistry and mixing on the transformation of air masses in the free troposphere away from emissions. To this end attempts were made to intercept and sample air masses several times during their journey across the North Atlantic using four aircraft based in New Hampshire (USA), Faial (Azores) and Creil (France). This article begins by describing forecasts using two Lagrangian models that were used to direct the aircraft into target air masses. A novel technique is then used to identify Lagrangian matches between flight segments. Two independent searches are conducted: for Lagrangian model matches and for pairs of whole air samples with matching hydrocarbon fingerprints. The information is filtered further by searching for matching hydrocarbon samples that are linked by matching trajectories. The quality of these coincident matches is assessed using temperature, humidity and tracer observations. The technique pulls out five clear Lagrangian cases covering a variety of situations and these are examined in detail. The matching trajectories and hydrocarbon fingerprints are shown and the downwind minus upwind differences in tracers are discussed.

Author

Lagrangian Function; Atmospheric Circulation; Environmental Transport; Air Masses; Photochemical Reactions; Mixing Ratios; Atmospheric Composition; Chemical Composition; Troposphere; North America; Atlantic Ocean; Environmental Monitoring

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*.

20080015852 NASA Langley Research Center, Hampton, VA, USA

Determination of Ice Water Path in Ice-over-Water Cloud Systems Using Combined MODIS and AMSR-E Measurements

Huang, Jianping; Minnis, Patrick; Lin, Bing; Yi, Yuhong; Fan, T.-F.; Sun-Mack, Sunny; Ayers, J. K.; November 2006; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 720817.04.07.01; Copyright; Avail.: CASI: A03, Hardcopy

To provide more accurate ice cloud properties for evaluating climate models, the updated version of multi-layered cloud retrieval system (MCRS) is used to retrieve ice water path (IWP) in ice-over-water cloud systems over global ocean using combined instrument data from the Aqua satellite. The liquid water path (LWP) of lower layer water clouds is estimated from the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) measurements. With the lower layer LWP known, the properties of the upper-level ice clouds are then derived from Moderate Resolution Imaging Spectroradiometer measurements by matching simulated radiances from a two-cloud layer radiative transfer model. Comparisons with single-layer cirrus systems and surface-based radar retrievals show that the MCRS can significantly improve the accuracy and reduce the over-estimation of optical depth and ice water path retrievals for ice over-water cloud systems. During the period from December 2004 through February 2005, the mean daytime ice cloud optical depth and IWP for overlapped ice-over-water clouds over ocean from Aqua are 7.6 and 146.4 gm(sup -2), respectively, significantly less than the initial single layer retrievals of 17.3 and 322.3 gm(sup -2). The mean IWP for actual single-layer clouds was 128.2 gm(sup -2).

Author

Ice Clouds; MODIS (Radiometry); Microwave Radiometers; Cloud Physics; Climate Models

20080015857 NASA Langley Research Center, Hampton, VA, USA

Ozone Observations by the Gas and Aerosol Measurement Sensor during SOLVE II

Pitts, M. C.; Thomason, L. W.; Zawodny, J. M.; Wenny, B. N.; Livingston, J. M.; Russell, P. B.; Yee, J.-H.; Swartz, W. H.; Shetter, R. E.; July 06, 2006; 15 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-621-60-01; Copyright; Avail.: Other Sources

The Gas and Aerosol Measurement Sensor (GAMS) was deployed aboard the NASA DC-8 aircraft during the second SAGE III Ozone Loss and Validation Experiment (SOLVE II). GAMS acquired line-of-sight (LOS) direct solar irradiance spectra during the sunlit portions of ten science flights of the DC-8 between 12 January and 4 February 2003. Differential line-of-sight (DLOS) optical depth spectra are produced from the GAMS raw solar irradiance spectra. Then, DLOS ozone number densities are retrieved from the GAMS spectra using a multiple linear regression spectral fitting technique. Both the DLOS optical depth spectra and retrieved ozone data are compared with coincident measurements from two other solar instruments aboard the DC-8 platform to demonstrate the robustness and stability of the GAMS data. The GAMS ozone measurements are then utilized to evaluate the quality of the Wulf band ozone cross sections, a critical component of the SAGE III aerosol, water vapor, and temperature/pressure retrievals. Results suggest the ozone cross section compilation of Shettle and Anderson currently used operationally in SAGE III data processing may be in error by as much as 10-20% in theWulf bands, and their lack of reported temperature dependence is a significant deficiency. A second, more recent, cross section database compiled for the SCIAMACHY satellite mission appears to be of much better quality in the Wulf bands, but still may have errors as large as 5% near the Wulf band absorption peaks, which is slightly larger than their stated uncertainty. Additional laboratory measurements of the Wulf band cross sections should be pursued to further reduce their uncertainty and better quantify their temperature dependence.

Author

Aerosols; Gas Analysis; Ozone; Sensors; SAGE Satellite

20080015858 State Univ. of New York, Albany, NY, USA

Determination of Spring Onset and Growing Season Duration using Satellite Measurements

Min, Q.; Lin, Bing; [2006]; 16 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): DE-FCO3-90ER61010; WBS 281945.13.01.08; Copyright; Avail.: CASI: A03, Hardcopy

An integrated approach to retrieve microwave emissivity difference vegetation index (EDVI) over land regions has been

developed from combined multi-platform/multi-sensor satellite measurements, including SSM/I measurements. A possible relationship of the remotely sensed EDVI and the leaf physiology of canopy is exploited at the Harvard Forest site for two growing seasons. This study finds that the EDVI is sensitive to leaf development through vegetation water content of the crown layer of the forest canopy, and has demonstrated that the spring onset and growing season duration can be determined accurately from the time series of satellite estimated EDVI within uncertainties about 3 and 7 days for spring onsets and growing season duration, respectively, compared to in-situ observations. The leaf growing stage may also be quantitatively monitored by a normalized EDVI. Since EDVI retrievals from satellite are generally possible during both daytime and nighttime under non-rain conditions, the EDVI technique studied here may provide higher temporal resolution observations for monitoring the onset of spring and the duration of growing season compared to currently operational satellite methods. Author

Emissivity; Microwave Emission; Microwave Imagery; Remote Sensing; Satellite Observation; Spring (Season); Vegetation; Sensitivity

20080015921 National Center for Atmospheric Research, Boulder, CO, USA

Radiative Forcing by Well-Mixed Greenhouse Gases: Estimates from Climate Models in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4)

Collins, W. D.; Ramaswamy, V.; Schwarzkopf, M. D.; Sun, Y.; Portmann, R. W.; Fu, Q.; Casanova, S. E. B.; Dufresne, J.-L.; Fillmore, D. W.; Forster, P. M. D.; Galin, V. Y.; Gohar, L. K.; Ingram, W. J.; Kratz, D. P.; Lefebvre, M.-P.; Li, J.; Marquet, P.; Oinas, V.; Tsushima, Y.; Uchiyama, T.; Zhong, W. Y.; Journal of Geophysical Research; July 28, 2006; Volume 111; 15 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NER/L/S/2001/0066; 307981; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2005JD006713

The radiative effects from increased concentrations of well-mixed greenhouse gases (WMGHGs) represent the most significant and best understood anthropogenic forcing of the climate system. The most comprehensive tools for simulating past and future climates influenced by WMGHGs are fully coupled atmosphere-ocean general circulation models (AOGCMs). Because of the importance of WMGHGs as forcing agents it is essential that AOGCMs compute the radiative forcing by these gases as accurately as possible. We present the results of a radiative transfer model intercomparison between the forcings computed by the radiative parameterizations of AOGCMs and by benchmark line-by-line (LBL) codes. The comparison is focused on forcing by CO2, CH4, N2O, CFC-11, CFC-12, and the increased H2O expected in warmer climates. The models included in the intercomparison include several LBL codes and most of the global models submitted to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4). In general, the LBL models are in excellent agreement with each other. However, in many cases, there are substantial discrepancies among the AOGCMs and between the AOGCMs and LBL codes. In some cases this is because the AOGCMs neglect particular absorbers, in particular the near-infrared effects of CH4 and N2O, while in others it is due to the methods for modeling the radiative processes. The biases in the AOGCM forcings are generally largest at the surface level. We quantify these differences and discuss the implications for interpreting variations in forcing and response across the multimodel ensemble of AOGCM simulations assembled for the IPCC AR4. Author

Climate Change; Climate Models; Greenhouse Effect; Governments; Atmospheric General Circulation Models; Gas Mixtures; Geophysics

20080016481 National Academy of Sciences - National Research Council, Washington, DC, USA

Earth Observations from Space: The First 50 Years of Scientific Achievements

January 2008; 143 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNG06GF62G; Copyright; Avail.: Other Sources

Observing Earth from space over the past 50 years has fundamentally transformed the way people view our home planet. The image of the ‘blue marble’ is taken for granted now, but it was revolutionary when taken in 1972 by the crew on Apollo 17. Since then the capability to look at Earth from space has grown increasingly sophisticated and has evolved from simple photographs to quantitative measurements of Earth properties such as temperature, concentrations of atmospheric trace gases, and the exact elevation of land and ocean. Imaging Earth from space has resulted in major scientific accomplishments; these observations have led to new discoveries, transformed the Earth sciences, opened new avenues of research, and provided important societal benefits by improving the predictability of Earth system processes. This report highlights the scientific achievements made possible by the first five decades of Earth satellite observations by space-faring nations. It follows on a recent report from the National Research Council (NRC) entitled Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond, also referred to as the ‘decadal survey.’ Recognizing the increasing need for

space observations, the decadal survey identifies future directions and priorities for Earth observations from space. This companion report was requested by the National Aeronautics and Space Administration (NASA) to highlight, through selected examples, important past contributions of Earth observations from space to our current understanding of the planet.
Author
Earth Observations (From Space); Earth Sciences; Spaceborne Photography; Earth Resources; Earth (Planet); Geology; Geophysics

20080016551 NASA Stennis Space Center, Stennis Space Center, MS, USA
Assessing MODIS-based Products and Techniques for Detecting Gypsy Moth Defoliation
Spruce, Joseph P.; Hargrove, William; Smoot, James C.; Prados, Don; McKellip, Rodney; Sader, Steven A.; Gasser, Jerry; May, George; April 09, 2008; 23 pp.; In English; 2008 US-IALE Sympsium: Landscape Patterns and Ecosystems Processes, 6-10 Apr. 2008, Madison, WI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNS04AB54T; NNS07AA29T
Report No.(s): SSTI-2220-0136; Copyright; Avail.: CASI: A03, Hardcopy

The project showed potential of MODIS and VIIRS time series data for contributing defoliation detection products to the USFS forest threat early warning system. This study yielded the first satellite-based wall-to-wall 2001 gypsy moth defoliation map for the study area. Initial results led to follow-on work to map 2007 gypsy moth defoliation over the eastern USA (in progress). MODIS-based defoliation maps offer promise for aiding aerial sketch maps either in planning surveys and/or adjusting acreage estimates of annual defoliation. More work still needs to be done to assess potential of technology for 'now casts'of defoliation.
Author
MODIS (Radiometry); Moths; Defoliation; Forests; Early Warning Systems; Time Series Analysis; Photomaps; Imaging Spectrometers; Aerial Photography

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*.

20080015966 National Renewable Energy Lab., Golden, CO USA
Technical Potential of Solar Water Heating to Reduce Fossil Fuel Use and Greenhouse Gas Emissions in the USA
Denholm, P.; Mar. 2007; 21 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO-10337
Report No.(s): DE2007-902167; NREL/TP-640-41157; No Copyright; Avail.: National Technical Information Service (NTIS)

Use of solar water heating (SWH) in the USA grew significantly in the late 1970s and early 1980s, as a result of increasing energy prices and generous tax credits. Since 1985, however, expiration of federal tax credits and decreased energy prices have virtually eliminated the U.S. market for SWH. More recently, increases in energy prices, concerns regarding emissions of greenhouse gases, and improvements in SWH systems have created new interest in the potential of this technology. SWH, which uses the sun to heat water directly or via a heat-transfer fluid in a collector, may be particularly important in its ability to reduce natural gas use. Dependence on natural gas as an energy resource in the USA has significantly increased in the past decade, along with increased prices, price volatility, and concerns about sustainability and security of supply. One of the readily deployable technologies available to decrease use of natural gas is solar water heating. This report provides an overview of the technical potential of solar water heating to reduce fossil fuel consumption and associated greenhouse gas emissions in U.S. residential and commercial buildings.
NTIS
Exhaust Emission; Exhaust Gases; Fossil Fuels; Greenhouse Effect; Solar Energy; Solar Heating; United States; Water Heating

45
ENVIRONMENT POLLUTION

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

20080015673 CH2M/Hill Hanford Group, Inc., Richland, WA, USA

Methodology and Calculations for the Assignment of Waste for the Large Underground Waste Storage Tanks at Hanford Site (Revison 6)

Hu, T.; Jan. 2007; 350 pp.; In English

Report No.(s): DE2007-901497; RPP-10006-REV-6; No Copyright; Avail.: Department of Energy Information Bridge

The document categorizes each of the large waste storage tanks into one of several categories based on each tank's waste and characteristics. These waste group assignments reflect a tank's propensity to retain a significant volume of flammable gases and the potential of the waste to release retained gas by a buoyant displacement event. Revision 6 is the annual update of the flammable gas Waste Groups for DSTs and SSTs.

NTIS

Radioactive Wastes; Storage Tanks; Underground Storage

20080015676 Pacific Northwest National Lab., Richland, WA, USA

Development of NEXRAD Wind Retrievals as Input to Atmospheric Dispersion Models

Fast, J. D.; Newson, R. K.; Allwine, K. J.; Xu, Q.; Zhang, P.; Feb. 2007; 103 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RL01830

Report No.(s): DE2007-901469; PNNL-16399; No Copyright; Avail.: National Technical Information Service (NTIS)

Two techniques that derive spatially varying wind fields from operational radar measurements have been evaluated in this study. Based on results, we propose that one technique be implemented operationally in a phased approach. The other technique would be suitable for operational implementation only after additional modifications have been made and evaluated. These two techniques would require additional funding to implement, maintain operational versions of these codes, and perform additional research to improve their accuracy. Atmospheric dispersion models (ADMs) are used by emergency-response organizations to address the consequences of potential airborne releases of harmful materials. The wind fields in ADMs are based on meteorological measurements and forecasts made by atmospheric models. In the USA, routine meteorological measurements from surface stations, towers, rawinsondes, and radar wind profilers are available to drive ADMs. Large metropolitan areas usually have a network of surface stations; however, the wind-speed and direction measurements from these stations are usually not representative of conditions above the surface. There are currently relatively few measurements that can characterize the winds above the surface. One potentially rich, yet untapped, source of meteorological data for routine use in ADMs is from the Next Generation Weather Radar (NEXRAD) systems with 141 nearly identical WSR-88D Doppler radar units installed throughout the USA. The objective of this study is to determine the feasibility that routinely collected data from the Doppler radars can appropriately be used in ADMs for emergency response.

NTIS

Air Pollution; Atmospheric Diffusion; Atmospheric Models; Meteorological Radar

20080015678 Savannah River National Lab., Aiken, SC, USA

Use of Digital Radiography in the Evaluation of Radioactive Materials Packaging Performance Testing

May, C. G.; Mar. 22, 2007; 14 pp.; In English

Report No.(s): DE2007-901322; WSRC-STI-2007-00144; No Copyright; Avail.: Department of Energy Information Bridge

New designs of radioactive material shipping packages are required to be evaluated in accordance with 10 CFR Part 71, Packaging and Transportation of Radioactive Material. This paper will discuss the use of digital radiography to evaluate the effects of the tests required by 10 CFR 71.71, Normal Conditions of Transport (NCT), and 10 CFR 71.73, Hypothetical Accident Conditions (HAC). One acceptable means of evaluating packaging performance is to subject packagings to the series of NCT and HAC tests. The evaluation includes a determination of the effect on the packaging by the conditions and tests. That determination has required that packagings be cut and sectioned to learn the actual effects on internal components. Digital radiography permits the examination of internal packaging components without sectioning a package. This allows a single package to be subjected to a series of tests. After each test, the package is digitally radiographed and the effects of particular tests evaluated. Radiography reduces the number of packages required for testing and also reduces labor and materials required

to section and evaluate numerous packages. This paper will include a description of the digital radiography equipment used in the testing and evaluation of the 9977 and 9978 packages at SRNL.
NTIS
Packaging; Performance Tests; Radioactive Materials; Radiography

20080015762 Nature Conservancy, Arlington, VA, USA
Technical Progress Report on Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration
Stanley, B.; Brown, S.; Gonzalez, P.; Sohngen, B.; Sampson, N.; Oct. 2006; 34 pp.; In English
Contract(s)/Grant(s): DE-FC-26-01NT41151
Report No.(s): DE2007-901296; No Copyright; Avail.: National Technical Information Service (NTIS)

The Nature Conservancy is participating in a Cooperative Agreement with the Department of Energy (DOE) National Energy Technology Laboratory (NETL) to explore the compatibility of carbon sequestration in terrestrial ecosystems and the conservation of biodiversity. The title of the research project is Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration. The objectives of the project are to: (1) improve carbon offset estimates produced in both the planning and implementation phases of projects; (2) build valid and standardized approaches to estimate project carbon benefits at a reasonable cost; and (3) lay the groundwork for implementing cost-effective projects, providing new testing ground for biodiversity protection and restoration projects that store additional atmospheric carbon. This Technical Progress Report discusses preliminary results of the six specific tasks that The Nature Conservancy is undertaking to answer research needs while facilitating the development of real projects with measurable greenhouse gas reductions.
NTIS
Carbon; Cost Effectiveness; Environment Protection; Environmental Cleanup

20080015871 Lawrence Livermore National Lab., Livermore, CA USA
Chapter 4: Geological Carbon Sequestration
Friedmann, J.; Herzog, H.; Jun. 19, 2006; 34 pp.; In English
Report No.(s): DE2007-902358; UCRL-BOOK-222206; No Copyright; Avail.: National Technical Information Service (NTIS)

Carbon sequestration is the long term isolation of carbon dioxide from the atmosphere through physical, chemical, biological, or engineered processes. The largest potential reservoirs for storing carbon are the deep oceans and geological reservoirs in the earths upper crust. This chapter focuses on geological sequestration because it appears to be the most promising large-scale approach for the 2050 timeframe. It does not discuss ocean or terrestrial sequestration.
NTIS
Carbon; Carbon Dioxide; Geology; Atmospheric Chemistry

20080015881 Delaware Univ., Newark, DE, USA
Estimation, Validation, and Forecasts of Regional Commercial Marine Vessel Inventories
Corbett, J. J.; Apr. 2007; 76 pp.; In English
Contract(s)/Grant(s): ARB-04-346
Report No.(s): PB2007-107362; No Copyright; Avail.: CASI: A05, Hardcopy

This report presents results of a project to develop and deliver commercial marine emissions inventories for cargo traffic in shipping lanes serving U.S. continental coastlines. A regional scale methodology consistent with port-based inventory methods was applied for estimating commercial marine vessel (CMV) emissions in coastal waters. Geographically resolved inventories were produced for a 2002 baseline year (Task 1). Several port-based inventories were evaluated to validate the regional inventory (Task 2). Using average growth trends describing trade and energy requirements for North American cargo and passenger vessels, an unconstrained forecast was developed to describe a business as usual (BAU) scenario without sulfur controls (Task 3), and a with-SECA scenario assuming IMO-compliant reductions in fuel sulfur to 1.5% by weight for all activity within the Exclusive Economic Zone (200 nautical miles) of North American nations (Task 4). This work contributes to better regional inventories of commercial marine emissions for North America that supports the California Air Resources Board (ARB), Commission for Environmental Cooperation of North America (CEC), western regional states, USA federal, and multinational efforts to quantify and evaluate potential air pollution impacts from shipping in U.S, Canadian, and Mexican coastal waters.
NTIS
Forecasting; Inventories

20080015926 National Center for Atmospheric Research, Boulder, CO, USA; NASA Langley Research Center, Hampton, VA, USA

Ozone Production from the 2004 North American Boreal Fires

Pfister, G. G.; Emmons, L. K.; Hess, P. G.; Honrath, R.; Lamarque, J.-F.; Val Martin, M.; Owen, R. C.; Avery, M. A.; Browell, E. V.; Holloway, J. S.; Nedelec, P.; Purvis, R.; Ryerson, T. B.; Sachse, G. W.; Schlager, H.; [2006]; 45 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NA16GP1658; NA86GP0325; NA03OAR4310002; ATM0215843; NNG04GA45G; EOS/03-0601-0145; Copyright; Avail.: CASI: A03, Hardcopy

We examine the ozone production from boreal forest fires based on a case study of wildfires in Alaska and Canada in summer 2004. The model simulations were performed with the chemistry transport model, MOZART-4, and were evaluated by comparison with a comprehensive set of aircraft measurements. In the analysis we use measurements and model simulations of carbon monoxide (CO) and ozone (O3) at the PICO-NARE station located in the Azores within the pathway of North American outflow. The modeled mixing ratios were used to test the robustness of the enhancement ratio deltaO3/deltaCO (defined as the excess O3 mixing ratio normalized by the increase in CO) and the feasibility for using this ratio in estimating the O3 production from the wildfires. Modeled and observed enhancement ratios are about 0.25 ppbv/ppbv which is in the range of values found in the literature, and results in a global net O3 production of 12.9 2 Tg O3 during summer 2004. This matches the net O3 production calculated in the model for a region extending from Alaska to the East Atlantic (9-11 Tg O3) indicating that observations at PICO-NARE representing photochemically well-aged plumes provide a good measure of the O3 production of North American boreal fires. However, net chemical loss of fire related O3 dominates in regions far downwind from the fires (e.g. Europe and Asia) resulting in a global net O3 production of 6 Tg O3 during the same time period. On average, the fires increased the O3 burden (surface-300 mbar) over Alaska and Canada during summer 2004 by about 7-9%, and over Europe by about 2-3%.

Author

Canada; Forest Fires; Ozone; Alaska; Pollution Transport

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*.

20080015733 Colorado Univ., Boulder, CO, USA

Troposphere-Thermosphere Tidal Coupling as Measured by the SABER Instrument on TIMED during July-September, 2002

Forbes, J. M.; Russell, J.; Miyahara, S.; Zhang, X.; Palo, S.; Mlynczak, M.; Mertens, C. J.; Hagan, M. E.; January 2005; 30 pp.; In English

Contract(s)/Grant(s): NAG5-5028; 2351-370-29-10; Copyright; Avail.: CASI: A03, Hardcopy

Coupling between the troposphere and lower thermosphere due to upward-propagating tides is investigated using temperatures measured from the SABER instrument on the TIMED satellite. The data analyzed here are confined to 20-120 km altitude and +/-40 deg latitude during 20 July 20 September, 2002. Apart from the migrating (sun-synchronous) tidal components, the predominant feature seen (from the satellite frame) during this period is a wave-4 structure in longitude with extrema of up to +/-40-50 K at 110 km. Amplitudes and longitudes of maxima of this structure evolve as the satellite precesses in local time, and as the wave(s) responsible for this structure vary with time. The primary wave responsible for the wave-4 pattern is the eastward-propagating diurnal tide with zonal wavenumber s=3 (DE3). Its average amplitude distribution over the interval is quasi-symmetric about the equator, similar to that of a Kelvin wave, with maximum of about 20 K at 5 deg S and 110 km. DE3 is primarily excited by latent heating due to deep tropical convection in the troposphere. It is demonstrated that existence of DE3 is intimately connected with the predominant wave-4 longitude distribution of topography and land-sea difference at low latitudes, and an analogy is drawn with the strong presence of DE1 in Mars atmosphere, the predominant wave-2 topography on Mars, and the wave-2 patterns that dominate density measurements from the Mars Global Surveyor (MGS) spacecraft near 130 km. Additional diurnal, semidiurnal and terdiurnal nonmigrating tides are also revealed in the present study. These tidal components are most likely excited by nonlinear interactions between their migrating counterparts

and the stationary planetary wave with s=1 known to exist in the Southern Hemisphere during this period just prior to the austral mid-winter stratospheric warming of 2002.
Author
Atmospheric Tides; Troposphere; Thermosphere; Mesosphere; Satellite-Borne Instruments; Infrared Radiometers; Meteorological Satellites; Atmospheric Temperature

20080015843 NASA Langley Research Center, Hampton, VA, USA
The Angstrom Exponent and Bimodal Aerosol Size Distributions
Schuster, Gregory L.; Dubovik, Oleg; Holben, Brent H.; [2005]; 43 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Powerlaws have long been used to describe the spectral dependence of aerosol extinction, and the wavelength exponent of the aerosol extinction powerlaw is commonly referred to as the Angstrom exponent. The Angstrom exponent is often used as a qualitative indicator of aerosol particle size, with values greater than two indicating small particles associated with combustion byproducts, and values less than one indicating large particles like sea salt and dust. In this study, we investigate the relationship between the Angstrom exponent and the mode parameters of bimodal aerosol size distributions using Mie theory calculations and Aerosol Robotic Network (AERONET) retrievals. We find that Angstrom exponents based upon seven wavelengths (0.34, 0.38, 0.44, 0.5, 0.67, 0.87, and 1.02 micrometers) are sensitive to the volume fraction of aerosols with radii less then 0.6 micrometers, but not to the fine mode effective radius. The Angstrom exponent is also known to vary with wavelength, which is commonly referred to as curvature; we show how the spectral curvature can provide additional information about aerosol size distributions for intermediate values of the Angstrom exponent. Curvature also has a significant effect on the conclusions that can be drawn about two-wavelength Angstrom exponents; long wavelengths (0.67, 0.87 micrometers) are sensitive to fine mode volume fraction of aerosols but not fine mode effective radius, while short wavelengths (0.38, 0.44 micrometers) are sensitive to the fine mode effective radius but not the fine mode volume fraction.
Author
Aerosols; Robotics; Mathematical Models; Exponents; Size Distribution; Radii

20080015845 Texas A&M Univ., College Station, TX, USA
Application of Aerosol Hygroscopicity Measured at the Atmospheric Radiation Measurement Program's Southern Great Plains Site to Examine Composition and Evolution
Gasparini, Roberto; Runjun, Li; Collins, Don R.; Ferrare, Richard A.; Brackett, Vincent G.; February 2006; 17 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): ATM-0094342; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2004JD005448

A Differential Mobility Analyzer/Tandem Differential Mobility Analyzer (DMA/TDMA) was used to measure submicron aerosol size distributions, hygroscopicity, and occasionally volatility during the May 2003 Aerosol Intensive Operational Period (IOP) at the Central Facility of the Atmospheric Radiation Measurement Program's Southern Great Plains (ARM SGP) site. Hygroscopic growth factor distributions for particles at eight dry diameters ranging from 0.012 micrometers to 0.600 micrometers were measured throughout the study. For a subset of particle sizes, more detailed measurements were occasionally made in which the relative humidity or temperature to which the aerosol was exposed was varied over a wide range. These measurements, in conjunction with backtrajectory clustering, were used to infer aerosol composition and to gain insight into the processes responsible for evolution. The hygroscopic growth of both the smallest and largest particles analyzed was typically less than that of particles with dry diameters of about 0.100 micrometers. It is speculated that condensation of secondary organic aerosol on nucleation mode particles is largely responsible for the minimal hygroscopic growth observed at the smallest sizes considered. Growth factor distributions of the largest particles characterized typically contained a nonhygroscopic mode believed to be composed primarily of dust. A model was developed to characterize the hygroscopic properties of particles within a size distribution mode through analysis of the fixed size hygroscopic growth measurements. The performance of this model was quantified through comparison of the measured fixed size hygroscopic growth factor distributions with those simulated through convolution of the size-resolved concentration contributed by each of the size modes and the mode-resolved hygroscopicity. This transformation from sizeresolved hygroscopicity to mode-resolved hygroscopicity facilitated examination of changes in the hygroscopic properties of particles within a size distribution mode that accompanied changes in the sizes of those particles. This model was used to examine three specific cases in which the sampled aerosol evolved slowly over a period of hours or days.
Author
Aerosols; Atmospheric Radiation; Hygroscopicity; Radiation Measurement; Great Plains Corridor (North America); Geophysics; Atmospheric Composition

20080015856 Leeds Univ., UK

Using CO2:CO Correlations to Improve Inverse Analyses of Carbon Fluxes

Palmer, Paul I.; Suntharalingam, Parvadha; Jones, Dylan B. A.; Jacob, Daniel J.; Streets, David G.; Fu, Qingyan; Vay, Stephanie A.; Sachse, Glen W.; June 2006; 11 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2005JD006697

Observed correlations between atmospheric concentrations of CO2 and CO represent potentially powerful information for improving CO2 surface flux estimates through coupled CO2-CO inverse analyses. We explore the value of these correlations in improving estimates of regional CO2 fluxes in east Asia by using aircraft observations of CO2 and CO from the TRACE-P campaign over the NW Pacific in March 2001. Our inverse model uses regional CO2 and CO surface fluxes as the state vector, separating biospheric and combustion contributions to CO2. CO2-CO error correlation coefficients are included in the inversion as off-diagonal entries in the a priori and observation error covariance matrices. We derive error correlations in a priori combustion source estimates of CO2 and CO by propagating error estimates of fuel consumption rates and emission factors. However, we find that these correlations are weak because CO source uncertainties are mostly determined by emission factors. Observed correlations between atmospheric CO2 and CO concentrations imply corresponding error correlations in the chemical transport model used as the forward model for the inversion. These error correlations in excess of 0.7, as derived from the TRACE-P data, enable a coupled CO2-CO inversion to achieve significant improvement over a CO2-only inversion for quantifying regional fluxes of CO2.

Author

Carbon Dioxide Concentration; Flux Quantization; Geophysics; Correlation; Carbon Monoxide; Mathematical Models; Biosphere

20080015904 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Combinations of Earth Orientation Measurements: SPACE2005, COMB2005, and POLE2005

Gross, Richard S.; September 2006; 27 pp.; In English; Original contains black and white illustrations

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Report No.(s): JPL Publication 06-3; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015904

Independent Earth orientation measurements taken by the space-geodetic techniques of lunar and satellite laser ranging, by very long baseline interferometry, and by the Global Positioning System have been combined using a Kalman filter. The resulting combined Earth orientation series, SPACE2005, consists of values and uncertainties for Universal Time, polar motion, and their rates that span from September 28, 1976, to January 7, 2006, at daily intervals and is available in versions whose epochs are given at either midnight or noon. The space-geodetic measurements used to generate SPACE2005 have then been combined with optical astrometric measurements to form two additional combined Earth orientation series: (1) COMB2005, consisting of values and uncertainties for Universal Time, polar motion, and their rates that span from January 20, 1962, to January 7, 2006, at daily intervals and which is also available in versions whose epochs are given at either midnight or noon; and (2) POLE2005, consisting of values and uncertainties for polar motion and its rate that span from January 20, 1900, to December 21, 2005, at 30.4375-day intervals.

Author

Astrometry; Earth Orientation; Global Positioning System; Time Measurement; Universal Time; Geodesy; Geodetic Surveys; Satellite Laser Ranging

20080015922 Northwest Research Associates, Inc., Boulder, CO, USA; NASA Langley Research Center, Hampton, VA, USA

Observations of Intermediate-Scale Diurnal Waves in the Equatorial Mesosphere and Lower Thermosphere

Lieberman, R. S.; Riggin, D. M.; Garcia, R. R.; Wu, Qian; Remsberg, E. E.; Journal of Geophysical Research; September 2006; Volume 111; 13 pp.; In English; Original contains black and white illustrations

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ONLINE: http://dx.doi.org/10.1029/2005JA011498

The purpose of this study is to seek observational evidence for diurnal, vertically propagating inertia-gravity waves (IGWs) in the mesosphere and lower thermosphere (MLT). Numerical modeling studies indicate that vertically propagating IGWs excited by tropical heating provide a significant source of momentum for the semiannual oscillation (SAO) in the equatorial zonal mean winds. The power spectrum of these waves has a strong diurnal component. We analyze global patterns of ascending and descending node differences in MLT satellite temperatures, which are assumed in this study to be proxies

for waves of diurnal period. Juxtaposed upon the planetary-scale features are localized variations with longitudinal wavelengths ranging from 25 deg to 50 deg, and with vertical wavelengths between 13 and 25 km. These intermediate-scale variations are spatially coherent, and persist for several weeks. Their amplitudes generally increase with altitude, while their phase structures suggest both eastward and westward propagation. The variance of wave numbers 9-17 in the MLT is examined in relation to the underlying stratospheric zonal mean zonal gradient winds. Stronger variances generally coincide with periods where the underlying zonal mean winds are relatively light, or unidirectional. The weak inverse association between variance strength and zonal wind magnitude is suggestive of a wave filtering mechanism.
Author
Diurnal Variations; Inertia; Mesosphere; Thermosphere; Gravity Waves; Atmospheric Circulation

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080015688 Lawrence Livermore National Lab., Livermore, CA USA
Three Blind Men and the Elephant
Long, J. C. S.; Feb. 15, 2007; 8 pp.; In English
Report No.(s): DE2007-902614; UCRL-CONF-228099; No Copyright; Avail.: Department of Energy Information Bridge

Just like the blind men in the popular story of perceiving the elephant, the three major constituencies participating in the energy debate have greatly different perceptions of the problem. The constituency that is worried about climate change believes the energy problem is caused by profligate use of fossil fuel that has dramatically changed our atmosphere. The energy security group sees dangerous reliance on foreign sources of oil increasingly held by countries hostile to the US. The economic vitality group sees high energy prices and their effect on the economy and our life-style. Just like the blind men, each of the three constituencies perceives a different problem. And just as with the blind men, while each perspective is right as a piece of the elephant, it takes all the perspectives together to actually solve the problem. Environmentalists focus on solutions responding to the scientific consensus that greenhouse gases are creating rapid climate change. The tipping point has come: it is now a consensus position among scientists the global warming is being affected by anthropogenic activity to 90% certainty according to the last IPCC report.
NTIS
Climate Change; Fossil Fuels; Human Beings; Males

20080015842 Utah Univ., Salt Lake City, UT, USA; NASA Ames Research Center, Moffett Field, CA, USA; NASA Langley Research Center, Hampton, VA, USA
Convective Formation of Pileus Cloud Near the Tropopause
Garrett, Timothy J.; Dean-Day, Jonathan; Liu, Chuntao; Barnett, Brian K.; Mace, Gerald G.; Baumgardner, Darrel G.; Webster, Christopher R.; Bui, T. Paul; Read, William G.; Minnis, Patrick; January 2005; 37 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG1-1505; NNG045168G; Copyright; Avail.: CASI: A03, Hardcopy

Pileus clouds form where humid, stably stratified air is mechanically displaced vertically ahead of rising convection. This paper describes convective formation of pileus cloud in the tropopause transition layer (TTL), and explores a possible link to the formation of long-lasting cirrus at cold temperatures. In-situ measurements from off the coast of Honduras during the July 2002 CRYSTALFACE experiment show an example of TTL cirrus associated with, and penetrated by, deep convection. The cirrus was enriched with total water compared to its surroundings, but composed of extremely small ice crystals with effective radii between 2 and 4 m. Through gravity wave analysis, and intercomparison of measured and simulated cloud microphysics, it is argued that the TTL cirrus in this case originated neither from convectively-forced gravity wave motions nor environmental mixing alone. Rather, it is hypothesized that some combination was involved in which, first, convection forced pileus cloud to form from TTL air; second, it punctured the pileus layer, contributing larger ice crystals through interfacial mixing; third, the addition of condensate inhibited evaporation of the original pileus ice crystals in the warm phase of the ensuing gravity wave; fourth, through successive pulses, deep convection formed the observed layer of TTL cirrus. While the general incidence and longevity of pileus cloud remains unknown, in-situ measurements, and satellite-based Microwave Limb Sounder retrievals, suggest that much of the tropical TTL is sufficiently humid to be susceptible to its formation. Where these

clouds form and persist, there is potential for an irreversible repartition from water vapor to ice at cold temperatures.
Author
Convection Clouds; Cloud Physics; Transition Layers; Tropopause; Clouds (Meteorology); Convection; Gravity Waves; Atmospheric Models

20080015844 NASA Ames Research Center, Moffett Field, CA, USA; NASA Langley Research Center, Hampton, VA, USA
Atmospheric Radiation Measurements Aerosol Intensive Operating Period: Comparison of Aerosol Scattering during Coordinated Flights
Hallar, A. G.; Strawa, A. W.; Schmid, B.; Andrews, E.; Ogren, J.; Sheridan, P.; Ferrare, R.; Covert, D.; Elleman, R.; Jonsson, H.; Bokarius, K.; Luu, A.; Journal of Geophysical Research; March 2006; Volume 111; 17 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD006250

In May 2003, a Twin Otter airplane, equipped with instruments for making in situ measurements of aerosol optical properties, was deployed during the Atmospheric Radiation Measurements (ARM) Program s Aerosol Intensive Operational Period in Oklahoma. Several of the Twin Otter flights were flown in formation with an instrumented light aircraft (Cessna 172XP) that makes routine in situ aerosol profile flights over the site. This paper presents comparisons of measured scattering coefficients at 467 nm, 530 nm, and 675 nm between identical commercial nephelometers aboard each aircraft. Overall, the agreement between the two nephelometers decreases with longer wavelength. During the majority of the flights, the Twin Otter flew with a diffuser inlet while the Cessna had a 1 mm impactor, allowing for an estimation of the fine mode fraction aloft. The fine mode fraction aloft was then compared to the results of a ground-based nephelometer. Comparisons are also provided in which both nephelometers operated with identical 1 mm impactors. These scattering coefficient comparisons are favorable at the longer wavelengths (i.e., 530 nm and 675 nm), yet differed by approximately 30% at 467 nm. Mie scattering calculations were performed using size distribution measurements, made during the level flight legs. Results are also presented from Cadenza, a new continuous wave cavity ring-down (CW-CRD) instrument, which compared favorably (i.e., agreed within 2%) with data from other instruments aboard the Twin Otter. With this paper, we highlight the significant implications of coarse mode (larger than 1 mm) aerosol aloft with respect to aerosol optical properties.
Author
Atmospheric Radiation; Scattering; Aerosols; Optical Properties; Optical Equipment

20080015846 Bay Area Environmental Research Inst., Sonoma , CA, USA; NASA Langley Research Center, Hampton, VA, USA
How Well do State-of-the-Art Techniques Measuring the Vertical Profile of Tropospheric Aerosol Extinction Compare?
Schmid, B.; Ferrare, R.; Flynn, C.; Elleman, R.; Covert, D.; Strawa, A.; Welton, E.; Turner, D.; Jonsson, H.; Redemann, J.; Eilers, J.; Ricci, K.; Hallar, A. G.; Clayton, M.; Michalsky, J.; Smirnov, A.; Holben, B.; Barnard, J.; Journal of Geophysical Research; February 2006; Volume 111; 25 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD005837

The recent Department of Energy Atmospheric Radiation Measurement (ARM) Aerosol Intensive Operations Period (AIOP, May 2003) yielded one of the best measurement sets obtained to date to assess our ability to measure the vertical profile of ambient aerosol extinction sigma(ep)(lambda) in the lower troposphere. During one month, a heavily instrumented aircraft with well-characterized aerosol sampling ability carrying well-proven and new aerosol instrumentation devoted most of the 60 available flight hours to flying vertical profiles over the heavily instrumented ARM Southern Great Plains (SGP) Climate Research Facility (CRF). This allowed us to compare vertical extinction profiles obtained from six different instruments: airborne Sun photometer (AATS-14), airborne nephelometer/absorption photometer, airborne cavity ring-down system, groundbased Raman lidar, and two ground-based elastic backscatter lidars. We find the in situ measured sigma(ep)(lambda) to be lower than the AATS-14 derived values. Bias differences are 0.002-0.004 Km!1 equivalent to 13-17% in the visible, or 45% in the near-infrared. On the other hand, we find that with respect to AATS-14, the lidar sigma(ep)(lambda) are higher: Bias differences are 0.004 Km(-1) (13%) and 0.007 Km(-1) (24%) for the two elastic backscatter lidars (MPLNET and MPLARM, lambda = 523 nm) and 0.029 Km(-1) (54%) for the Raman lidar (lambda = 355 nm). An unnoticed loss of sensitivity of the Raman lidar had occurred leading up to AIOP, and we expect better agreement from the recently restored system. Looking at the collective results from six field campaigns conducted since 1996, airborne in situ measurements of sigma(ep)(lambda) tend to be biased slightly low (17% at visible wavelengths) when compared to airborne Sun photometer sigma(ep)(lambda). On the other hand, sigma(ep)(lambda) values derived from lidars tend to have no or positive biases. From the bias differences we conclude that the typical systematic error associated with measuring the

tropospheric vertical profile of the ambient aerosol extinction with current state-of-the-art instrumentation is 15-20% at visible wavelengths and potentially larger in the UV and near-infrared.
Author
Aerosols; Atmospheric Radiation; Optical Measurement; Troposphere; Extinction

20080015849 North Dakota Univ., Grand Forks, ND, USA; NASA Langley Research Center, Hampton, VA, USA
Observational Evidence of Changes in Water Vapor, Clouds, and Radiation at the ARM SGP Site
Dong, Xiquan; Xi, Baike; Minnus, Patrick; January 2006; 12 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL04AA11G; NNG06GB59G; NNL04AA52G; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015849

Characterizing water vapor and cloud effects on the surface radiation budget is critical for understanding the current climate because water vapor is the most important greenhouse gas in the atmosphere and clouds are one of the largest sources of uncertainty in predicting potential future climate change. Several studies have shown that insolation over land declined until 1990 then increased until the present. Using 8 years of surface data, we observed the increasing trend of insolation from 1997 to 2000, but detected a significant decrease from 2001 to 2004. The variation of cloud fraction mirrors that of insolation with an overall increase of 1 percent per year. Under clear-sky conditions, water vapor changes have a greater impact on longwave flux than on insolation.
Author
Insolation; Water Vapor; Cloud Physics; Atmospheric Radiation

20080015851 Lawrence Livermore National Lab., Livermore, CA USA
Dynamically-Coupled Groundwater, Land Surface and Regional Climate Model to Predict Seasonal Watershed Flow and Groundwater Response, FINAL LDRD REPORT
Maxwell, R. M.; Kollet, S. J.; Chow, F. K.; Granvold, P.; Duan, Q.; Feb. 26, 2007; 108 pp.; In English
Report No.(s): DE2007-902346; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project was to develop and apply a coupled regional climate, land-surface, groundwater flow model as a means to further understand important mass and energy couplings between regional climate, the land surface, and groundwater. The project involved coupling three distinct submodels that are traditionally used independently with abstracted and potentially oversimplified (inter-model) boundary conditions. This coupled model lead to (1) an improved understanding of the sensitivity and importance of coupled physical processes from the subsurface to the atmosphere; (2) a new tool for predicting hydrologic conditions (rainfall, temperature, snowfall, snowmelt, runoff, infiltration and groundwater flow) at the watershed scale over a range of timeframes; (3) a simulation of hydrologic response of a characteristic watershed that will provide insight into the certainty of hydrologic forecasting, dominance and sensitivity of groundwater dynamics on land-surface fluxes; and (4) a more realistic model representation of weather predictions, precipitation and temperature, at the regional scale.
NTIS
Climate Models; Earth Surface; Ground Water; Watersheds

20080015859 Tokyo Univ., Japan
Assessment of Satellite Surface Radiation Products in Highland Regions with Tibet Instrumental Data
Yang, Kun; Koike, Toshio; Stackhouse, Paul; Mikovitz, Colleen; November 2006; 18 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 509496.02.01.01.13; Copyright; Avail.: CASI: A03, Hardcopy

This study presents results of comparisons between instrumental radiation data in the elevated Tibetan Plateau and two global satellite products: the Global Energy and Water Cycle Experiment - Surface Radiation Budget (GEWEX-SRB) and International Satellite Cloud Climatology Project - Flux Data (ISCCP-FD). In general, shortwave radiation (SW) is estimated better by ISCCP-FD while longwave radiation (LW) is estimated better by GEWEX-SRB, but all the radiation components in both products are under-estimated. Severe and systematic errors were found in monthly-mean SRB SW (on plateau-average, -48 W/sq m for downward SW and -18 W/sq m for upward SW) and FD LW (on plateau-average, -37 W/sq m for downward LW and -62 W/sq m for upward LW) for radiation. Errors in monthly-mean diurnal variations are even larger than the monthly mean errors. Though the LW errors can be reduced about 10 W/sq m after a correction for altitude difference between the site and SRB and FD grids, these errors are still higher than that for other regions. The large errors in SRB SW was mainly due

to a processing mistake for elevation effect, but the errors in SRB LW was mainly due to significant errors in input data. We suggest reprocessing satellite surface radiation budget data, at least for highland areas like Tibet.
Author
Satellite Observation; Atmospheric Radiation; Clouds (Meteorology); Energy Budgets; Long Wave Radiation; Climatology

20080015867 NASA Langley Research Center, Hampton, VA, USA
Revisiting a Hydrological Analysis Framework with International Satellite Land Surface Climatology Project Initiative 2 Rainfall, Net Radiation, and Runoff Fields
Koster, Randal D.; Fekete, Balazs M.; Huffman, George J.; Stackhouse, Paul W.; November 2006; 12 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 509496.02.01.01.13; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2006JD007182

The International Satellite Land Surface Climatology Project Initiative 2 (ISLSCP-2) data set provides the data needed to characterize the surface water budget across much of the globe in terms of energy availability (net radiation) and water availability (precipitation) controls. The data, on average, are shown to be consistent with Budyko s decades-old framework, thereby demonstrating the continuing relevance of Budyko s semiempirical relationships. This consistency, however, appears only when a small subset of the data with hydrologically suspicious behavior is removed from the analysis. In general, the precipitation, net radiation, and runoff data also appear consistent in their interannual variability and in the phasing of their seasonal cycles.
Author
Hydrological Cycle; Data Acquisition; Land Surface Temperature; Climatology; Satellite Observation; Precipitation (Meteorology); Radiation; Water Runoff

20080015888 Analytical Services and Materials, Inc., Hampton, VA, USA
Annual Cycles of Surface Shortwave Radiative Fluxes
Wilber, Anne C.; Smith, G. Louis; Gupta, Shashi K.; Stackhouse, Paul W.; February 2006; 13 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 509496.02.01.01.13; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1175/JCLI3625.1

The annual cycles of surface shortwave flux are investigated using the 8-yr dataset of the surface radiation budget (SRB) components for the period July 1983-June 1991. These components include the downward, upward, and net shortwave radiant fluxes at the earth's surface. The seasonal cycles are quantified in terms of principal components that describe the temporal variations and empirical orthogonal functions (EOFs) that describe the spatial patterns. The major part of the variation is simply due to the variation of the insolation at the top of the atmosphere, especially for the first term, which describes 92.4% of the variance for the downward shortwave flux. However, for the second term, which describes 4.1% of the variance, the effect of clouds is quite important and the effect of clouds dominates the third term, which describes 2.4% of the variance. To a large degree the second and third terms are due to the response of clouds to the annual cycle of solar forcing. For net shortwave flux at the surface, similar variances are described by each term. The regional values of the EOFs are related to climate classes, thereby defining the range of annual cycles of shortwave radiation for each climate class.
Author
Short Wave Radiation; Annual Variations; Radiant Flux Density; Earth Surface; Atmospheric Radiation; Climatology

20080015894 Maryland Univ., College Park, MD, USA
Satellite Estimates of Surface Short-wave Fluxes: Issues of Implementation
Wang, H.; Pinker, Rachel; Minnis, Patrick; December 2006; 19 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 188362.02.07.8918.01; Copyright; Avail.: CASI: A03, Hardcopy

Surface solar radiation reaching the Earth's surface is the primary forcing function of the land surface energy and water cycle. Therefore, there is a need for information on this parameter, preferably, at global scale. Satellite based estimates are now available at accuracies that meet the demands of many scientific objectives. Selection of an approach to estimate such fluxes requires consideration of trade-offs between the use of multi-spectral observations of cloud optical properties that are more difficult to implement at large scales, and methods that are simplified but easier to implement. In this study, an evaluation of such trade-offs will be performed. The University of Maryland Surface Radiation Model (UMD/SRB) has been used to

reprocess five years of GOES-8 satellite observations over the USA to ensure updated calibration and improved cloud detection over snow. The UMD/SRB model was subsequently modified to allow input of information on aerosol and cloud optical depth with information from independent satellite sources. Specifically, the cloud properties from the Atmospheric Radiation Measurement (ARM) Satellite Data Analysis Program (Minnis et al., 1995) are used to drive the modified version of the model to estimate surface short-wave fluxes over the Southern Great Plain ARM sites for a twelve month period. The auxiliary data needed as model inputs such as aerosol optical depth, spectral surface albedo, water vapor and total column ozone amount were kept the same for both versions of the model. The estimated shortwave fluxes are evaluated against ground observations at the ARM Central Facility and four satellite ARM sites. During summer, the estimated fluxes based on cloud properties derived from the multi-spectral approach were in better agreement with ground measurements than those derived from the UMD/SRB model. However, in winter, the fluxes derived with the UMD/SRB model were in better agreement with ground observations than those estimated from cloud properties provided by the ARM Satellite Data Analysis Program. During the transition periods, the results were comparable.
Author
Solar Radiation; Earth Surface; Earth Observations (From Space); Solar Flux; Clouds

20080015901 Pacific Northwest National Lab., Richland, WA, USA
Use of In Situ Cloud Condensation Nuclei, Extinction, and Aerosol Size Distribution Measurements to Test a Method for Retrieving Cloud Condensation Nuclei Profiles From Surface Measurements
Ghan, Stephen J.; Rissman, Tracey A.; Ellman, Robert; Ferrare, Richard A.; Turner, David; Flynn, Connor; Wang, Jian; Ogren, John; Hudson, James; Jonsson, Haflidi H.; VanReken, Timothy; Flagan, Richard C.; Seinfeld, John H.; January 2006; 15 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-AC06-76RLO 1830; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2004JD005752

If the aerosol composition and size distribution below cloud are uniform, the vertical profile of cloud condensation nuclei (CCN) concentration can be retrieved entirely from surface measurements of CCN concentration and particle humidification function and surface-based retrievals of relative humidity and aerosol extinction or backscatter. This provides the potential for long-term measurements of CCN concentrations near cloud base. We have used a combination of aircraft, surface in situ, and surface remote sensing measurements to test various aspects of the retrieval scheme. Our analysis leads us to the following conclusions. The retrieval works better for supersaturations of 0.1% than for 1% because CCN concentrations at 0.1% are controlled by the same particles that control extinction and backscatter. If in situ measurements of extinction are used, the retrieval explains a majority of the CCN variance at high supersaturation for at least two and perhaps five of the eight flights examined. The retrieval of the vertical profile of the humidification factor is not the major limitation of the CCN retrieval scheme. Vertical structure in the aerosol size distribution and composition is the dominant source of error in the CCN retrieval, but this vertical structure is difficult to measure from remote sensing at visible wavelengths.
Author
Measurement; Clouds; Condensation Nuclei; Extinction; Aerosols; Size Distribution

20080015924 National Inst. for Environmental Studies, Tsukuba, Japan; NASA Langley Research Center, Hampton, VA, USA
Ozone Profiles in the High-latitude Stratosphere and Lower Mesosphere Measured by the Improved Limb Atmospheric Spectrometer (ILAS)-II: Comparison with other Satellite Sensors and Ozonesondes
Sugita, T.; Nakajima, H.; Yokota, T.; Kanzawa, H.; Gernandt, H.; Herber, A.; VonderGathen, P.; Koenig-Langlo, G.; Sato, K.; Dorokhov, V.; Yushkov, V. A.; Murayama, Y.; Yamamori, M.; Godin-Beekmann, S.; Goutail, F.; Roscoe, H. K.; Deshler, T.; Yela, M.; Taalas, P.; Kyroe, E.; Oltmans, S. J.; Johnson, B. J.; Allaart, M.; Litynska, Z.; Klekociuk, A.; Journal of Geophysical Research; March 24, 2006; Volume 111; 15 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): EC EVK2-CT-2001-00129; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD006439

A solar occultation sensor, the Improved Limb Atmospheric Spectrometer (ILAS)-II, measured 5890 vertical profiles of ozone concentrations in the stratosphere and lower mesosphere and of other species from January to October 2003. The measurement latitude coverage was 54-71degN and 64-88degS, which is similar to the coverage of ILAS (November 1996 to June 1997). One purpose of the ILAS-II measurements was to continue such high-latitude measurements of ozone and its related chemical species in order to help accurately determine their trends. The present paper assesses the quality of ozone data in the version 1.4 retrieval algorithm, through comparisons with results obtained from comprehensive ozonesonde measurements and four satellite-borne solar occultation sensors. In the Northern Hemisphere (NH), the ILAS-II ozone data

agree with the other data within +/-10% (in terms of the absolute difference divided by its mean value) at altitudes between 11 and 40 km, with the median coincident ILAS-II profiles being systematically up to 10% higher below 20 km and up to 10% lower between 21 and 40 km after screening possible suspicious retrievals. Above 41 km, the negative bias between the NH ILAS-II ozone data and the other data increases with increasing altitude and reaches 30% at 61-65 km. In the Southern Hemisphere, the ILAS-II ozone data agree with the other data within 10% in the altitude range of 11-60 km, with the median coincident profiles being on average up to 10% higher below 20 km and up to 10% lower above 20 km.
Author
Ozone; Stratosphere; Satellite Observation; Solar Sensors; Occultation; Gas Composition; Mesosphere

20080015941 National Inst. of Information and Communications Technology, Tokyo, Japan
Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2
March/June 2007; 185 pp.; In English; See also 20080015942 - 20080015959; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Topics discussed include: Comprehensive Arctic Atmosphere Observing System and Observed Results for System Performance Demonstration; Predicting and Validating the Motion of an Ash Cloud during the 2006 Eruption of Mount Augustine Volcano, Alaska, USA; NICT Lidar Systems at Poker Flat Research Range; Intensive Ozonesonde Observation at Fairbanks and Comparison with Three-Dimensional Chemical Transport Model; Characteristics of Aerosol in the Polar Mesosphere Derived from Rayleigh Lidar Observations; A Comparative Study of the Electron Density Estimated with MF Radar DAE Method and Cosmic Noise Absorption at Poker Flat, Alaska; Wind Estimations with Meteor Observations by MF Radars at Poker Flat, Alaska and Wakkanai, Japan; Tides in the Polar Mesosphere Derived from Two MF Radar Measurements at Poker Flat and Tromso; Optical Interferometry Techniques and Scientific Results of Dynamics of Upper Atmosphere in Alaska Project; Cosmic Noise Absorption Observed with Imaging Riometer in Alaska: Use of CNA to Estimate Energy Spectra of Auroral Precipitating Electrons; Artificial Ionospheric Irregularities Measured with the MUIR (Modular UHF Ionospheric Radar) at HAARP (High Frequency Active Auroral Research Program); Ionospheric Plasma Convection Observed by HF Radar Network in the Northern Polar Region; Space Weather Study Using the HF Radar in King Salmon, Alaska; Development and Ground Tests of Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES); The Laboratory Measurement of Pressure Broadening Parameter for Atmospheric Remote Sensing; BSMILES: A Balloon-Borne Superconducting Submillimeter-Wave Limb-Emission Sounder; Implementation of a Neural Network for Retrieving Atmospheric Parameters from Remote Sensing; and The Impact of Cirrus Clouds on Retrieval of Ozone in the Upper Troposphere/Lower Stratosphere from SMILES Data.
Derived from text
Ultrahigh Frequencies; Submillimeter Waves; Space Weather; Pressure Measurement; Radar Networks; Optical Radar; Ozone; Meteorological Parameters; Aerosols; Cirrus Clouds; Electron Precipitation

20080015942 National Inst. of Information and Communications Technology, Japan
Predicting and Validating the Motion of an Ash Cloud during the 2006 Eruption of Mount Augustine Volcano, Alaska, USA
Collins, R. L.; Fochesatto, J.; Sassen, K.; Webley, P. W.; Atkinson, D. E.; Dean, K. G.; Cahill, C. F.; MIZUTANI, Kohei; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 13-24; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

On 11 January 2006, Mount Augustine volcano in southern Alaska began erupting after 20- year repose. The Anchorage Forecast Office of the National Weather Service (NWS) issued an advisory on 28 January for Kodiak City. On 31 January, Alaska Airlines cancelled all flights to and from Anchorage after multiple advisories from the NWS for Anchorage and the surrounding region. The Alaska Volcano Observatory (AVO) had reported the onset of the continuous eruption. AVO monitors the approximately 100 active volcanoes in the Northern Pacific. Ash clouds from these volcanoes can cause serious damage to an aircraft and pose a serious threat to the local communities, and to transcontinental air traffic throughout the Arctic and sub-Arctic region. Within AVO, a dispersion model has been developed to track the dispersion of volcanic ash clouds. The model, Puff, was used operational by AVO during the Augustine eruptive period. Here, we examine the dispersion of a volcanic ash (or aerosol) cloud from Mount Augustine across Alaska from 29 January through the 2 February 2006. We present the synoptic meteorology, the Puff predictions, and measurements from aerosol samplers, laser radar (or lidar) systems, and satellites. UAF aerosol samplers revealed the presence of volcanic aerosols at the surface at sites where Puff predicted the ash clouds movement. Remote sensing satellite data showed the development of the ash cloud in close proximity to the volcano consistent with the Puff predictions. Two lidars showed the presence of volcanic aerosol with consistent characteristics aloft over Alaska and were capable of detecting the aerosol, even in the presence of scattered clouds and where the ash cloud is

too thin/disperse to be detected by remote sensing satellite data. The lidar measurements revealed the different trajectories of ash consistent with the Puff predictions. Dispersion models provide a forecast of volcanic ash cloud movement that might be undetectable by any other means but: are still a significant hazard. Validation is the key to assessing the accuracy of any future predictions. The study highlights the use of multiple and complementary observations used in detecting the trajectory ash cloud, both at the surface and aloft within the atmosphere.
Author
Volcanic Eruptions; Clouds (Meteorology); Ashes; Synoptic Meteorology; Radar Measurement; Remote Sensing; Forecasting; Detection; Aerosols; Predictions

20080015944 National Inst. of Information and Communications Technology, Japan
NICT Lidar Systems at Poker Flat Research Range
MIZUTANI, Kohei; ITABE, Toshikazu; YASUI, Motoaki; AOKI, Tetsuo; ISHII, Shoken; MURAYAMA, Yasuhiro; SASANO, Masahiko; YOSHIOKA, Kensuke; OHTANI, Yoshiko; Collins, R. L.; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 25-34; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

We have developed three lidar instruments for the observations of the arctic: troposphere, stratosphere and mesosphere at Poker Flat Research Range near Fairbanks, Alaska (65.1 N, 147.5 W). A multi-wavelength lidar to observe clouds, aerosols and water vapor distribution in the arctic troposphere and stratosphere is operated from March 2003. A Rayleigh lidar system for temperature observations of the stratosphere and mesosphere is working after November 1997. A Rayleigh Doppler lidar for wind measurements of the middle atmosphere was installed at Poker Flat in August 2005. Here, we give descriptions of the multi-wavelength lidar, the Rayleigh lidar, and the Rayleigh Doppler lidar for the observations of the Arctic atmosphere in Alaska.
Author
Optical Radar; Meteorological Radar; Doppler Radar; Arctic Regions; Troposphere; Stratosphere; Middle Atmosphere; Mesosphere; Aerosols

20080015945 National Inst. of Information and Communications Technology, Japan
Intensive Ozonesonde Observation at Fairbanks and Comparison with Three-Dimensional Chemical Transport Model
YAMAMORI, Miho; MURAYAMA, Yamhiro; SHIBASAKI, Kazuo; MURATA, Isao; KAGAWA, Akiko; KASAI, Yasuko; MIYAZAKI, Kazuyuki; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 35-41; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

An observation campaign including intensive launches of ozonesondes was conducted at Fairbanks (64.8 N, 147.9 W), Alaska, during 23-30 August 2003. The objectives are validation of data from Improved Limb Atmospheric Spectrometer-II (ILAS-II) on board the Advanced Earth Observing Satellite-II (ADEOS-II) with Alaska Project ground-based instruments and examination of small-scale ozone variation in the upper troposphere and lower stratosphere. Observed small-scale structures in ozone are compared with high-resolution fields reconstructed from 3-dimensional chemical transport model using the reverse domain filling technique.
Author
Ozonesondes; Ozone; Stratosphere; Fine Structure; Spectrometers; Transport Properties

20080015946 National Inst. of Information and Communications Technology, Japan
Ionospheric Plasma Convection Observed by HF Radar Network in the Northern Polar Region
HASHIMOTO K. Kumiko; KIKUCHI Takashi; KUNITAKE Manabu; OHTAKA kazuhiro; WATARI Shin-ichi; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 103-111; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

The space weather forecast is getting more and more important issue for the operations of the spacecrafts and telecommunication facilities. Among several important research subjects in the space weather, we studied the transmission mechanism of the electromagnetic energy into the inner magnetosphere and to low latitude ionosphere, using radar and magnetometer networks. We report in this article that the ionospheric plasma convection in the polar region is closely related with magnetic disturbances at the equator and in the inner magnetosphere. With these observational facts, we emphasize a crucial role of the ionosphere in transmitting the electromagnetic energy to the space.
Author
Plasma Dynamics; Magnetometers; High Frequencies; Radar Networks; Space Weather; Magnetic Disturbances; Forecasting

20080015947 National Inst. of Information and Communications Technology, Japan

Comprehensive Arctic Atmosphere Observing System and Observed Results for System Performance Demonstration

MURAYAMA,Yashuhiro; ISHII, Mamoru; KUBOTA, Minoru; MORI, Hirotaka; MIZUTANI, Kohei; OCHIAI, Satoshi; KASAI,Yasuko; KAWAMURA, Seiji; TANAKA, Yoshimasa; MASUKO, Harunobu; IGUCHI, Toshio; KUMAGAI, Hiroshi; KIKUCHI, Takashi; SATO, Kaoru; Collins, R. L.; Watkins, B. J.; Conde, M.; Bristow, B.; Smith, R. W.; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 3-12; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

The 'middle atmosphere', defined as the atmospheric layer at altitudes from approximately 10 to 100 km, has been stressed as a region important in global environment and climate change studies; importance is also stressed on the Arctic region where the global warming is predicted to appear most predominantly. The 'Alaska Project', an international joint research project with National Institute of Information and Communications Technology (NICT) and Geophysical Institute of University of Alaska Fairbanks, developed radio/optical instruments technology and instruments which are effective for global environment studies. Project overview and results are shown the article.

Author

Atmospheric Stratification; Global Warming; Climatology; Climate Change; Geophysics

20080015948 National Inst. of Information and Communications Technology, Japan

Development and Ground Tests of Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES)

YAMADA, Masumi; KASAI, Yasuko; AMANO, Takayoshi; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 123-130; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Superconducting Submillimeter-wave Limb-Emission Sounder, SMILES is an Earth observation sensor aboard Exposure Facility of Japanese Experiment Module of the international space station. SMILES will be launched in 2009. SMILES has two superconducting receivers in 625 and 650 GHz bands. Height profiles of stratospheric chemical species will be retrieved from limb spectra taken by SMILES. SMILES are developed under cooperation of NlCT and JAXA. The submillimeter-wave receiver will be integrated and tested in 2007. The flight model of SMILES will be integrated in 2008.

Author

Submillimeter Waves; Superconductivity; Ground Tests; Spacecraft Modules; Earth Observations (From Space); Atmospheric Composition; Remote Sensing; Sounding

20080015949 National Inst. of Information and Communications Technology, Japan

Optical Interferometry Techniques and Scientific Results of Dynamics of Upper Atmosphere in Alaska Project

ISHII, Mamoru; KUBOTA, Minoru; MURAYAMA, Yasuhiro; Conde, Mark; Smith, Roger W.; OKANO, Shoichi; SAKANOI, Kazuyo; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 77-85; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

We developed Fabry-Perot interferometer named NICT-FPI in Alaska project and have observed in several observatories in domestic and overseas. We deployed the instruments at Poker Flat research range and Eagle observatory, Alaska on 1998 and started the observation of aurora optics for deducing the neutral-ion coupling and vertical winds with active aurora. We can expect the technique to be widely applied in many fields, e.g., laser technology.

Author

Fabry-Perot Interferometers; Upper Atmosphere; Laser Applications; Auroras

20080015950 National Inst. of Information and Communications Technology, Japan

Wind Estimations with Meteor Observations by MF Radars at Poker Flat, Alaska and Wakkanai, Japan

KAWAMURA, Seiji; TSUTSUMI, Masaki; MURAYAMA, Yasuhiro; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 59-66; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

A new measurement mode is introduced into two MF (medium frequency) radars of NICT at Wakkanai and Poker Flat, Alaska in August 2004. In this method, meteor trails are used to estimate wind velocities. The positions of meteor trails are determined by the interferometry technique, and horizontal wind velocities are estimated by their line-of-sight Doppler velocities. The height coverage of this technique by MF radars is from about 80 to 120 km. Wind velocities by meteors show

quite good agreement with those by FCA technique (a traditional method to estimate winds by MF radar). In this paper, a method and observed results are reported.
Author
Estimates; Wind Velocity; Interferometry; Meteor Trails; Frequencies; Meteoroids

20080015951 National Inst. of Information and Communications Technology, Japan
Characteristics of Aerosol in the Polar Mesosphere Derived from Rayleigh Lidar Observations
SAKANOI, Kazuyo; MURAYAMA, Yasuhiro; Collins, R. L.; MIZUTANI, Kouhei; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 43-50; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

In this paper, we present characteristics of aerosol in the polar mesosphere derived from Rayleigh lidar observations over Poker Flat Research Range, Univ. of Alaska, Fairbanks. There are two kinds of aerosol, noctilucent clouds and rocket plume. At first, we show that aerosol of noctilucent clouds are transported by background wind. Then extent of the rocket plume can be estimated from lidar data considering their transport by background wind. This kind of measurements is useful to new research in the mesosphere.
Author
Optical Radar; Noctilucent Clouds; Mesosphere; Aerosols

20080015952 National Inst. of Information and Communications Technology, Japan
Tides in the Polar Mesosphere Derived from Two MF Radar Measurements at Poker Flat and Tromso
ISHII, Mamoru; KUBOTA, Minoru; MURAYAMA, Yasuhiro; Conde, Mark; Smith, Roger W.; OKANO, Shoichi; SAKANOI, Kazuyo; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 67-76; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

We have investigated diurnal and semidiurnal tides in the polar mesosphere based on wind data obtained from November 1998 to December 2002 with two MF radars located at Tromso, (69.58 N, 19.22 E) and Poker Flat (65.1 N, 147.5 W). We have investigated characteristics of diurnal and semidiurnal amplitudes and phases between 70 and 91 km. Pdso, we have compared amplitudes and phases of the diurnal and semidiurnal tides at t\wo sites, and investigated contributions of the non-migrating tide of the semidiurnal tide.
Author
Radar Measurement; Mesosphere; Tides; Diurnal Variations

20080015955 National Inst. of Information and Communications Technology, Japan
The Laboratory Measurement of Pressure Broadening Parameter for Atmospheric Remote Sensing
YAMADA, Masumi; KASAI, Yasuko; AMANO, Takayoshi; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 131-136; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

The upcoming JEMISMILES (a Superconducting Submillimeter-wave Limb Emission Sounder) and EOS-MLS (Earth Observing System-Microwave Limb Sounder) missions are planned to continually monitor key atmospheric species, which play a crucial role in the chemistry of the upper atmosphere. For reliable retrieval of spatial distributions of key species from observational data, various types of spectroscopic parameters should be known with high accuracy. In this investigation, the pressure broadening parameters and their temperature dependences of BrO, HO2, and O3 have been critically examined.
Author
Atmospheric Sounding; Earth Observing System (EOS); Superconductivity; Submillimeter Waves; Remote Sensing; Pressure Measurement; Microwave Sounding; Ozone; Upper Atmosphere

20080015956 National Inst. of Information and Communications Technology, Japan
Cosmic Noise Absorption Observed with Imaging Riometer in Alaska: Use of CNA to Estimate Energy Spectra of Auroral Precipitating Electrons
TANAKA, Yoshimasa; ISHII, Mamoru; KUBOTA, Minoru; MONZEN, Yoshizumi; MURAYAMA, Yasuhiro; MORI, Takahiro; Lummerzeim, Dirk; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 87-94; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Since the NICT's 256-element imaging riometer was installed at Poker Flat, Alaska, in 1995 in cooperation with the Geophysical Institute of the University of Alaska Fairbanks, it has been recording the high-spatial-resolution cosmic noise

absorption (CNA) to study the effect of high-energy electron precipitation on the polar middle atmosphere. We examined how to use the CNA data to estimate the energy distribution of auroral precipitating electrons. In this paper, we describe the method to extract the information of the flux of high-energy precipitating electrons by combining CNA with the optical emissions observed at two wavelengths with the all-sky imager.
Author
Cosmic Noise; Electron Precipitation; Middle Atmosphere; Geophysics; Riometers; Auroras; Energy Spectra

20080015957 National Inst. of Information and Communications Technology, Japan
The Impact of Cirrus Clouds on Retrieval of Ozone in the Upper Troposphere/Lower Stratosphere from SMILES Data
Mendrok, Jana; Philippe, Baron; KASAI, Yasuko; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 161-173; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Characterized by an exceptionally low instrumental noise, tropospheric measurements of the Superconducting Submillimeter-Wave Limb Emission Sounder (SMILES), dedicated to the observation of atmospheric ozone chemistry, may noticeably be affected by cirrus clouds. When not taken into account in the retrieval, the change in broadband spectral signal caused by ice clouds introduces uncertainties in the derivation of trace gas profiles around the upper troposphere/lower stratosphere (UTLS). In this paper, we demonstrate cirrus effects on submm limb spectra as well as on the measurement sensitivity concerning trace gas profile retrievals. We analyze the error budget in the retrieval of UTLSozone (O3) induced by neglecting the observed cirrus. Furthermore, possibilities to compensate for cloud effects by retrieving additional parameters like a measurement baseline and (pseudo) water vapor (H2O) content are evaluated.
Author
Cirrus Clouds; Ozone; Troposphere; Stratosphere; Meteorological Parameters; Atmospheric Composition; Ice Clouds; Submillimeter Waves; Superconductivity

20080015958 National Inst. of Information and Communications Technology, Japan
BSMILES: A Balloon-Borne Superconducting Submillimeter-Wave Limb-Emission Sounder
IRIMAJIRI, Yoshihisa; OCHIAI, Satoshi; Baron, Philippe; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 137-145; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

Stratospheric ozone layer protects life on the Earth from harmful ultraviolet rays from the Sun. Since the antarctic ozone hole was discovered in 1980, ozone destruction became a serious global environmental problem especially because it is caused by human activity. Although it is said that the ozone layer is recovering in recent years by international reduction of ozone-depleting substances such as designated chlorofluorocarbons, ozone recovery rates are still uncertain. Because catalyst reaction with the stratospheric minor constituents is related to the ozone destruction, observations of the molecules and clarifying of the photochemical processes are important in order to predict recovery of ozone concentrations. We have developed a balloon-borne high-sensitive superconductive receiver system in order to measure stratospheric minor gases. Balloon flight experiments were successfully conducted in 2003, 2004, and 2006, and ozone and ozone-depleting substances and greenhouse gases were measured.
Author
Atmospheric Composition; Stratosphere; Ozonosphere; Ozone Depletion; Chlorofluorocarbons; Catalysts; Superconductivity; Receivers; Photochemical Reactions

20080015959 National Inst. of Information and Communications Technology, Japan
Implementation of a Neural Network for Retrieving Atmospheric Parameters from Remote Sensing
Baron, P.; Mendrok, J.; KASAI, Yasuko; Review of the National Institute of Information and Communications Technology, Vol. 53, Nos. 1/2; March/June 2007, pp. 147-160; In Japanese; See also 20080015941; Copyright; Avail.: Other Sources

A numerical model of a supervised feedforward Neural Network (NIV) has been implemented. The purpose is to study the capabilities of a NN based retrieval algorithm to inverse the measurements performed by the future JEM/SMILES limb sounder. The model has been designed for research purpose with a special care given to its flexibility and extension facility, but keeping in mind that the computational performances must allow the use of a network with the size of those commonly used for satellite data inversion. The code is written in the Python language. The procedure to create and use a NN is presented and the algorithms of the training procedure are described in detail. The MLP is trained using either the Levenberg-Marquardt or the steepest descent method to find the optimal value of the model parameters according to some examples of the inputs

and outputs. The model also provides a set of functions to scale the data or to use their principal components. In order to prevent the MLP to overfit the training data, several solutions are available. A regularization term car1 be added to the cost function with the possibility to optimize the hyperparameters using a Bayesian method. Also, an early stopping procedure can be set using a cross-validation data set. The correctness of the algorithms implementation is demonstrated with simulations and the results are discussed.
Author
Meteorological Parameters; Remote Sensing; Neural Nets; Sounding; Mathematical Models; Education; Inversions; Algorithms

20080015981 NASA Marshall Space Flight Center, Huntsville, AL, USA
Integrated Modeling Framework
Luvall, Jeffrey C.; February 19, 2008; 1 pp.; In English; Prepared for a site visit meeting on urban air quality in Region 2 and the NASA IDEAS project, San Juan, Puerto Rico, Feb. 19-21, 2008; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015981
This document is a chart showing the inputs to and outputs from various parts of the integrated climate model.
CASI
Charts; Climate Models; Atmospheric Models; Meteorological Parameters

20080015989 Deutscher Wetterdienst, Hohenpeissenberg , Germany; NASA Langley Research Center, Hampton, VA, USA
Long-term Evolution of Upper Stratospheric Ozone at Selected Stations of the Network for the Detection of Stratospheric Change (NDSC)
Steinbrecht, W.; Claude, H.; Schoenenborn, F.; McDermid, I. S.; LeBlanc, T.; Godin, S.; Swart, D. P. J.; Meijer, Y. J.; Bodecker, G. E.; Connor, B. J.; Kaempfer, N.; Hocke, K.; Calisesi, Y.; delaNoee; Parrish, A. D.; Boyd, I. S.; Bruehl, C.; Steil, B.; Manzini, E.; Thomason, L. W.; Zawodny, J. M.; McCormick, M. P.; Russell, J. M., III; Bhartia, P. K.; Stolarski, R. S.; May 2006; 18 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AFO-2000 07ATF43/44; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD006454
The long-term evolution of upper stratospheric ozone has been recorded by lidars and microwave radiometers within the ground-based Network for the Detection of Stratospheric Change (NDSC), and by the space-borne Solar Backscatter Ultra-Violet instruments (SBUV), Stratospheric Aerosol and Gas Experiment (SAGE), and Halogen Occultation Experiment (HALOE). Climatological mean differences between these instruments are typically smaller than 5% between 25 and 50 km. Ozone anomaly time series from all instruments, averaged from 35 to 45 km altitude, track each other very well and typically agree within 3 to 5%. SBUV seems to have a slight positive drift against the other instruments. The corresponding 1979 to 1999 period from a transient simulation by the fully coupled MAECHAM4-CHEM chemistry climate model reproduces many features of the observed anomalies. However, in the upper stratosphere the model shows too low ozone values and too negative ozone trends, probably due to an underestimation of methane and a consequent overestimation of ClO. The combination of all observational data sets provides a very consistent picture, with a long-term stability of 2% or better. Upper stratospheric ozone shows three main features: (1) a decline by 10 to 15% since 1980, due to chemical destruction by chlorine; (2) two to three year fluctuations by 5 to 10%, due to the Quasi-Biennial Oscillation (QBO); (3) an 11-year oscillation by about 5%, due to the 11-year solar cycle. The 1979 to 1997 ozone trends are larger at the southern mid-latitude station Lauder (45 S), reaching 8%/decade, compared to only about 6%/decade at Table Mountain (35 N), Haute Provence/Bordeaux (approximately equal to 45 N), and Hohenpeissenberg/Bern(approximately equal to 47 N). At Lauder, Hawaii (20 N), Table Mountain, and Haute Provence, ozone residuals after subtraction of QBO- and solar cycle effects have levelled off in recent years, or are even increasing. Assuming a turning point in January 1997, the change of trend is largest at southern mid-latitude Lauder, +11%/decade, compared to +7%/decade at northern mid-latitudes. This points to a beginning recovery of upper stratospheric ozone. However, chlorine levels are still very high and ozone will remain vulnerable. At this point the most northerly mid-latitude station, Hohenpeissenberg/Bern differs from the other stations, and shows much less clear evidence for a beginning recovery, with a change of trend in 1997 by only +3%/decade. In fact, record low upper stratospheric ozone values were observed at Hohenpeissenberg/Bern, and to a lesser degree at Table Mountain and Haute Provence, in the winters 2003/2004 and 2004/2005.
Author
Climatology; Ozone; SAGE Satellite; Solar Backscatter UV Spectrometer; Stratosphere; Networks

20080016006 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: December 2007
December 2007; In English; Copyright; Avail.: Other Sources

CD-ROM concerning the December 2007 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from a Multi-functional Transport Satellite (MTSAT-1R) and the polar orbital meteorological satellite NOAA. This Monthly Report contains image data observed by the following 4 channels and processed satellite product data from the observation data: IR:Infrared(10.3-11.3um), VS:Visible(0.55-0.90um), WV:Water Vapor(6.5-7.0um), SW:3.8 micron image(3.5-4.0um). These CD-ROMs contain the following data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its Vicinity; Water Vapor Motion Wind; HRIT Image Data Catalog; TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; TOVS Total Ozone Amount; Aerosol Optical Thickness; Snow and Ice Index; Sea Surface Temperature and Cloud Grid Information. Explanations of the above data are included in the document files.
Derived from text
Meteorological Satellites; Satellite Observation; Data Acquisition

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*.

20080015960 Lawrence Livermore National Lab., Livermore, CA USA
Modeling the Mechano-Chemistry of NTPases
Xing, J.; Feb. 23, 2007; 57 pp.; In English
Report No.(s): DE2007-902335; UCRL-TR-228269; No Copyright; Avail.: Department of Energy Information Bridge

This project is to develop theoretical framework for protein motors based on experimental data. Protein motors use chemical and electrochemical energies to perform mechanical work. Protein motors are machines of life. They are essential for many biological processes, including cell division, DNA transcription, replication, etc. Understanding the working mechanisms of protein motors has both scientific and medical/clinical significances, including revealing the physiological origins of certain diseases, designing of drugs against pathogens. Experiments with new techniques, especially recent advances in single molecule force measurements, have accumulated a large amount of experimental data that requires systematic theoretical analysis. We worked out a theoretical analysis on protein fluctuations to explain the recent single molecule experiment on dynamic disorders, proposed a new mechanism to explain mechanical signal propagation through the allosteric effect, a fundamental property of proteins, and examined the dynamic disorder effects on protein interaction networks. We also examined various theoretical formulations describing mechanical stress propagation in proteins, and derived mathematical formula for various approximate methods solving the mathematical equations.
NTIS
Electrochemistry; Molecular Biology; Proteins; Experimentation; Mathematical Models

20080016538 Government Accountability Office, Washington, DC, USA
Nanotechnology: Better Guidance Is Needed to Ensure Accurate Reporting of Federal Research Focused on Environmental, Health, and Safety Risks. Report to Congressional Requesters
March 2008; 43 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-08-402; No Copyright; Avail.: CASI: A03, Hardcopy

The National Nanotechnology Institute (NNI) reported that in fiscal year 2006,federal agencies devoted $37.7million--or 3 percent of the $1.3 billion total nanotechnology research funding--to research that was primarily focused on the Environmental, Health, and Safety (EHS) risks of nanotechnology. However, about 20 percent of this total cannot actually be attributed to this purpose; GAO found that 22 of the 119 projects identified as EHS-related by five federal agencies in fiscal year 2006 were not focused on determining the extent to which nanotechnology poses an EHS risk. Instead, the focus of many of these projects was to explore how nanotechnology could be used to remediate environmental damage or to detect a variety of hazards. GAO determined that this mischaracterization is rooted in the current reporting structure which does not allow these types of projects to be easily categorized and the lack of guidance for agencies on how to apportion funding across multiple topics. In addition to the EHS funding totals reported by the NNI, federal agencies conduct other research that is not captured in the totals. This research was not captured by the NNI because either the research was funded by an agency not

generally considered to be a research agency or because the primary purpose of the research was not to study EHS risks. Federal agencies and the NNI are currently in the process of identifying and prioritizing EHS risk research needs; the process they are using appears reasonable overall. For example, identification and prioritization of EHS research needs is being done by the agencies and the NNI. The NNI also is engaged in an iterative prioritization effort through its Nanotechnology Environmental and Health Implications (NEHI) working group. NEHI has identified five specific research priorities for five general research categories, but it has not yet completed the final steps of this process, which will identify EHS research gaps, determine specific research needed to fill those gaps, and outline a long-term, overarching EHS research strategy. GAO found that the focus of most EHS research projects underway in fiscal year 2006 was generally consistent with agency priorities and NEHI research categories and that the projects focused on the priority needs within each category to varying degrees. The anticipated EHS research strategy is expected to provide a framework to help ensure that the highest priority needs are met. Agency and NNI processes to coordinate activities related to potential EHS risks of nanotechnology have been generally effective. The NEHI working group has convened frequent meetings that have helped agencies identify opportunities to collaborate on EHS risk issues, such as joint sponsorship of research and workshops to advance knowledge and facilitate information-sharing among the agencies. In addition, NEHI has incorporated several practices that are key to enhancing and sustaining interagency collaboration, such as leveraging resources. Finally, agency officials GAO spoke with expressed satisfaction with the coordination and collaboration on EHS risk research that has occurred through NEHI. They cited several factors they believe contribute to the group#s effectiveness, including the stability of the working group membership and the expertise and dedication of its members.
Derived from text
Hazards; Health; Nanotechnology; Risk; Safety

52
AEROSPACE MEDICINE

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

20080015863 NASA Johnson Space Center, Houston, TX, USA
C-9 and Other Microgravity Simulations
September 2007; 158 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A08, Hardcopy

This document represents a summary of medical and scientific evaluations conducted aboard the C-9 or other NASA-sponsored aircraft from June 30, 2006, to June 30, 2007. Included is a general overview of investigations manifested and coordinated by the Human Adaptation and Countermeasures Office. A collection of brief reports that describe tests conducted aboard the NASA-sponsored aircraft follows the overview. Principal investigators and test engineers contributed significantly to the content of the report, describing their particular experiment or hardware evaluation. Although this document follows general guidelines, each report format may vary to accommodate differences in experiment design and procedures. This document concludes with an appendix that provides background information about the Reduced Gravity Program.
Derived from text
General Overviews; Microgravity; Aerospace Medicine; Weightlessness Simulation; Parabolic Flight

20080015884 NASA Johnson Space Center, Houston, TX, USA
Medullary Sponge Kidney and Urinary Calculi Aeromedical Concerns
Jones, Jeffrey A.; Cherian, Sebastian F.; Barr, Yael R.; Stocco, Amber; [2008]; 15 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

Medullary Sponge Kidney (MSK) is a benign disorder associated with renal stones in 60% of patients. Patients frequently have episodic painless hematuria but are otherwise asymptomatic unless renal calculi or infections complicate the disease. Nephrolithiasis is a relative, but frequently enforced, contraindication to space or other high performance flight. Two case reports of asymptomatic NASA flight crew with MSK and three cases of military aviators diagnosed with MSK are reviewed, all cases resulted in waiver and return to flight status after treatment and a vigorous follow up and prophylaxis protocol. MSK in aviation and space flight necessitates a highly case-by-case dependent evaluation and treatment process to rule out other

potential confounding factors that might also contribute to stone formation and in order to re-qualify the aviator for flight duties.
Author
Kidney Stones; Infectious Diseases; Hematuria; Aircraft Pilots; Flight Crews; Aerospace Medicine; Urology

53
BEHAVIORAL SCIENCES

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

20080015996 NASA Ames Research Center, Moffett Field, CA, USA
Human Performance Models of Pilot Behavior
Foyle, David C.; Hooey, Becky L.; Byrne, Michael D.; Deutsch, Stephen; Lebiere, Christian; Leiden, Ken; Wickens, Christopher D.; Corker, Kevin M.; September 26, 2005; 10 pp.; In English; Human Factors & Ergonomics Society Meeting, 26-30 Sept. 2005, Orlando, FL, USA
Report No.(s): 21-078-20-10; Copyright; Avail.: CASI: A02, Hardcopy

Five modeling teams from industry and academia were chosen by the NASA Aviation Safety and Security Program to develop human performance models (HPM) of pilots performing taxi operations and runway instrument approaches with and without advanced displays. One representative from each team will serve as a panelist to discuss their team s model architecture, augmentations and advancements to HPMs, and aviation-safety related lessons learned. Panelists will discuss how modeling results are influenced by a model s architecture and structure, the role of the external environment, specific modeling advances and future directions and challenges for human performance modeling in aviation.
Author
Human Performance; Lessons Learned; Flight Safety; Instrument Approach; Aircraft Safety; Display Devices

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*.

20080015698 Air Force Research Lab., Rome, NY, USA
Method for a Registering and Enrolling Multiple-Users in Interactive Information Display Systems
Ghanamgari, S., Inventor; Smith, J. D., Inventor; 29 May 05; 18 pp.; In English
Patent Info.: Filed Filed 29 May 05; US-Patent-Appl-SN-11-094 551
Report No.(s): PB2007-106014; No Copyright; Avail.: CASI: A03, Hardcopy

This invention provides a method for registering and enrolling multiple users in a interactive information display systems where the untethered multiple users interact with large information displays using laser pointers coordinated with voice commands. A registration program assigns a unique identification to each user that associates a particular user's voice and a particular laser pointer pattern chosen by that user, with that particular user. Users may speak voice commands. The system will then perform speech recognition of the user's voice command. If the command is recognized, the system performs the speech-recognized command as a window operation.
NTIS
Computer Systems Design; Computer Systems Performance; Display Devices; Human-Computer Interface; Information Retrieval; Information Systems; Patent Applications

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

20080015684 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Taming Surprises
Struzik, Z. R.; Oct. 31, 2002; 14 pp.; In English
Report No.(s): PB2007-100688; INS-R0208; Copyright; Avail.: National Technical Information Service (NTIS)

A methodological trajectory has been described dealing with the 'novelty' or 'surprise' issue in time series records arising

from real world complex systems. It is based on extracting regularity (or scaling) characteristics of non-differentiable time series with wavelet transform, on modeling the complex system using multi-fractal properties and on investigating novelty in the context of the possible non-stationarity of such a model.
NTIS
Complex Systems; Time Series Analysis

20080015690 Sandia National Labs., Albuquerque, NM USA
Evolving Story of Information Assurance at the DoD
Campbell, P. L.; Jan. 2007; 81 pp.; In English
Report No.(s): DE2007-902561; SAND2006-7179; No Copyright; Avail.: National Technical Information Service (NTIS)

This document is a review of five documents on information assurance from the Department of Defense (DoD), namely 5200.40, 8510.1-M, 8500.1, 8500.2, and an interim document on DIACAP (9). The five documents divide into three sets: (1) 5200.40 & 8510.1-M, (2) 8500.1 & 8500.2, and (3) the interim DIACAP document. The first two sets describe the certification and accreditation process known as DITSCAP; the last two sets describe the certification and accreditation process known as DIACAP (the second set applies to both processes). Each set of documents describes (1) a process, (2) a systems classification, and (3) a measurement standard. Appendices in this report (a) list the Phases, Activities, and Tasks of DITSCAP, (b) note the discrepancies between 5200.40 and 8510.1-M concerning DITSCAP Tasks and the System Security Authorization Agreement (SSAA), (c) analyze the DIACAP constraints on role fusion and on reporting, (d) map terms shared across the documents, and (e) review three additional documents on information assurance, namely DCID 6/3, NIST 800-37, and COBIT.
NTIS
Information Systems; Security

20080015726 Prairie View Agricultural and Mechanical Coll., TX, USA
Mathematically Reduced Chemical Reaction Mechanism Using Neural Networks. Technical Progress Report for Period Ending September 30, 2006
Mar. 2007; 38 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT-41913
Report No.(s): DE2007-902508; No Copyright; Avail.: Department of Energy Information Bridge

This is an annual technical report for the work done over the last year (period ending 9/30/2005) on the project titled Mathematically Reduced Chemical Reaction Mechanism Using Neural Networks. The aim of the project is to develop an efficient chemistry model for combustion simulations. The reduced chemistry model will be developed mathematically without the need of having extensive knowledge of the chemistry involved. To aid in the development of the model, Neural Networks (NN) will be used via a new network topology know as Non-linear Principal Components Analysis (NPCA). We report on the significant development made in developing a truly meshfree computational fluid dynamics (CFD) flow solver to be coupled to NPCA. First, the procedure of obtaining nearly analytic accurate first order derivatives using the complex step method (CSM) is extended to include computation of accurate meshfree second order derivatives via a theorem described in this report.
NTIS
Chemical Reactions; Neural Nets

20080015728 Fish and Neave IP Group, Ropes, Boston, MA, USA; BBNT Solutions, LLC, Cambridge, MA, USA
Systems and Methods for Framing Quantum Cryptographic Links
Schlafer, J. D., Inventor; Pikalo, O., Inventor; Elliott, B. B., Inventor; Nov. 10, 2004; 25 pp.; In English
Contract(s)/Grant(s): DARP-F30602-01-C-0170
Patent Info.: Filed Filed 10 Nov 04; US-Patent-Appl-SN-10-985 631
Report No.(s): PB2007-106023; No Copyright; Avail.: CASI: A03, Hardcopy

An optical transmitter includes a transmitting unit and a processing unit. The transmitting unit transmits multiple optical synchronization pulses at a first intensity, and transmits multiple optical quantum cryptographic key distribution (QKD) pulses at a second intensity. The processing unit encodes a cryptographic key symbol in a quantum state of each QKD pulse of the QKD pulses, and delays transmission of each of the multiple optical synchronization pulses a derived interval after transmission of a corresponding one of the multiple QKD pulses.
NTIS
Cryptography; Electromagnetic Pulses; Patent Applications; Synchronism; Transmitters

20080015729 Bruckner (John), P.C, Austin, TX, USA
Digital-Data Receiver Synchronization Method and Apparatus
Smith, S. F., Inventor; Turner, G. W., Inventor; Apr. 26, 2005; 18 pp.; In English
Patent Info.: Filed Filed 26 Apr 05; US-Patent-Appl-SN-11-114 893
Report No.(s): PB2007-106024; No Copyright; Avail.: CASI: A03, Hardcopy

Digital-data receiver synchronization is provided with composite phase-frequency detectors, mutually cross-connected comparison feedback or both to provide robust reception of digital data signals. A single master clock can be used to provide frequency signals. Advantages can include fast lock-up time in moderately to severely noisy conditions, greater tolerance to noise and jitter when locked, and improved tolerance to clock asymmetries.
NTIS
Digital Data; Patent Applications; Receivers; Synchronism

20080015732 Department of the Army, Fort Belvoir, VA, USA
Multi-Color Infrared Imaging Device
Milton, A. F., Inventor; Jul. 26, 2004; 8 pp.; In English
Patent Info.: Filed Filed 26 Jul 04; US-Patent-Appl-SN-10-787 907
Report No.(s): PB2007-106035; No Copyright; Avail.: CASI: A02, Hardcopy

A multi-color IR imaging device includes optics that direct mid-wave infrared (MWIR) and long-wave infrared (LWIR) radiation onto a focal plane array having LWIR and MWIR detection layers. Pixel groups that include at least one first pixel and one second pixel are defined on the focal plane array, and a first filter and a second filter which form part of an inhomogeneous filter is placed over the respective first and second pixels in a checkerboard pattern, in close proximity to the detection layers. This allows MWIR radiation in M band, and LWIR radiation in an L.sub.1 band to pass therethrough and illuminate the first pixels, and M, L.sub.1, and a separate LWIR band designated L(sub 2) to pass therethrough and illuminate the second pixels. To simultaneously image both MWIR and LWIR, the focal plane array is placed at a predetermined distance from the optics so that the MWIR spot size covers a single pixel and the LWIR spot size is about the same area as the area of a group of two first pixels and two second pixels. Since all pixels receive the M band, half of the pixels in the group receive the L.sub.1 band, and the other half receives the L(sub 2) band, three bands can be generated. This allows simultaneous imaging of MWIR and two sub-bands of the LWIR from the same point in space.
NTIS
Color; Colorimetry; Display Devices; Infrared Imagery; Patent Applications

20080016472 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Test Results for Digital Data Acquisition Tool: IXimager (Version 2.0) February 1, 2006
Apr. 2007; 121 pp.; In English
Report No.(s): PB2007-110426; No Copyright; Avail.: CASI: A06, Hardcopy

The Computer Forensics Tool Testing (CFTT) program is a joint project of the National Institute of Justice (NIJ), the research and development organization of the U.S. Department of Justice, and the National Institute of Standards and Technologys (NISTs) Office of Law Enforcement Standards (OLES) and Information Technology Laboratory (ITL). CFTT is supported by other organizations, including the Federal Bureau of Investigation, the U.S. Department of Defense Cyber Crime Center, U.S. Internal Revenue Service Criminal Investigation Division Electronic Crimes Program, and the U.S. Department of Homeland Securitys Bureau of Immigration and Customs Enforcement and U.S. Secret Service. The objective of the CFTT program is to provide measurable assurance to practitioners, researchers, and other applicable users that the tools used in computer forensics investigations provide accurate results. Accomplishing this requires the development of specifications and test methods for computer forensics tools and subsequent testing of specific tools against those specifications. Test results provide the information necessary for developers to improve tools, users to make informed choices, and the legal community and others to understand the tools capabilities. This approach to testing computer forensic tools is based on well-recognized methodologies for conformance and quality testing. This document reports the results from testing the IXimagera noncommercial, restricted-use, law-enforcement-only, evidence production tool against the Dgital Data Acquisition Tool Assertions and Test Plan Version 1.0.
NTIS
Data Acquisition; Digital Data; Computer Techniques; Information Systems

20080016574 IPSI BgD Internet Research Society, New York, NY, USA

The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1

Milutinovic, Veljko, Editor; Adell, Hojjat, Editor; Blaisten-Barjoas, Estela, Editor; Crisp, Bob, Editor; Domenici, Andrea, Editor; Flynn, Michael, Editor; Fujii, Hironori, Editor; Ganascia, Jean-Luc, Editor; January 2007; ISSN 1820-4511; 64 pp.; In English; See also 20080016575 - 20080016586; Original contains black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

Topics covered include: Another View on Computer Architecture; The Key to Innovation; Number and Organization of Primary Memory Objects in the Brain; Flight Performance of Planetary Atmospheric Flight Airship (PLAS); Advances in Symbolic Simulation of Systems; Specifying Sequent Calculi Rules for Managing Some Redundancies in Proof Search; Accelerating Conjugate Gradient Solver: Temporal Versus Spatial Data; The Pattern-Oriented Decision-Making Approach; Development of User-Friendly Didactic Climate Models for Teaching and Learning Purposes; Knowledge Processing and Computer Architecture; Development of a Biomechanical Knowledge System to Identify Brain Injuries in Emergency Department; and Literature Review of Water Demand.

Derived from text

Architecture (Computers); Conjugate Gradient Method; Proving; Biodynamics; Climate Models; Education; Planetary Atmospheres

20080016575 IPSI Belgrade, Belgrade, Serbia

Number and Organization of Primary Memory Objects in the Brain

DeGennes, Pierre-Gilles; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. p. 4; In English; See also 20080016574; Copyright; Avail.: CASI: A01, Hardcopy

A memory area contains a large number (N approx.10(exp 6)) of neurons, each of which is connected with many neighbors (number of efferents: Z approx.10(exp 4). But the connections are poor: the probability for one connection to be efficient is p approx. 10(exp -2). This is important: different memory objects must be independent. We need to know how a definite memory object can be stored on a cluster of well connected neurons, and what is the statistics of these clusters. The average number M of neurons per cluster is contained within two limits: if M is too small, the memory is not faithful. If M is too large, the storage capacity is too small. Various consequences of this picture have to be researched.

Author

Memory (Computers); Images; Neurons; Probability Theory

20080016576 Massachusetts Inst. of Tech., Cambridge, MA, USA

Literature Review of Water Demand

Milutinovic, Milan; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 55-60; In English; See also 20080016574; Copyright; Avail.: CASI: A02, Hardcopy

The field of water demand analysis is becoming increasingly important, due to the problems that water utilities are faced with, when supplying the constantly increasing water quantities. This review paper starts with an introduction to water demand modeling and continues with the specification of the demand models and variables used. Also, effects of nonprice policies and technology changes are reviewed.

Author

Climate Change; Annual Variations; Water Consumption; Conservation

20080016577 Belgrade Univ., Serbia

Specifying Sequent Calculi Rules for Managing Some Redundancies in Proof Search

Tatjana, Lutovac A.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 15-20; In English; See also 20080016574; Copyright; Avail.: CASI: A02, Hardcopy

A central aspect of proof search is the identification and control over various forms of redundancies in the search space. We investigate systematic techniques for managing some redundancies in proof search in sequent calculi. This paper is a summary of some results of our investigation. In particular we have enriched inference rules with some additional information about status the search in order to preclude some redundant or useless choices which would otherwise be allowed in the

standard sequent system. We have developed a method for detection of redundant and eliminable formulae from a given sequent proof and an algorithm for ensuring termination i.e. for eliminating (infinite) loops during a backward sequent calculi proof search.
Author
Algorithms; Calculi; Inference; Proving; Mathematical Logic; Searching

20080016578 Ljubljana Univ., Ljubljana, Slovenia
Knowledge Processing and Computer Architecture
Omerovic, S.; Tomazic, S.; Milovanovic, M.; Torrents, D.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 39-46; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This position paper argues that the most suitable computer architecture for knowledge processing in bioinformatics is TM (transactional memory), ported into the DSM (distributed shared memory) environment, and expanded with elements of SMT (simultaneous multithreading. Current implementations of TM are in the SMP (shared memory multiprocessor) environment and without extensive support for SMT. In order to justify this position, the paper treats the field of decision making (DM) applied to knowledge processing for the need of bioinformatics. The basic idea is to have an automated reasoning mechanism Decision Making System (DMS) able to make a decision (related to the corresponding question), if the input data are in a text form (like it is the case in genomic processing). An illustration of Data modelling and Analysis layer, as a part of DMS and for the purpose of genomic processing, is given next, Bioinformatics experts mostly use BLAST software output in order to make decisions concerning genomic data. This DM process is mostly done manually, making it dependent on the expert knowledge and talent, in a way which is (for the most part) not automated and therefore not uniform and not eligible for global data exchange and comparing. We have proposed an approach that may lead to automatization of the DM process, based on the theory of concept processing (upgrade of Data Mining and Semantic Web). Analysing the typical processing needs in the set of genomic data (atomic access and high levels of parallelism), conclusion is that TM Systems (TMS) offer the processing capabilities demanded by both the Data Modelling and Analysis (layer 2) and Concept Processing (layer 3)' but first have to be ported from SMP to DSM and enhanced with SMT (to support the higher levels of parallelism), before they can be successfully applied in genomic processing and other areas of science where huge volume knowledge processing through DM is required.
Author
Multiprocessing (Computers); Architecture (Computers); Knowledge; Memory (Computers); Distributed Memory; Data Mining

20080016580 Belgrade Univ., Serbia
Advances in Symbolic Simulation of Systems
Tosic, Dejan V.; Lutovac, Miroslav D.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 9-14; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

A framework and recent advances in symbolic simulation of discrete-time and continuous-time systems are presented. The role and application of symbolic analysis in modern engineering are highlighted. A software realization of a symbolic system simulator is presented and exemplified. Real-life application examples are presented in which systems are symbolically solved and simulated with Mathematica. We introduce an original approach to algorithm development system design and symbolic processing that successfully overcomes some problems encountered in the traditional approach. Benefits of symbolic methods and the role of computer algebra systems are highlighted from the viewpoint of both academia and industry.
Author
Simulation; Systems Engineering; Algorithms; Computers; Algebra

20080016581 Belgrade Univ., Serbia
Accelerating Conjugate Gradient Solver: Temporal Versus Spatial Data
Korolija, Nenad G.; Veljko, Milutinovic; Milosevic, Srdjan; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 21-25; In English; See also 20080016574; Copyright; Avail.: CASI: A01, Hardcopy

Simulation of an object in the wind tunnel is a long lasting process, and therefore an ideal candidate for making code run in parallel. Simulation complexity is still to high for today's computers. With a growing number of processes computation time

is falling, but communication time is rising. Memory can also be the problem. Existing solutions are based on one process being the master, and, as so, communicating with all other processes. That causes both time consuming communication while other processes wait for the master process and memory problem while one process holds aN the data at one moment if no special technique is applied. In this paper, another approach is described. Using load balancing, all processes became equal during the computation phase. That means that each one the n processes tends to hold approximately 1/n of the data, and works without waiting for communication to finish. Numerical and computational analyses are done in order to show reader the major advantage of this approach. As a result, in a real case, the speedup when switching from 64 to 128 processors is almost two.
Author
Conjugate Gradient Method; Data Simulation; Numerical Analysis; Analysis (Mathematics); Computation; Data Processing

20080016582 Belgrade Univ., Serbia
The Pattern-Oriented Decision-Making Approach
Boris, Delibasic A.; Milija, Suknovic B.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 26-31; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This paper introduces a pattern-based approach when solving decision-making problems. We believe that integrated solutions of algorithms and methods in multiattribute decision-making (MADM) and data mining (DM) do not support the decision making process as they could in the process of finding an acceptable solution, or gaining knowledge. Most methods and algorithms in MADM and DM provide the decision maker an acceptable solution. On the other side the analysts have no freedom to adapt the methods or algorithms to the subtle details of the problem; so many new problems can't be handled well. We propose a solution of building pattern solutions for algorithms and methods of MADM and DM, where these patterns have passed experience validation and could be used well as building components in modular development environments. We believe this way that analysts could be able to generate their own algorithms and methods which could better adapt to new problems and generate better solutions. In this paper we present the four big patterns of decision-making and their common realizations. We present also the developed platform for modular MADM.
Author
Decision Making; Patterns; Data Mining; Algorithms

20080016583 Wayne State Univ., Detroit, MI, USA
Development of a Biomechanical Knowledge System to Identify Brain Injuries in Emergency Department
Kou, Zhifeng; Ziejewski, Mariusz; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 47-54; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Traumatic brain injury (TBI) has an annual incidence rate of over one million emergency department (ED) visits in the USA (U.S.). A patient subjected Po trauma-induced alternation of mental status could have an PBS that may, or may not, involve any loss of consciousness. In clinical practice, diagnosis of TBI is very difficult because the presence of a head injury may be masked by a serious injury to another body part subtle and changeable symptoms, or the delayed onset of symptoms. Many people with TBI do not receive medical care at the time of the injury and may complain to their physicians of their persistent symptoms for days, weeks, months, or even years after the injury. Currently, there is no reliable diagnostic tool to assist the ED physician when he, or she, sees a patient with TBI, especially mild traumatic brain injury (MTBI). Meanwhile, over forty years of injury mechanism study in the area of impact biomechanics proved to be effective in predicting brain injuries. To dale, there is no diagnostic tool using impact biomechanics to quantify the risk factors of motor vehicle crash (MVC) occupants for MTBI in EDs. To the best of our knowledge, no one has explored how to prepare and model the knowledge of impact biomechanics into an information system for EDs. Our overall hypothesis was that an MVC scenario in association with the injury mechanism are important risk factors for MTBI. As part of our study series, this paper reports the development of a Web-based application system using the knowledge of impact biomechanics, based on MTBI scenarios, in order to identify the patients, in EDs, at risk for MTBI and to stratify their risk levels. The system has been able to capture 94% of hypothetical MTBI patients at risk The system could potential!y assist the ED physicians in decision making for a proper referral pattern and clinical diagnosis of MTBI. The study also provides a novel approach to modeling the knowledge in impact biomechanics into a database, a shell for managing the knowledge rules, and a generic interface for editing the rules.

The system shell could be easily adapted to other knowledge based systems to provide domain expertise from other fields for biomedical applications.
Author
Biodynamics; Brain Damage; Emergencies; Knowledge Based Systems; Signs and Symptoms; Diagnosis; Hypotheses; Information Systems; Injuries

20080016584 Geneva Univ., Geneva, Switzerland
Development of User-Friendly Didactic Climate Models for Teaching and Learning Purposes
Goyette, Stephane; Platteaux, Herve; Jimenez, Francois; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 32-38; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This study reports on the development and application of two e-learning tools dedicated to climate science: these are Energy Balance Models, or EBMs. Such physically-based models form the ideal framework for studying fundamental energy processes at the basis of global climate and climate changes. The main assumption behind this development is that learning strategy would enhance the student's conceptual understanding from improved pedagogical technologies by allowing a greater interactivity and faster turn around, thus allowing a large number of experiments per unit time where all features are interfaced to appealing graphic displays. Consequently, these tools would contribute to learning efficiency. An analysis of the sort of reception such tools obtained in the student community in terms of their structural design, ergonomy and overall learning performances was carried out. The results show that their understanding of basic climate concepts may improve due to the interactivity and the graphic interfaces, allowing a visual display of the basic climate processes driving the energy balance of the Earth.
Author
Education; Climate Models; Display Devices; Energy Budgets; Graphs (Charts); Students

20080016585 IPSI Belgrade, Belgrade, Serbia
Another View on Computer Architecture
Wilson, Kenneth G.; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. p. 3; In English; See also 20080016574; Copyright; Avail.: CASI: A01, Hardcopy

The coming of the computer has created a revolution as profound as the change from the Middle Ages to the Renaissance. Many of the changes that took place around the time of the Renaissance - the invention of printing, the development of systematic experimental science, the invention of oil painting - have analogs today, made possible by the computer. We are moving from printed media communication, with time delays of a year or more for professional publications, to instantaneous communication via computer networks. Computers are revolutionizing the capability of scientific instruments. Supercomputers are enabling man to 'see' phenomena not even accessible to experiment - from tomorrow's weather, to the complete billion-year history of a star, to the deep interior of the earth. The ability of computers to sort information is giving mankind unprecedented capability to find needles in our rapidly growing haystack of knowledge. In the past forty years, the power of computers has advanced by a factor of a million or so. Nevertheless, the computer revolution has only just begun. The technological opportunities for further advances seem almost limitless. Since the bit carries no weight or other mechanical burdens, one can expect the volume assigned to a single bit in processors, communications, and memory, to continue to shrink dramatically, vastly increasing the number of bits that can be handled at a time. The needs for computing power are likely to keep pace with any technological advances that come along, due to the many problems of exponential or close to exponential complexity that computers must deal with -from economic forecasting to probing the secrets of molecules. Unfortunately, there is one constraint from the discipline of physics which is limiting and shaping computer architectures of today and into the future. There is a maximum speed with which bits can travel, namely the speed of light, and today's computer designs already suffer from this limitation - forcing supercomputers to become smaller and smaller as their speed increases. The speed of light limitation is forcing architects to achieve new levels of processing capabilities mostly through parallelism rather than speed. As silicon chips (or whatever replaces silicon in future) become three-dimensional and the bit continues to shrink, the number of bits that can be processed in parallel could increase in spectacular fashion - is Avogodro's number (the number of atoms in a few grams, or 10(exp 23)) out of reach? Clearly the challenge to computer architects is to harness the capabilities of bits processed in parallel for the benefits of man- and womankind. Finally, I remind all readers already deep into the jargon of silicon circuits that the brain puts all silicon circuits that the brain puts all silicon to shame. The brain has cycle times of milliseconds, and a size smaller than even a desktop computer, yet it recognizes patterns, analyzes speech, and stores and sorts

through databases, all at rates that are untouchable even by supercomputers. Its programming system is natural and user-friendly. Only its fault-tolerance does not meet engineering standards.
Author
Architecture (Computers); Computer Networks; Fault Tolerance; Forecasting; Data Bases; Economics; Computer Design; Chips; Circuits

20080016586 IPSI Belgrade, Belgrade, Serbia
The Key to Innovation
Friedman, Jerome; The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. p. 4; In English; See also 20080016574; Copyright; Avail.: CASI: A01, Hardcopy

The development of Homo Sapiens has been a history of innovations, from the earliest crude tools to the modern technological society of today. The growth of science and technology has been exponential during the last century; and under the right circumstances, this rapid growth can be expected to continue. The major innovations of the future - those that will shape the society of the future - will require a strong foundation of both basic and applied research. It is ironic that quantum mechanics, one of most abstruse conceptual frameworks in physics - one that was developed to explain atomic spectra and the structure of the atom, lies at the foundation of some of our most important technological developments, because it provided the understanding of semiconductors that was essential for the invention of the transistor. Quantum mechanics thus contributed directly to the development of technologies that gave us world wide communication, computers with their applications to ali phases of modern life, lasers with many diverse uses, consumers electronics, atomic clocks, and superconductors - just to mention a few. The internet and the world wide web, which are profoundly reshaping the way we communicate, learn, and engage in commerce, owe their origins in a deep sense to the physicists of the past who worked to understand the atom. In modern industrial nations, quantum mechanics probably lies at the basis of a sizable fraction of the gross national product. This is but one example, and there are many others in all areas of science that demonstrate this point. It is clear that innovation is the key to the future and the human drive to understand nature is the key to future innovation. Society must do all that it can to preserve, nurture and encourage curiosity and the drive to understand.
Author
Research and Development; Computers; World Wide Web; Internets; Laser Applications; Quantum Mechanics; Semiconductors (Materials); Superconductors (Materials); Atomic Spectra

20080016587 Belgrade Univ., Serbia
The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1
Milutinovic, Veljko, Editor; Hojjat, Adeli, Editor; Blaisten-Barojas, Estela, Editor; Crisp, Bob, Editor; Domenici, Andrea, Editor; Flynn, Michael, Editor; Fujii, Hironori, Editor; Ganascia, Jean-Luc, Editor; Gonzalez, Victor, Editor; Janicic, Predrag, Editor; January 2007; ISSN 1820-4503; 64 pp.; In English; See also 20080016588 - 20080016599; Original contains black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

Topics covered include: Another View of Neural Networks; TV is dead - Long Live the WEB; Challenges of Distance Learning; Forgotten ideas in Computer Architecture: It's Time to bring them Back!; On Reducing Overheads in CMP TLS Integrated Protocols; A Technique for Round-Trip Engineering of Behavioral UML Model Elements; Support for Knowledge Tests: Brief Summary of Regulations and Software; Efficient Development and Maintenance of Enterprise Information Systems in Multicultural Developer Environment; Challenges in Geovisualization; Network Systems Intrusion: Concept, Detection, Decision, and Prevention; Investigating Software Dependability Mechanisms for Robotic Applications; and A Contribution to Development of Methods for E-business and E-commerce.
Derived from text
Applications Programs (Computers); Information Systems; Television Systems; Robotics; Protocol (Computers); Internets; Electronic Commerce

20080016588 Belgrade Univ., Serbia
Efficient Development and Maintenance of Enterprise Information Systems in Multicultural Developer Environment
Milovanovic, M. Milos; Milutinovic, M. Veljko; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 30-34; In English; See also 20080016587; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Development of enterprise systems has the following chasacteristics: deadlines are always too short, there is no final

specification, requirements change in the development phase and nobody knows the whole business process exactly (at least those who know the business process don't know how to specify software which would support that process). On the other side, developers in big international corporations come from different countries; have different education and culture background, as well as their way of software development. In such environment it is extremely important that each part of the system is very flexible, generic and parameterized so runtime changes can be handled instantly. This paper gives a view on serious problems in the development process and the methodology for effective problem solving. There are several frameworks that help developers in building the enterprise systems, but if a developer is not aware of these problems, framework cannot prevent him or her from making the similar mistakes. Methodology presented in this paper is completely independent from the technology.
Author
Computer Programming; Information Systems; Software Engineering; Real Time Operation; Organizations; Education; Problem Solving

20080016589 Belgrade Univ., Serbia
Support for Knowledge Tests: Brief Summary of Regulations and Software
Bosnjakokvic, M. Andrija; Tartalja, I. Igor; Protic, Z. Jelica; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 25-29; In English; See also 20080016587; Copyright; Avail.: CASI: A01, Hardcopy

The intention of this paper is to brief the reader with overall status of the support for knowledge tests in contemporary software. Need and multiplicity of ways to ask a question and to administer a knowledge test have lead to development of numerous systems with different output formats, thus pushing the need for standardization to front. In order to classify relevant terms, two main criteria are taken into account - whether a term refers to a regulation or to a software product and term's generality. Additional criterion is applied to classify products: free of charge (even open source) or commercial. Examples are given for all of the classes constructed using these criteria. Also provided are lists of further readings and brief comparison of relevant features in most products prominent software tools, based on the proposed question-type taxonomy.
Author
Computer Programs; Regulations; Standardization; Knowledge; Tests; Criteria

20080016590 Brest Univ., Brest, France
Investigating Software Dependability Mechanisms for Robotic Applications
Laurent, T. Nana; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 50-55; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

This paper relates our case study of the application of software dependability to the design and implementation of robotics languages and architectures. The failure of a robot or that of its control system may lead to important damage to the environment in which it evolves or on human life. On the other hand, the amount of software used in robotics systems is increasing radically. For these reasons, solutions for software safety are needed in order to meet the dependability requirement inherent to such systems. In this Paper, We show that in robotic systems, formal specification and verification methods are only used in a few cases and fault tolerance mechanisms as well as software testing techniques are exploited little. We have experienced static and dynamic testing as well as specification and verification with Petri nets in the context of the robotic language PILOT f (Programming and Interpreted Language Of actions for Telerobotics) and its control system software. Among the benefits of the application of those approaches to the control system software, we can quote: defection and elimination of faults, fault tolerance capabilities, algorithms simplification, operator assistance in the design of plans, security of modification in the course of mission execution.
Author
Fault Tolerance; Software Engineering; Telerobotics; Robotics; Dynamic Tests; Applications Programs (Computers); Static Tests; Petri Nets

20080016591 Cornell Univ., New York, NY, USA

Challenges of Distance Learning

Richardson, Bob; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 4-4; In English; See also 20080016587; Copyright; Avail.: CASI: A01, Hardcopy

There is no longer question that the internet and electronic communication are the major new tools far collaborative advances in the creation of new knowledge and in future learning. There are countless examples of highly successful professional courses taught of the Internet. Similarly, international and multidisciplinary collaborations in scientific research based upon little contact other than through electronic communication dominate the scientific literature. Perhaps the most profound examples of distance collaboration in science are found in astronomy. The Hubble telescope has permitted astronomers to gather breathtaking images from the most remote observatory imaginable - one in orbit around the earth. A significant challenge remains. The challenge is to devise a remote mode for nonverbal communication about difficult concepts. In the shared creation of new idea and knowledge, facial expressions and body gestures frequently play an important role in peer interactions. As the speed arid bandwidth of electronic communication increase, we have the prospect that the important elements af human contact can be imitated, without the development of sympathetic peer or mentor relationships, distance learning will remain quite sterile.

Author

Internets; Multidisciplinary Research; Bandwidth; Education

20080016592 Sussex Univ., Brighton, UK

TV is dead - Long Live the WEB

Harold, Kroto; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 4-4; In English; See also 20080016587; Copyright; Avail.: CASI: A01, Hardcopy

Science, Engineering and Technology are as vital to our intellectual and cultural development (particularly our children's) as they are to our training to get along in the Modern World. Some efforts to redress the problems involved in the general Public awareness and understanding of science and Engineering (PAUSE) issues are being initiated via the Vega Science Trust (www.vega.org.uk), which aims to take advantage of the revolution in TV and internet communications technology to improve matters. The best scientists and science communicators are being recorded and the programmes are being broadcast on BBC-TV and the Internet. Furthermore School/University outreach programmes are being developed and Vega is piloting ways in which members of the Science, Engineering and Technology (SET) community can, as individuals and groups, make important contributions. Excerpts from SET programmes will be presented. These efforts present a perspective on SET which places the cultural factors in the foreground and focuses on the intrinsic charisma of science which is hidden from many. It is now crucial that the society in general and the scientific community in particular accept that serious problems are involved in communicating science and the lnternet as set to play a major role. Before the invention of the printing press there was only one book in the west - the bible - and it was hand-written by monks. After the invention the printing press book -writing and reading was democratized and this was truly the beginning of general education. In a similar way the birth of the lnternet has democratized broadcasting - the broadcasting channels no longer control the dissemination of recorded material - individuals and groups of individuals can now do it themselves and so the lnternet has enabled broadcasting to fulfill the promise it has always had - to be a superb educational medium.

Author

Communicating; Education; Internets; World Wide Web; Schools

20080016593 T-Mobile Deutschland G.m.b.H., Germany

On Reducing Overheads in CMP TLS Integrated Protocols

Radulovic, Milan B.; Tomasevic, Milo V.; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 11-16; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

The paper primarily tries to identify the main obstacles for performance and complexity improvements in CMPs (speculative chip multiprocessors) with TLS (thread level speculation). It is focused on an analysis of the integrated speculation and coherence protocols in the state-of-the-art CMPs and identifies four areas where the improvements are promising: hardware overhead, software overhead, bursty traffic, and replacement policy. After an overview of each aspect,

some ideas for reducing the identified overheads are outlined. Finally, the paper concludes with a very brief sketch of an innovative proposal which employs the lessons learned the previous analysis.
Author
Chips; Protocol (Computers); Multiprocessing (Computers)

20080016594 Brown Univ., Providence, RI, USA
Another View of Neural Networks
Cooper, Leon; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 3-3; In English; See also 20080016587; Copyright; Avail.: CASI: A01, Hardcopy

When interest in neural networks revived some fifteen years ago, few people believed that such systems would ever be of any use. Computers worked too well; it was felt that they could be programmed to perform any desired task. Clearly, fashion has changed. Now, limitations of current computers in solving many problems involving difficult to define rules or complex pattern recognition are widely recognized; if anything, expectations for neural networks may be too high. The problem is no longer to convince anyone that neural networks might be useful, but rather to actually incorporate such networks into systems that solve real-world problems economically. Neural networks are inspired by biological systems where large numbers of neurons, that individually function rather slowly and imperfectly, collectively perform tasks that even the largest computers have not been able to match. They are made of many relatively simple processors connected to one another by variable memory elements whose weights are adjusted by experience. They differ from the now standard Von Neumann computer in that they characteristically process information in a manner that is highly parallel rather than serial, and that they learn (memory element weights and thresholds are adjusted by experience) so that to a certain extent that can be said to program themselves. They differ from the usual artificial intelligence systems in that (since neural networks learn) the solution of real-world problems requires much less of the expensive and elaborate programming and knowledge engineering required for such artificial intelligence products as rule-based expert systems. In their current state, neural networks are probably best at problems related to pattern recognition. Some existing neural network systems can efficiently and rapidly learn to separate enormously complex decision spaces. The problem of coordinating many neural networks, each a specialist in dividing some portion of the decision space, has also been solved. It is in these areas, therefore, that the first commercial uses will appear. Products that recognize characters, assembly line parts or signatures, that make complex decisions mimicking or improving on human experts (such as underwriters) that can diagnose engine or assembly line problems are in the prototype stage and/or are already fielded. One expects, further, that the pattern recognition ability coupled with, and feeding back and forth to rule-based systems (as has already been done in some simple applications) will finally result in machines that share our ability to learn and duplicate our processes of reasoning-machines that might be said to think. The question is not whether but when. Predicting the future, as we all know, is risky. Predicting the evolution of new technology is downright hazardous. Who in the 1930's would have said that among the consequences of the uncertainty principle would be transistors, silicon chips, and all of the vast array of solid state devices on which all modern computers depend? Or that superconductors would lead to extraordinarily sensitive detectors of magnetic fields now carried on many naval ships? Or in the late 19th century, that among the consequences of the research of Maxwell, Lorentz and Einstein, would be all that we call modern communication: radio, radar, etc.? Accepting that risk, I would predict that neural networks will become standard components of what we today call computers. This will likely occur in a somewhat evolutionary manner: they will encroach gradually-board by board, intelligent components, that can be trained by humans in a language humans understand, into dumb machines-somewhat like neo-cortex came to dominate the reptilean brain. And, just as the 20th century is the century of automobiles, airplanes, telephones and computers, the 21st will be the century of intelligent machines. We will not only learn to live with these machines but, indeed, will wonder, one day, how we ever liv without them.
Author
Neural Nets; Superconductors (Materials); Pattern Recognition; Solid State Devices; Computer Storage Devices; Memory (Computers); Predictions; Expert Systems

20080016595 Ljubljana Univ., Ljubljana, Slovenia
Network Systems Intrusion: Concept, Detection, Decision, and Prevention
Pleskonjic, Dragan; Omerovic, Sanida; Tomazic, Saso; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 40-49; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

This paper analyzes concepts for intrusion detection processes; building decision making (DM) criteria on the bases of intrusion detection, and prevention based on DM as a last level of protection in computer systems and networks. The second

part of the paper discusses a practical implementation for Intrusion Detection and Prevention Systems (IDPS), based on Wireless technology (WIDPS). Basically paper concentrates on the problems/answers of how to differentiate between legal and illegal access, i.e. intrusion and what are the key and root causes of this difference. Two issues are differenced: finding the set of concepts needed for detection and a set of criteria for DM in IDPS. Paper concludes with achieved results and future goals related to automated DM process in wireless technology.
Author
Warning Systems; Intrusion; Detection; Protection; Computer Networks

20080016596 Purdue Univ., West Lafayette, IN, USA
A Contribution to Development of Methods for E-business and E-commerce
Milutinovic, Dusan V.; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 56-62; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

This paper represents an annotated bibliography of interest for development on new internet-based strategies for efficient company management, effective customer-relationships, development, outsourcing, and negotiation infrastructure in mobile semantic web, with a special emphasis on transitional economies. Each bibliographical unit (a paper) to be presented belongs to the one of the following categories: TE (Transition economies) EB (Electronic business) MB (Mobile business) SW (Semantic web) IS (Internet strategies) CRM (Customer relationship management) OS (Outsourcing) NG (Negotiation) MM (Marketing methods) SC (Supply chain) and MG (Management). The approaches described in presented papers can serve as justification for the application of a novel approach introduced by this author: iterative gradual refinement based on the back tracking and feedback (IGRBTF). This paper concludes with the essence of the proposed approach, which is the subject of a follow-up paper.
Author
Internets; Electronic Commerce; Annotations; Economy; Marketing

20080016597 Massachusetts Inst. of Tech., Cambridge, MA, USA
Forgotten Ideas in Computer Architecture: It's Time to Bring them Back!
Dennis, Jack; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 5-10; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

Future computing systems will comprise multiple processors to achieve high performance. The issues surrounding the programming of such systems offer a major opportunity for innovative research in computer system architecture. The ideas of global virtual memory, functional programming, and data- cognizant control, which have long been ignored by mainstream computer architects, are relevant to addressing and solving the problems of formulating a satisfactory programming model for parallel computing, and developing computing systems that support such a model and the modular construction of software. The Fresh Breeze Project offers one approach to this goal.
Author
Architecture (Computers); Parallel Processing (Computers); Virtual Memory Systems; Computer Programming; Computer Systems Programs

20080016598 Belgrade Univ., Serbia
A Technique for Round-Trip Engineering of Behavioral UML Model Elements
Bojic, Dragan M.; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 18-24; In English; See also 20080016587; Copyright; Avail.: CASI: A02, Hardcopy

A set of specific requirements, both functional and non-functional, to support roundtrip engineering of behavioral UML model elements is derived by studying existing solutions of roundtrip engineering in object-oriented modeling. This paper elaborates a use case- and test-driven approach named URCA to satisfy stated requirements. Experimental results gained with a prototype that implements the core technique are also given, along with a discussion of some questions requiring further investigation.
Author
Object-Oriented Programming; Software Engineering; Computer Programming; Data Bases; Static Models; Software Development Tools

20080016599 Toronto Univ., Ontario, Canada

Challenges in Geovisualization

Ragia, Lemonia; Fiume, Eugene; The IPSI BgD Transactions on Internet Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. 35-39; In English; See also 20080016587; Copyright; Avail.: CASI: A01, Hardcopy

The increasing complexity and pervasiveness of geographical information in many walks of life is giving rise to some difficult challenges in the growing field of geovisualization. We take stock of these challenges and argue that mature technologies taken from areas such as databases and computer may offer partial resolution of these challenges.
Author

Geography; Information Systems; Computer Graphics; Data Bases; Data Systems

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.

20080015742 NASA Langley Research Center, Hampton, VA, USA

Towards a Credibility Assessment of Models and Simulations

Blattnig, Steve R.; Green, Lawrence L.; Luckring, James M.; Morrison, Joseph H.; Tripathi, Ram K.; Zang, Thomas A.; April 07, 2008; 16 pp.; In English; 10th AIAA Non-Deterministic Approaches Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015742

A scale is presented to evaluate the rigor of modeling and simulation (M&S) practices for the purpose of supporting a credibility assessment of the M&S results. The scale distinguishes required and achieved levels of rigor for a set of M&S elements that contribute to credibility including both technical and process measures. The work has its origins in an interest within NASA to include a Credibility Assessment Scale in development of a NASA standard for models and simulations.
Author

Computerized Simulation; Models; Validity; Measurement; Assessments; Aerospace Industry; Program Verification (Computers); Decision Making

20080015887 NASA Ames Research Center, Moffett Field, CA, USA

Program Model Checking: A Practitioner's Guide

Pressburger, Thomas T.; Mansouri-Samani, Masoud; Mehlitz, Peter C.; Pasareanu, Corina S.; Markosian, Lawrence Z.; Penix, John J.; Brat, Guillaume P.; Visser, Willem C.; March 2008; 146 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 939904.02.01
Report No.(s): NASA/TM-2008-214577; Copyright; Avail.: CASI: A07, Hardcopy

Program model checking is a verification technology that uses state-space exploration to evaluate large numbers of potential program executions. Program model checking provides improved coverage over testing by systematically evaluating all possible test inputs and all possible interleavings of threads in a multithreaded system. Model-checking algorithms use several classes of optimizations to reduce the time and memory requirements for analysis, as well as heuristics for meaningful analysis of partial areas of the state space Our goal in this guidebook is to assemble, distill, and demonstrate emerging best practices for applying program model checking. We offer it as a starting point and introduction for those who want to apply model checking to software verification and validation. The guidebook will not discuss any specific tool in great detail, but we provide references for specific tools.
Author

Program Verification (Computers); Proving; Handbooks; Algorithms; Procedures; Heuristic Methods; Computer Programs

20080015912 NASA Johnson Space Center, Houston, TX, USA

Distributed Avionics and Software Verification for the Constellation Program

Hood, Laura E.; Adams, James E.; April 07, 2008; 11 pp.; In English; 24th Aerospace Testing Seminar, 7-10 Apr. 2008, Manhattan Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015912

This viewgraph presentation reviews the planned verification of the avionics and software being developed for the

Constellation program.The Constellation Distributed System Integration Laboratory (DSIL) will consist of multiple System Integration Labs (SILs), Simulators, Emulators, Testbeds, and Control Centers interacting with each other over a broadband network to provide virtual test systems for multiple test scenarios.
CASI
Program Verification (Computers); Systems Integration; Astrionics; Distributed Processing

62
COMPUTER SYSTEMS

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

20080015865 NASA Goddard Space Flight Center, Greenbelt, MD, USA
PPS System Test Approach
Spero, James J.; June 20, 2007; 9 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

This viewgraph presentation reviews the systems testing approach for the Precipitation Processing System (PPS). PPS will be certified as operationally ready to support TRMM
CASI
Performance Tests; Computer Systems Performance; Software Reliability; Software Engineering; Program Verification (Computers)

20080015937 ISRO Satellite Centre, Peenya, Bangalore, India
Design and Implementation of Peripheral Component Interconnect and Direct Digital Synthesiser-Based Universal Encoder for Multiple Spacecraft Command
Narasimhan, N. Lakshmi; Geetha, S.; Srividhya, R.; Rao, B. S. Nagesh; Vasantha, E.; Seshaiah, R.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 23-29; In English; See also 20080015934; Copyright; Avail.: Other Sources

A command encoder is an important piece of equipment in ground stations for commanding spacecraft. In order to provide a common encoder to command multiple spacecraft simultaneously, a Peripheral Component Interconnect (PCI) add-on card encoder is designed and developed. The application software, equipped with multi-threading, communicates with four cards simultaneously, hosted on a single industrial computer under Linux environment. Direct Digital Synthesizer (DDS) based design is used to generate sub-carrier frequencies. Dedicated microcontroller design is used to allow real-time transmission without being interrupted by other processes running on the computer. This approach results in compact low-cost, lightweight, low power, user-friendly GUI, high speed encoder design. This paper describes the design process of the PCI, and DDS base Integrated Command Encoder (PCDICE). It also describes the test system and typical parametric evaluation results.
Author
Coders; Commands; Spacecraft Control; Ground Based Control; Computer Systems Design; Computer Components

20080015938 ISRO Satellite Centre, Peenya, Bangalore, India
Interoperable Three-Tier Database Model
Deepika, C. N.; Eswaraprakash, W. V.; Journal of Spacecraft Technology, Volume 17, No. 2; July 2007, pp. pp. 16-22; In English; See also 20080015934; Copyright; Avail.: Other Sources

Generalization of software systems is achieved mostly using configurable data elements, maintained outside. In the case of complex system, these configurable elements themselves are big and comp1ex. So, we require separate software for maintaining them. These elements are maintained in a flat file or in a database based on end-user requirement. Nowadays multiple-user, simultaneous support has become a basic requirement in a distributed system. Solutions based on a two-tier architecture exists. In this paper we wish to discuss the advantages of a simple three tier architecture, in generalization of software systems, with ‘multi-user telecommand directory sing client-server architecture’ software systems as a case study.
Author
Complex Systems; Software Engineering; Distributed Processing; Client Server Systems; Relational Data Bases; Data Base Management Systems; Computer Systems Design

65
STATISTICS AND PROBABILITY

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

20080015683 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Updating Probabilities
Grunwald, P. D.; Halpern, J. Y.; Sep. 30, 2002; 32 pp.; In English
Report No.(s): PB2007-100687; INS-R0207; Copyright; Avail.: National Technical Information Service (NTIS)

As examples such as the Monty Hall puzzle show, applying conditioning to update a probability distribution on a 'naive space', which does not take into account the protocol used, can often lead to counterintuitive results. Here we examine why. A criterion known as CAR ('coarsening at random') in the statistical literature characterizes when 'naive' conditioning in a naive space works. We show that the CAR condition holds rather infrequently, and we provide a procedural characterization of it, by giving a randomized algorithm that generates all and only distributions for which CAR holds. This substantially extends previous characterizations of CAR. We also consider more generalized notions of update such as Jeffrey conditioning and minimizing relative entropy (MRE). We give a generalization of the CAR condition that characterizes when Jeffrey conditioning leads to appropriate answers, and show that there exist some very simple settings in which MRE essentially never gives the right results. This generalizes and interconnects previous results obtained in the literature on CAR and MRE.
NTIS
Probability Distribution Functions; Probability Theory

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*.

20080015675 Pacific Northwest National Lab., Richland, WA, USA
FY2006 Miniature Spherical Retroreflectors Final Report
Anheier, N. C.; Bernacki, B. E.; Krishnaswami, K.; Dec. 2006; 31 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2007-901474; PNNL-16320; No Copyright; Avail.: National Technical Information Service (NTIS)

Research done by the Infrared Photonics team at Pacific Northwest National Laboratory (PNNL) is focused on developing miniature spherical retroreflectors using the unique optical and material properties of chalcogenide glass to reduce performance-limiting spherical aberrations. The optimized optical performance will provide efficient signal retroreflection that enables a broad range of remote detection scenarios for mid-wave infrared (MWIR) and long-wave infrared (LWIR) sensing applications. Miniature spherical retroreflectors can be developed to aid in the detection of signatures of nuclear proliferation or other chemical vapor or radiation signatures. Miniature spherical retroreflectors are not only well suited to traditional LIDAR methods for chemical plume detection and identification, but could enable remote detection of difficult semi-volatile chemical materials or low-level radiation sources. During FY 2006, PNNL's Infrared Photonics research team continued efforts developing miniature spherical retroreflectors based on chalcogenide glass. Optical ray trace modeling and stray light simulation analysis were used to refine the optical performance and to develop optimized optical designs. Baseline optical retroreflection measurements were performed on commercially available high-index ball lenses. The Flow Focusing micro-nozzle retroreflector fabrication approach, explored during FY 2005, was shelved in favor of a more cost-effective compression molding approach. PNNL developed specifications for a custom compression molding press, and then managed the design and fabrication by a commercial company.
NTIS
Miniaturization; Retroreflectors; Chalcogenides; Optical Properties; Aberration

20080015679 Stanford Linear Accelerator Center, Stanford, CA, USA
Trajectory Stability Modeling and Tolerances in the LCLS
Emma, P.; Wu, J.; January 2006; 3 pp.; In English
Report No.(s): DE2007-902722; SLAC-PUB-12491; No Copyright; Avail.: National Technical Information Service (NTIS)

To maintain stable performance of the Linac Coherent Light Source (LCLS) x-ray free-electron laser, one must control

the electron trajectory stability through the undulator to a small fraction of the beam size. BPM-based feedback loops running at 120 Hz will be effective in controlling jitter at low frequencies less than a few Hz. On the other hand, linac and injector stability tolerances must be chosen to limit jitter at higher frequencies. In this paper we study possible sources of high frequency jitter, including: (1) steering coil current regulation; (2) quadrupole magnet transverse vibrations; (3) quadrupole current regulation with transverse misalignments; (4) charge variations coupled to jitter through transverse wakefields of misaligned RF structures; and (5) bunch length variations coupled through coherent synchrotron radiation in the bunch compressor chicanes. Based on this study, we set component tolerances and estimate expected trajectory stability in the LCLS.
NTIS
Light Sources; Stability; Trajectories

20080015680 Fermi National Accelerator Lab., Batavia, IL, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Los Alamos National Lab., NM USA; Brookhaven National Lab., Upton, NY USA
Recent Progress on the Marylie/Impact Beam Dynamics Code
Dragt, A. J.; Adelmann, A.; Abell, D.; Amundson, J.; Spentzouris, P.; January 2006; 3 pp.; In English
Report No.(s): DE2007-902811; No Copyright; Avail.: National Technical Information Service (NTIS)

MARYLIE/IMPACT (ML/I) is a hybrid code that combines the beam optics capabilities of MARYLIE with the parallel Particle-In-Cell capabilities of IMPACT. In addition to combining the capabilities of these codes, ML/I has a number of powerful features, including a choice of Poisson solvers, a fifth-order rf cavity model, multiple reference particles for rf cavities, a library of soft-edge magnet models, representation of magnet systems in terms of coil stacks with possibly overlapping fields, and wakefield effects. The code allows for map production, map analysis, particle tracking, and 3D envelope tracking, all within a single, coherent user environment. ML/I has a front end that can read both MARYLIE input and MAD lattice descriptions. The code can model beams with or without acceleration, and with or without space charge. Developed under a US DOE Scientific Discovery through Advanced Computing (SciDAC) project, ML/I is well suited to large-scale modeling, simulations having been performed with up to 100M macroparticles. The code inherits the powerful fitting and optimizing capabilities of MARYLIE augmented for the new features of ML/I. The combination of soft-edge magnet models, high-order capability, space charge effects, and fitting/optimization capabilities, make ML/I a powerful code for a wide range of beam optics design problems.
NTIS
Beam Interactions; Design Analysis; Cavities; Space Charge

20080015681 Lawrence Livermore National Lab., Livermore, CA USA
Critical Parameters Influencing the EUV-Induced Damage of Ru-Capped Multilayer Mirrors
Hill, S. B.; Ermanoski, I.; Tarrio, C.; Lucatorto, T. B.; Madey, T. E.; Mar. 13, 2007; 14 pp.; In English
Report No.(s): DE2007-902623; UCRL-CONF-229030; No Copyright; Avail.: Department of Energy Information Bridge

Ongoing endurance testing of Ru-capped multilayer mirrors (MLMs) at the NIST synchrotron facility has revealed that the damage resulting from EUV irradiation does not always depend on the exposure conditions in an intuitive way. Previous exposures of Ru-capped MLMs to EUV radiation in the presence of water vapor demonstrated that the mirror damage rate actually decreases with increasing water pressure. We will present results of recent exposures showing that the reduction in damage for partial pressures of water up to 5x10-6 Torr is not the result of a spatially uniform decrease in damage across the Gaussian intensity distribution of the incident EUV beam. Instead we observe a drop in the damage rate in the center of the exposure spot where the intensity is greatest, while the reflectivity loss in the wings of the intensity distribution appears to be independent of water partial pressure. We will discuss how the overall damage rate and spatial profile can be influenced by admixtures of carbon-containing species (e.g., CO, CO2, C6H6) at partial pressures one-to-two orders of magnitude lower than the water vapor partial pressure. An investigation is underway to find the cause of the non-Gaussian damage profile. Preliminary results and hypotheses will be discussed.
NTIS
Damage; Extreme Ultraviolet Radiation; Lithography; Mirrors

20080015685 Lawrence Livermore National Lab., Livermore, CA USA
Probing the Quark-Gluon Plasma at the LHC with Z0 Tagged Jets in CMS
Mironov, C.; Castro, M.; Constantin, P.; Kunde, G. J.; Vogt, R.; Mar. 13, 2007; 9 pp.; In English
Report No.(s): DE2007-902621; UCRL-PROC-228997; No Copyright; Avail.: Department of Energy Information Bridge

An important tool in quark-gluon plasma studies at RHIC has been the measurement of dijets investigated via leading

hadron correlations. With much higher rates for hard processes at the Large Hadron Collider, studies of Z0-tagged jets become possible. A clear experimental signature is provided by the measurement of muon pairs from the Z0 decays, for which CMS is an ideally suited detector. Instead of measuring back-to-back correlations of two strongly interacting particles, one side is replaced by an electromagnetic probe which propagates through the plasma undisturbed and provides a measurement of the energy of the initial hard scattering. We propose to use lepton-pair tagged jets to study medium-induced partonic energy loss and to measure in-medium parton fragmentation functions. The lepton pairs from semileptonic decays of heavy meson pairs (BB and DD) are a background source for the tagged dilepton-jet signal. We present the calculated signal rates (using PYTHIA) and background rates (using HVQMNR). We also discuss strategies for maximizing the signal-to-background ratio.
NTIS
Gluons; Plasmas (Physics); Quarks

20080015687 Lawrence Livermore National Lab., Livermore, CA USA
Accelerated Collaboration Meets with Beaming Success
Hazi, A. U.; Feb. 16, 2007; 5 pp.; In English
Report No.(s): DE2007-902622; UCRL-TR-228147; No Copyright; Avail.: Department of Energy Information Bridge

Maintaining a smaller, aging U.S. nuclear weapons stockpile without underground nuclear testing requires the capability to verify and validate the complex computer calculations on which stockpile confidence is based. This capability, in turn, requires nonnuclear hydrodynamic tests (hydrotests) that can x-ray stages of the implosion process, providing freeze-frame photos of materials imploding at speeds of more than 16,000 kilometers per hour. The images will yield important information on shapes and densities of metals and other materials under the extreme pressures and temperatures generated by the detonation of high explosives.
NTIS
Bunching; Nuclear Weapons; Particle Accelerators

20080015694 Lawrence Livermore National Lab., Livermore, CA USA
New Results on Fission Cross Sections in Actinide Nuclei using the Surrogate Ratio Method and on Conversion Coefficients in Triaxial Strongly Deformed Bands in 167Lu from ICE Ball and Gammasphere
Beausang, C. W.; Lesher, S. R.; Burke, J. T.; Bernstein, L. A.; Phair, L.; Feb. 05, 2007; 17 pp.; In English
Report No.(s): DE2007-902611; UCRL-PROC-227750; No Copyright; Avail.: Department of Energy Information Bridge

The surrogate ratio technique is described. New results for neutron induced fission cross sections on actinide nuclei, obtained using this technique are presented. The results benchmark the surrogate ratio technique and indicate that the method is accurate to within 5% over a wide energy range. New results for internal conversion coefficients in triaxial strongly deformed bands in 167Lu are also presented.
NTIS
Actinide Series; Deformation; Fission; Ice

20080015701 Stanford Linear Accelerator Center, Stanford, CA, USA
HOM/LOM Coupler Study for the ILC Crab Cavity
Xiao, L.; Li, Z.; Ko, K.; Apr. 2007; 5 pp.; In English
Report No.(s): DE2007-902484; SLAC-PUB-12409; No Copyright; Avail.: National Technical Information Service (NTIS)

The FNAL 9-cell 3.9GHz deflecting mode cavity designed for the CKM experiment was chosen as the baseline design for the ILC BDS crab cavity. The full 9- cell CKM cavity including the coupler end-groups was simulated using the parallel eigensolver Omega3P and scattering parameter solver S3P. It was found that both the notch filters for the HOM/LOM couplers are very sensitive to the notch gap, which is about 1.6MHz/micron and is more than 10 times more sensitive than the TTF cavity. It was also found in the simulation that the unwanted vertical pion-mode (SOM) is strongly coupled to the horizontal pion/9 mode which causes x-y coupling and reduces the effectiveness of the SOM damping. To meet the ILC requirements, the HOM/LOM couplers are redesigned to address these issues. With the new designs, the damping of the HOM/LOM modes is improved. The sensitivity of the notch filter for the HOM coupler is reduced by one order of magnitude. The notch filter for the LOM coupler is eliminated in the new design which significantly simplifies the geometry. In this paper, we will present the simulation results of the original CKM cavity and the progresses on the HOM/LOM coupler re-design and optimization.
NTIS
Cavities; Couplers; Crab Nebula

20080015702 Stanford Linear Accelerator Center, Stanford, CA, USA
Mitigation of Emittance Dilution due to Transverse Mode Coupling in the L-Band Linacs of the ILC
Jones, R. M.; Miller, R. H.; Apr. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902486; SLAC-PUB-12469; No Copyright; Avail.: National Technical Information Service (NTIS)

The main L-band linacs of the ILC accelerate 2820 bunches from a center of mass of 10 GeV to 500 GeV (and in the proposed later upgrade, to 1 TeV). The emittance of the vertical plane is approximately 400 times less than that of the horizontal plane. Provided the vertical and horizontal mode dipole frequencies are degenerate then the motion in each plane is not coupled. However, in reality the frequency degeneracy is split and the eigenmodes are shifted due to inevitable manufacturing errors introduced in fabricating 20,000 cavities. This gives rise to a transverse coupling in the horizontal-vertical motion and can readily lead to a dilution in the emittance in the vertical plane. We investigate means to ameliorate this effect dilution by splitting the horizontal-vertical tune of the lattice.

NTIS
Coupled Modes; Dilution; Emittance; Linear Accelerators; Ultrahigh Frequencies

20080015704 Central Lab. of the Research Councils, Warrington, UK; Oxford Univ., Oxford, UK
Design of the ILC Prototype FONT4 Digital Intra Train Beam Based Feedback System
Burrows, P. N.; Christian, G.; Clarke, C.; Khan, H. D.; Hartin, T.; Apr. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902487; SLAC-PUB-12470; No Copyright; Avail.: Department of Energy Information Bridge

We present the design of the FONT4 digital intra-train beam position feedback system prototype and preliminary results of initial beam tests at the Accelerator Test Facility (ATF) at KEK. The feedback system incorporates a fast analogue beam position monitor (BPM) front-end signal processor, a digital feedback board, and a kicker driver amplifier. The short bunchtrain, comprising 3 electron bunches separated by c. 150ns, in the ATF extraction line was used to test components of the prototype feedback system.

NTIS
Beams (Radiation); Feedback; Prototypes

20080015705 Central Lab. of the Research Councils, Warrington, UK; Oxford Univ., Oxford, UK; Stanford Linear Accelerator Center, Stanford, CA, USA
Performance of the FONT3 Fast Analogue Intra-Train Beam-Based Feedback System at ATF
Burrows, P. N.; Christian, G.; Clarke, C.; Khah, H. D.; Hartin, T.; Apr. 2007; 3 pp.; In English
Report No.(s): DE2007-902488; SLAC-PUB-12471; No Copyright; Avail.: National Technical Information Service (NTIS)

We report results of beam tests of the FONT3 intra-train position feedback system prototype at the Accelerator Test Facility (ATF) at KEK. The feedback system incorporates a novel beam position monitor (BPM) processor with latency below 5 nanoseconds, and a kicker driver amplifier with similar low latency. The 56 nanosecond-long bunchtrain in the ATF extraction line was used to test the prototype feedback system. The achieved latency of 23ns provides a demonstration of intra-train feedback on very short timescales relevant even for the CLIC Linear Collider design.

NTIS
Analogs; Beams (Radiation); Feedback

20080015706 Hamburg Univ., Germany; Deutsches Elektronen-Synchrotron, Hamburg, Germany; Stanford Linear Accelerator Center, Stanford, CA, USA
Comparative Study of Bunch Length and Arrival Time Measurements at Flash
Azima, A.; Dusterer, S.; Huning, M.; Knabbe, E. A.; Roehrs, M.; Apr. 2007; 3 pp.; In English
Report No.(s): DE2007-902489; SLAC-PUB-12472; No Copyright; Avail.: National Technical Information Service (NTIS)

Diagnostic devices to precisely measure the longitudinal electron beam profile and the bunch arrival time require elaborate new instrumentation techniques. At FLASH, two entirely different methods are used. The bunch profile can be determined with high precision by a transverse deflecting RF structure, but the method is disruptive and does not allow to monitor multiple bunches in a macro-pulse train. It is therefore complemented by two non-disruptive electrooptical devices, called EO and TEO. The EO setup uses a dedicated diagnostic laser synchronized to the machine RF. The longitudinal electron beam profile is encoded in the intensity profile of a chirped laser pulse and analyzed by looking at the spectral composition of the pulse. The second setup, TEO, utilizes the TiSa-based laser system used for pump-probe experiments. Here, the

temporal electron shape is encoded into the spatial dimension of the laser pulse by an intersection angle between the laser and the electron beam at the EO-crystal. In this paper, we present a comparative study of bunch length and arrival time measurements performed simultaneously with all three experimental techniques.
NTIS
Bunching; Length; Time Measurement

20080015707 Central Lab. of the Research Councils, Warrington, UK; Stanford Linear Accelerator Center, Stanford, CA, USA
Study of Emittance Measurement at the ILC
Kalinin, D. A.; Jenner, L.; Ross, M.; Seryi, A.; Woodley, M.; Apr. 2007; 3 pp.; In English
Report No.(s): DE2007-902490; SLAC-PUB-12473; No Copyright; Avail.: Department of Energy Information Bridge
The measurement of the International Linear Collider (ILC) emittance in the ILC beam delivery system (BDS) is simulated. Estimates of statistical and machine-related errors are discussed and the implications for related diagnostics R&D are inferred. A simulation of the extraction of the laser-wire Compton signal is also presented.
NTIS
Emittance; Accelerators

20080015708 Stanford Linear Accelerator Center, Stanford, CA, USA
Precision Measurement of the Undulator K Parameter Using Spontaneous Radiation
Welch, J.; Arthur, J.; Emma, P.; Hastins, J.; Huang, Z.; Apr. 2007; 4 pp.; In English
Report No.(s): DE2007-902491; SLAC-PUB-12450; No Copyright; Avail.: National Technical Information Service (NTIS)
Several methods have been proposed to measure in situ undulator K differences by alternately comparing spontaneous radiation spectra from two undulator segments. We are looking into the possibilities of using the combined radiation spectrum produced by two nearby segments. The first harmonic peak of the on-axis spontaneous radiation energy spectrum from a single undulator has a bandwidth equal to the inverse of the number of periods. The combined radiation from two such undulators has a bandwidth that is narrower by a factor of two.
NTIS
Precision; Wiggler Magnets; Energy Spectra

20080015709 Argonne National Lab., IL, USA; Stanford Linear Accelerator Center, Stanford, CA, USA
Linac Coherent Light Source Undulator RF BPM System
Lill, R.; Waldschmidt, G.; Walters, D.; Morrison, L.; Smith, S.; Apr. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902492; SLAC-PUB-12452; No Copyright; Avail.: Department of Energy Information Bridge
The Linac Coherent Light Source (LCLS) will be the world's first x-ray free-electron laser (FEL) when it becomes operational in 2009. The LCLS is currently in the construction phase. The beam position monitor (BPM) system planned for the LCLS undulator will incorporate a high-resolution X-band cavity BPM system described in this paper. The BPM system will provide high-resolution measurements of the electron beam trajectory on a pulseto- pulse basis and over many shots. The X-band cavity BPM size, simple fabrication, and high resolution make it an ideal choice for LCLS beam position detection. We will discuss the system specifications, design, and prototype test results.
NTIS
Coherent Light; Light Sources; Linear Accelerators; Radio Frequencies; Wiggler Magnets

20080015710 Argonne National Lab., IL, USA; Stanford Linear Accelerator Center, Stanford, CA, USA
Initial Search for 9-keV XTR from a 28-GeV Beam at SPPS
Lumpkin, A. H.; Hastings, J. B.; Rule, D. W.; Apr. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902493; SLAC-PUB-12451; No Copyright; Avail.: National Technical Information Service (NTIS)
The potential to use x-ray transition radiation (XTR) as a beam diagnostic and coherent XTR (CXTR) as a gain diagnostic in an x-ray FEL was proposed previously. At that time we noted that the unique configuration of the SLAC Sub-picosecond Photon Source (SPPS) with its known x-ray wiggler source, a special three-element x-ray monochromator, x-ray transport line, and experimental end station with x-ray detectors made it an ideal location for an XTR feasibility experiment. Estimates of

the XTR compared to the SPPS source strength were done, and initial experiments were performed in September 2005. Complementary measurements on optical transition radiation (OTR) far-field images from a 7-GeV beam are also discussed.
NTIS
X Ray Sources; Accelerators; X Ray Detectors; Optical Transition; Electromagnetic Radiation

20080015711 Paris Univ., Orsay, France; Stanford Linear Accelerator Center, Stanford, CA, USA
2 Beta + Gamma from B(0) to + or - K(0) pi + or - Decays at BaBar: A Simulation Study
Polci, F.; Schune, M. H.; Stocchi, A.; Apr. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902494; SLAC-PUB-12428; No Copyright; Avail.: National Technical Information Service (NTIS)
The ambition of the analysis technique is to be completely model independent, in the sense that at high statistics it will not rely on any theoretical assumption: all quantities will be directly extracted from the fit on data. A sensitivity study of the channel can be found in this document. Here, following the same approach, we complete it with simulations making use of realistic background distributions, resolution and tagging performances taken from the BaBar Run1-4 data sample.
NTIS
Beta Particles; High Energy Interactions; Radioactive Decay

20080015723 Stanford Linear Accelerator Center, Stanford, CA, USA
New Spectroscopy at BaBar
Mazzoni, M. A.; Jan. 2005; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902498; No Copyright; Avail.: National Technical Information Service (NTIS)
The Babar experiment at the SLAC B factory has accumulated a high luminosity that offers the possiblity of systematic studies of quarkonium spectroscopy and of investigating rare new phenomena. Recent results in this field are presented.
NTIS
Spectroscopy; Industrial Plants; Accumulations

20080015724 Technische Univ., Dresden, Germany; Stanford Linear Accelerator Center, Stanford, CA, USA
Initial State Radiation Studies at BaBar
Petzold, A.; Apr. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-902499; SLAC-PUB-12449; No Copyright; Avail.: Department of Energy Information Bridge
As theoretical predictions of (g-2) of the muon and the running QED coupling constant depend on the precise knowledge of the production of hadronic final states at energies below 10 GeV, the interest in new measurements in this energy range has recently increased. Currently the predictions of the hadronic contributions to these two quantities are taken from direct e(sup+)e(sup-) measurements at low energies.
NTIS
Quantum Electrodynamics; Radiation

20080015725 California State Univ., Los Angeles, CA, USA; Stanford Linear Accelerator Center, Stanford, CA, USA
Transverse Coherence Properties of the LCLS X-Ray Beam
Reiche, S.; Apr. 2007; 4 pp.; In English
Report No.(s): DE2007-902501; SLAC-PUB-12456; No Copyright; Avail.: Department of Energy Information Bridge
Self-amplifying spontaneous radiation free-electron lasers, such as the LCLS or the European X-FEL, rely on the incoherent, spontaneous radiation as the seed for the amplifying process. Though this method overcomes the need for an external seed source one drawback is the incoherence of the effective seed signal. The FEL process allows for a natural growth of the coherence because the radiation phase information is spread out within the bunch due to slippage and diffraction of the radiation field. However, at short wavelengths this spreading is not sufficient to achieve complete coherence. In this presentation we report on the results of numerical simulations of the LCLS X-ray FEL. From the obtained radiation field distribution the coherence properties are extracted to help to characterize the FEL as a light source.
NTIS
X Ray Sources; X Rays; Accelerators; Radiation Distribution; Diffraction Radiation

20080015753 Los Alamos National Lab., NM USA

Energy Harvesting for Structural Health Monitoring Sensor Networks

Park, G.; Farrar, C. R.; Todd, M. D.; Hodgkiss, W.; Rosing, T.; Feb. 2007; 88 pp.; In English

Report No.(s): DE2007-902464; LA-14314-MS; No Copyright; Avail.: Department of Energy Information Bridge

This report has been developed based on information exchanges at a 2.5-day workshop on energy harvesting for embedded structural health monitoring (SHM) sensing systems that was held June 2830, 2005, at Los Alamos National Laboratory. The workshop was hosted by the LANL/UCSD Engineering Institute (EI). This Institute is an education- and research-focused collaboration between Los Alamos National Laboratory (LANL) and the University of California, San Diego (UCSD), Jacobs School of Engineering. A Statistical Pattern Recognition paradigm for SHM is first presented and the concept of energy harvesting for embedded sensing systems is addressed with respect to the data acquisition portion of this paradigm. Next, various existing and emerging sensing modalities used for SHM and their respective power requirements are summarized, followed by a discussion of SHM sensor network paradigms, power requirements for these networks and power optimization strategies. Various approaches to energy harvesting and energy storage are discussed and limitations associated with the current technology are addressed. This discussion also addresses current energy harvesting applications and system integration issues. The report concludes by defining some future research directions and possible technology demonstrations that are aimed at transitioning the concept of energy harvesting for embedded SHM sensing systems from laboratory research to field deployed engineering prototypes.

NTIS

Pattern Recognition; Systems Health Monitoring; Sensors; Detectors; Structural Analysis; Structural Reliability

20080015755 Stanford Linear Accelerator Center, Stanford, CA, USA

BABAR Status and Prospects for CP Asymmetry Measurements: sin(2Beta + Gamma)

Ganzhur, S.; Apr. 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901842; SLAC-PUB-12443; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Asymmetry; Computation

20080015757

Review of Exclusive B yields D(*,)(iota)(nv) Decays Branching Fractions, Form Factors and /V(sub cb)/**

Snyder, A. E.; Apr. 2007; 22 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901843; SLAC-PUB-12431; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Form Factors; Mesons; Particle Decay

20080015758 Stanford Linear Accelerator Center, Stanford, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA; Louisiana State Univ., Baton Rouge, LA, USA; Iowa State Univ., Ames, IA, USA

Light Nuclei in the Framework of the Symplectic No-Core Shell Model

Draayer, J. P.; Dytrych, T.; Sviratcheva, K. D.; Bahri, C.; Vary, J. P.; January 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901844; SLAC-PUB-12432; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Light Sources; Active Galactic Nuclei

20080015759 Stanford Linear Accelerator Center, Stanford, CA, USA

Relativistic Flows Using Spatial and Temporal Adaptive Structured Mesh Refinement. I. Hydrodynamics

Want, P.; Abel, T.; Zhang, W.; January 2007; 13 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00151

Report No.(s): DE2007-901845; SLAC-PUB-12433; No Copyright; Avail.: Department of Energy Information Bridge

Astrophysical relativistic flow problems require high resolution three-dimensional numerical simulations. In this paper, we describe a new parallel three-dimensional code for simulations of special relativistic hydrodynamics (SRHD) using both spatially and temporally structured adaptive mesh refinement (AMR). We used method of lines to discrete SRHD equations

spatially and used a total variation diminishing (TVD) Runge-Kutta scheme for time integration. For spatial reconstruction, we have implemented piecewise linear method (PLM), piecewise parabolic method (PPM), third order convex essentially non-oscillatory (CENO) and third and fifth order weighted essentially non-oscillatory (WENO) schemes. Flux is computed using either direct flux reconstruction or approximate Riemann solvers including HLL, modified Marquina flux, local Lax-Friedrichs flux formulas and HLLC. The AMR part of the code is built on top of the cosmological Eulerian AMR code enzo, which uses the Berger-Colella AMR algorithm and is parallel with dynamical load balancing using the widely available Message Passing Interface library. We discuss the coupling of the AMR framework with the relativistic solvers and show its performance on eleven test problems.
NTIS
Grid Refinement (Mathematics); Hydrodynamics; Structured Grids (Mathematics)

20080015760 Stanford Linear Accelerator Center, Stanford, CA, USA; California Univ., Berkeley, CA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
FERMI at Elettra: A Seeded FEL Facility for Euv and Soft X-Rays
Allaria, E.; Bocchetta, C. J.; Bulfond, D.; Cargnello, F.; Cocco, D.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901848; SLAC-PUB-12434; No Copyright; Avail.: Department of Energy Information Bridge
We describe the conceptual design and major performance parameters for the FERMI at Elettra Free Electron Laser (FEL) project funded for construction at Sincrotrone Trieste, Italy. This user facility complements the existing storage ring light source at Sincrotrone Trieste, and will be the first facility to be based on seeded harmonic cascade FELs. Seeded FELs provide high peak power pulses, with controlled temporal duration of the coherent output allowing tailored x-ray output for time domain explorations with short pulses of 100 fs or less, and high resolution with output bandwidths of the order of meV. The facility uses the existing 1.2 GeV S-band linac, driven by electron beam from a new high brightness RF photocathode gun, and will provide tunable output over a range from approximately 100 nm to approximately 10 nm, and APPLE undulator radiators allow control of x-ray polarization. Initially, two FEL cascades are planned, a single-stage harmonic generation to operate over approximately 100 nm to approximately 40 nm, and a two-stage cascade operating from approximately 40 nm to approximately 10 nm or shorter wavelengh, each with spatially and temporally coherent output, and peak power in the GW range.
NTIS
Extreme Ultraviolet Radiation; Free Electron Lasers; X Rays

20080015850 Lawrence Livermore National Lab., Livermore, CA USA
LQCD Phase 1 Runs with P4RHMC
Soltz, R.; Gupta, R.; Feb. 15, 2007; 17 pp.; In English
Report No.(s): DE2007-902345; UCRL-TR-228095; No Copyright; Avail.: Department of Energy Information Bridge
These results represent the first set of runs of 10 Beta values ranging from 2000-7000 trajectories with the p4rhmc code. This initial run sequence spanned roughly 2-weeks in late January and Early February, 2007.
NTIS
Quantum Chromodynamics; Lattices (Mathematics)

20080015861 NASA Langley Research Center, Hampton, VA, USA
Optical Properties of Tm(3+) Ions in Alkali Germanate Glass
Walsh, Brian M.; Barnes, Norman P.; Reichle, Donald J.; Jiang, Shibin; December 2006; 20 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 953033.01.07.18; Copyright; Avail.: CASI: A03, Hardcopy
Tm-doped alkali germanate glass is investigated for use as a laser material. Spectroscopic investigations of bulk Tm-doped germanate glass are reported for the absorption, emission and luminescence decay. Tm:germanate shows promise as a fiber laser when pumped with 0.792 m diodes because of low phonon energies. Spectroscopic analysis indicates low nonradiative quenching and pulsed laser performance studies confirm this prediction by showing a quantum efficiency of 1.69. Author
Fiber Lasers; Pulsed Lasers; Laser Outputs; Optical Properties; Spectroscopic Analysis; Diodes

20080015869 Lawrence Livermore National Lab., Livermore, CA USA

Final Report for Time Domain Boundary Element and Hybrid Finite Element Simulation for Maxwell's Equations

Pingenot, J.; Jandhyala, V.; Mar. 04, 2007; 23 pp.; In English

Report No.(s): DE2007-902353; UCRL-SR-228619; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes the work performed for Lawrence Livermore National Laboratory (LLNL) at the University of Washington between September 2004 and May 2006. This project studied fast solvers and stability for time domain integral equations (TDIE), especially as applied to radiating boundary for a massively parallel FEM solver.

NTIS

Boundaries; Boundary Conditions; Computerized Simulation; Finite Element Method; Maxwell Equation; Time Domain Analysis

20080015876 Lawrence Livermore National Lab., Livermore, CA USA

FRANCHFRI: the Finite-RANge Constrained Hartree-Fock Rapid Iterator

Younes, W.; Gogny, D.; Feb. 01, 2007; 7 pp.; In English

Report No.(s): DE2007-902336; UCRL-TR-227645; No Copyright; Avail.: Department of Energy Information Bridge

The Hartree-Fock code FRANCHFRI, which uses a nite-range nucleon-nucleon interaction, has been written and benchmarked. This code represents a new LLNL capability for realistic calculations in both nuclear-structure and nuclear-reaction physics. The use of a nite-range interaction represents a considerable improvement over other Hartree-Fock codes currently available in the public domain, which rely on zero-range forces. The nite-range force does not simply lead to a more realistic treatment of the nuclear problem, it avoids serious mathematical pathologies inherent to zero-range interactions. This brief and non-technical report introduces the code, its design philosophy, various benchmarks used to test its accuracy, and places it within its proper physics context. The current limitations and planned extensions of the code are also discussed.

NTIS

Hartree Approximation; Nuclear Structure

20080015882 Stanford Linear Accelerator Center, Stanford, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA; Louisiana State Univ., Baton Rouge, LA, USA; Iowa State Univ., IA, USA

Dynamical Symmetries Reflected in Realistic Interactions

Sviratacheva, K. D.; Draayer, J. P.; Vary, J. P.; January 2007; 10 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00151

Report No.(s): DE2007-901828; SLAC-PUB-12444; No Copyright; Avail.: National Technical Information Service (NTIS)

Realistic nucleon-nucleon (NN) interactions, derived within the framework of meson theory or more recently in terms of chiral effective field theory, yield new possibilities for achieving a unified microscopic description of atomic nuclei. Based on spectral distribution methods, a comparison of these interactions to a most general Sp(4) dynamically symmetric interaction, which previously we found to reproduce well that part of the interaction that is responsible for shaping pairing-governed isobaric analog 0+ states, can determine the extent to which this significantly simpler model Hamiltonian can be used to obtain an approximate, yet very good description of low-lying nuclear structure. And furthermore, one can apply this model in situations that would otherwise be prohibitive because of the size of the model space. In addition, we introduce a Sp(4) symmetry breaking term by including the quadrupole-quadrupole interaction in the analysis and examining the capacity of this extended model interaction to imitate realistic interactions. This provides a further step towards gaining a better understanding of the underlying foundation of realistic interactions and their ability to reproduce striking features of nuclei such as strong pairing correlations or collective rotational motion.

NTIS

Symmetry; Nucleon-Nucleon Interactions; Mesons; Chirality

20080015883 Stanford Linear Accelerator Center, Stanford, CA, USA; Tufts Univ., Boston, MA, USA

Proposal to Modify the Polarimeter Chicane in the ILC 14 Mrad Extraction Line

Moffeit, K.; Maruyama, T.; Nosochkov, Y.; Seryi, A.; Woodley, M.; Mar. 28, 2007; 17 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-901838; SLAC-PUB-12425; No Copyright; Avail.: National Technical Information Service (NTIS)

A proposal is presented in this paper to modify the extraction line polarimeter chicane to allow the Compton backscattered electrons to be deflected further from the beam line, and to provide optics for the downstream GAMCAL detector.
NTIS
Extraction; Polarimeters

20080015961 Stanford Linear Accelerator Center, Stanford, CA, USA; Stanford Univ., Stanford, CA USA
Status of SM Calculations of B Yields S Transitions
Hurth, T.; Apr. 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901839; SLAC-PUB-12396; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Branching (Physics); Computation

20080015962 Stanford Linear Accelerator Center, Stanford, CA, USA; Istituto Nazionale di Fisica Nucleare, Rome, Italy
Report of the Electromagnetic-Structure Based Accelerator Concepts Working Group
Colby, E.; Musumeci, P.; Jan. 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901851; SLAC-PUB-12437; No Copyright; Avail.: Department of Energy Information Bridge
We detail the most pressing physics and technical issues confronting short-wavelength acceleration. We review new acceleration concepts that are proposed and under development, and recent progress on technical issues such as structure fabrication and material damage. We outline key areas where work is still needed before a reliable assessment of the value of working at wavelengths below 1 cm can be made. Possible ways to enhance collaboration and progress in this important area are also discussed.
NTIS
Progress; Reports; Accelerators; Physics

20080015963 Stanford Linear Accelerator Center, Stanford, CA, USA; Victoria Univ., British Columbia, Canada
Determination of the CKM Element of V(sub Ub)
Fortin, D.; Jan. 2005; 182 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901852; SLAC-R-851; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Standard Model (Particle Physics); CP Violation; Particle Decay

20080015964 Stanford Linear Accelerator Center, Stanford, CA, USA; Manchester Univ., UK
Energy Calibration of the BaBar EMC Using the PI(sup 0) Invariant Mass Method
Tanner, D. J.; Oct. 1998; 98 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901853; SLAC-R-850; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Calibrating; Electromagnetic Compatibility; Theses

20080015965; British Columbia Univ., Vancouver, British Columbia, Canada
Monte Carlo Study of the Momentum Dependence on the Results of Tracking Unknown Particle Species in the BaBar Detector
Sewerynek, S.; Jan. 2005; 85 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901854; SLAC-R-838; No Copyright; Avail.: Department of Energy Information Bridge
The BABAR experiment is composed of an international collaboration that will test the Standard Model prediction of CP violation. To accomplish this a new detector was constructed at the asymmetric B Factory located at the Stanford Linear Accelerator Center. The tests will shed some light on the origins of CP violation, which is an important aspect in explaining the matter/antimatter asymmetry in the universe. In particular, the BABAR experiment will measure CP violation in the neutral B meson system. In order to succeed, the BABAR experiment requires excellent track fitting and particle species

identification. Prior to the current study, track fitting was done using only one particle species - the pion. But given the momentum dependence on the accuracy of the results from this choice of particle species, a better algorithm needed to be developed. Monte Carlo simulations were carried out and a new algorithm utilizing all five particle species present in the BABAR detector was created.
NTIS
Momentum; Monte Carlo Method; Radiation Counters

20080015967 Fermi National Accelerator Lab., Batavia, IL, USA
Precision Electroweak Physics at the Tevatron
James, E. B.; Jul. 2006; 13 pp.; In English
Report No.(s): DE2007-902200; FERMILAB-CONF-06-533-E; No Copyright; Avail.: National Technical Information Service (NTIS)

An overview of Tevatron electroweak measurements performed by the CDF and DA experiments is presented. The current status and future prospects for high precision measurements of electroweak parameters and detailed studies of boson production are highlighted.
NTIS
Electroweak Interactions (Field Theory); High Energy Interactions; Particle Accelerators

20080015998 Swedish Defence Research Establishment, Linkoeping, Sweden
Microwave Properties for Vanadium Dioxide
Ousbaeck, J. O.; May 2006; 14 pp.; In Swedish
Report No.(s): PB2007-106537; FOI-R-2005-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

Reflection properties of vanadium dioxide (VO2) in the IR-region have been studied for many years and are well known. Vanadium dioxide is a thermochromic material that undergoes a semiconductor to metal phase transition, in the IR-region, around 68 degrees C. This report presents experimental results of the reflection properties for vanadium dioxide in the microwave region. Microwave properties of vanadium dioxide have not been studied before. A significant change in the reflection coefficient was observed when the material was heated. Further studies will show if vanadium dioxide is a potential candidate as a material in different defense applications, for example switchable radomes.
NTIS
Dioxides; Heating; Microwaves; Vanadium

20080015999 Stanford Linear Accelerator Center, Stanford, CA, USA; Istituto Nazionale di Fisica Nucleare, Rome, Italy
B(sup 0) yields pi(sup +)pi(sup -)pi(sup 0) Time Dependent Dalitz Analysis at BaBar
Cavoto, G.; January 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901827; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available
Time Dependence; Particle Decay; CP Violation

20080016476 Physical Domains, Glendale, CA, USA
Retrodirective Noise-Correlating (RNC) Radar Methods and Apparatus
Brown, E. R., Inventor; 25 Jan 05; 20 pp.; In English
Contract(s)/Grant(s): MDA972-03-C-099
Patent Info.: Filed Filed 25 Jan 05; US-Patent-Appl-SN-11-043 745
Report No.(s): PB2007-104749; No Copyright; Avail.: CASI: A03, Hardcopy

Embodiments of the present invention provide retrodirective noise-correlating radar that include: (1) a transmit antenna array that quiescently transmits random noise; (2) a receive antenna array, in a desired spatial relationship with the transmit antenna array, for collecting the reflected noise from a target; and (3) RF electronic components interconnecting antenna-element pairs between the receive and transmit arrays. In one group of embodiments, the radar automatically transforms the broad pattern from each element of the array (when transmitting or receiving random noise), to a narrow pattern characteristic of the entire array. In a second group of embodiments, a presence of a target and its range are determined quickly by a quasi-coherent build-up of signal in the time or frequency domains. In third group of embodiments a target angle and

velocity vector are determined by cross correlation between two or more electronic channels connecting the transmit and receive arrays.
NTIS
Correlation; Patent Applications; Search Radar; Target Acquisition

20080016525 Maryland Univ., College Park, MD, USA
Results from the G(sup 0) Forward Angle Measurement
Liu, J.; January 2006; 3 pp.; In English
Report No.(s): DE2007-896966; No Copyright; Avail.: National Technical Information Service (NTIS)

The results from the G(sup 0) forward angle experiment are reported in this talk. The parity-violating asymmetry of elastic e-p scattering has been measured within the range of the four-momentum transfer (Q2) from 0.12 to 1.0 (GeV/c)2, which yields linear combinations of the strange electric and magnetic form factors of the nucleon, G(sub E)(sup s) + etaG(sub M)(sup s), in the same Q2 range. The G(sup 0) results, combined with the measurements from other experiments, indicate that G(sub E)(sup s) and G(sub M)(sup s) are both likely non-zero.
NTIS
Asymmetry; Elastic Scattering

20080016526
Recent DIS Results from Jefferson Lab: A(sup n)(sub 1) at High x and the Q(sup 2) Dependence of g(sup n(sub 2))
Averett, T. D.; January 2006; 3 pp.; In English
Report No.(s): DE2007-896998; No Copyright; Avail.: National Technical Information Service (NTIS)

In this talk, results were presented from two recently published Jefferson Lab experiments where longitudinally polarized electrons were scattered from a polarized (sup 3)He target in the inclusive reaction (sup 3)(rvec H)e((rvec e), e(prime)) in the deep-inelastic region. Incident electrons with energies E = 3.5-5.7 GeV were scattered from polarized (sup 3)He nuclei whose spins could be oriented parallel or perpendicular to the incident electron momentum, in the scattering plane of the electron. The helicities of the incident electrons were flipped pseudo-randomly at a rate of 30 Hz to minimize helicity correlated systematic uncertainties. A feedback system was also used to keep the helicity-dependent beam charge asymmetry below 50 x 10(sup -6) for a typical run in the g(sub 2) measurement. Scattered electrons were detected in either one of two nearly identical spectrometers. The detector package included vertical drift chambers for particle tracking, two segmented scintillator trigger planes, and used a gas Cherenkov detector and lead-glass calorimeter for particle identification. Electron polarization was measured periodically using a Moeller polarimeter and monitored continuously using a Compton polarimeter.
NTIS
Electrons; Ground State

20080016527 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Parametric Study of the Current Limit within a Single Driver-Scale Transport Beam Line of an Induction Linac for Heavy Ion Fusion
Prost, L. R.; January 2004; 310 pp.; In English
Report No.(s): DE2007-901534; No Copyright; Avail.: National Technical Information Service (NTIS)

The High Current Experiment (HCX) at Lawrence Berkeley National Laboratory is part of the US program that explores heavy-ion beam as the driver option for fusion energy production in an Inertial Fusion Energy (IFE) plant. The HCX is a beam transport experiment at a scale representative of the low-energy end of an induction linear accelerator driver. The primary mission of this experiment is to investigate aperture fill factors acceptable for the transport of space-charge-dominated heavy-ion beams at high intensity (line charge density approximately 0.2 mC/m) over long pulse durations (4 ms) in alternating gradient focusing lattices of electrostatic or magnetic quadrupoles. This experiment is testing transport issues resulting from nonlinear space-charge effects and collective modes, beam centroid alignment and steering, envelope matching, image charges and focusing field nonlinearities, halo and, electron and gas cloud effects.
NTIS
Linear Accelerators; Ion Currents; Density (Number/Volume); Electric Charge

20080016531 Stanford Linear Accelerator Center, Stanford, CA, USA
Positron Injector Accelerator and RF System for the ILC
Wang, J. W.; Adolphsen, C.; Bharadwaj, V.; Bowden, G.; Jongewaard, E.; Mar. 2007; 3 pp.; In English
Report No.(s): DE2007-901576; SLAC-PUB-12412; No Copyright; Avail.: National Technical Information Service (NTIS)

Due to the extremely high energy deposition from positrons, electrons, photons and neutrons behind the positron target, and because a solenoid is required to focus the large emittance positron beam, the 1.3 GHz pre-accelerator has to use normal conducting structures up to energy of 400 MeV. There are many challenges in the design of the normal-conducting portion of the ILC positron injector system such as obtaining high positron yield with required emittance, achieving adequate cooling with the high RF and particle loss heating, and sustaining high accelerator gradients during millisecond-long pulses in a strong magnetic field. Considering issues of feasibility, reliability and cost savings for the ILC, the proposed design for the positron injector contains both standing-wave (SW) and traveling-wave (TW) L-band accelerator structures. A short version of the new type of the SW section is under fabrication and testing. An updated status report is given. This paper also covers acceleration vs. deceleration for pre accelerator sections, SW vs. TW structures, as well as longitudinal matching from target to linac and linac to damping ring.
NTIS
Injectors; Positrons; Radio Frequencies; Linear Accelerators

20080016533 Stanford Linear Accelerator Center, Stanford, CA, USA; California Univ., Davis, CA, USA; University of Southern California, Los Angeles, CA USA
Electron Bunch Length Measurements in the E-167 Plasma Wakefield Experiment
Blumenfeld, I.; Auerbach, D.; Berry, M.; Clayton, C. E.; Decker, F. J.; January 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901583; SLAC-PUB-12419; No Copyright; Avail.: Department of Energy Information Bridge

Bunch length is of prime importance to beam driven plasma wakefield acceleration experiments due to its inverse relationship to the amplitude of the accelerating wake. We present here a summary of work done by the E167 collaboration measuring the SLAC ultra-short bunches via autocorrelation of coherent transition radiation. We have studied material transmission properties and improved our autocorrelation traces using materials with better spectral characteristics.
NTIS
Electron Bunching; Length; Plasmas (Physics)

20080016534 Stanford Linear Accelerator Center, Stanford, CA, USA
Beam Coupling to Optical Scale Accelerating Structures
Sears, C. M. S.; Byer, R. L.; Colby, E. R.; Cowan, B. M.; Ischebeck, R.; January 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-901584; SLAC-PUB-12422; No Copyright; Avail.: National Technical Information Service (NTIS)

Current research efforts into structure based laser acceleration of electrons utilize beams from standard RF linacs. These beams must be coupled into very small structures with transverse dimensions comparable to the laser wavelength. To obtain decent transmission, a permanent magnet quadrupole (PMQ) triplet with a focusing gradient of 560 T/m is used to focus into the structure. Also of interest is the induced wakefield from the structure, useful for diagnosing potential accelerator structures or as novel radiation sources.
NTIS
Electron Beams; Beamforming

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*.

20080015743 National Inst. of Aerospace, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Nonlinear Reduced-Order Analysis with Time-Varying Spatial Loading Distributions
Prezekop, Adam; April 07, 2008; 13 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2008-2323; Copyright; Avail.: CASI: A03, Hardcopy

Oscillating shocks acting in combination with high-intensity acoustic loadings present a challenge to the design of

resilient hypersonic flight vehicle structures. This paper addresses some features of this loading condition and certain aspects of a nonlinear reduced-order analysis with emphasis on system identification leading to formation of a robust modal basis. The nonlinear dynamic response of a composite structure subject to the simultaneous action of locally strong oscillating pressure gradients and high-intensity acoustic loadings is considered. The reduced-order analysis used in this work has been previously demonstrated to be both computationally efficient and accurate for time-invariant spatial loading distributions, provided that an appropriate modal basis is used. The challenge of the present study is to identify a suitable basis for loadings with time-varying spatial distributions. Using a proper orthogonal decomposition and modal expansion, it is shown that such a basis can be developed. The basis is made more robust by incrementally expanding it to account for changes in the location, frequency and span of the oscillating pressure gradient.
Author
Nonlinearity; Spatial Distribution; Time; Variations; Dynamic Response; Composite Structures; Hypersonic Vehicles; Pressure Gradients; Oscillations

20080015889 NASA Langley Research Center, Hampton, VA, USA
A Deconvolution Approach for the Mapping of Acoustic Sources (DAMAS) Determined from Phased Microphone Arrays
Brooks, Thomas F.; Humphreys, William M.; July 2006; 18 pp.; In English; 10th AIAA/CEAS Aeroacoustics Conference, 10-12 May 2004, Manchester, UK; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 23-781-10-11
Report No.(s): AIAA Paper 2004-2954; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015889

Current processing of acoustic array data is burdened with considerable uncertainty. This study reports an original methodology that serves to demystify array results, reduce misinterpretation, and accurately quantify position and strength of acoustic sources. Traditional array results represent noise sources that are convolved with array beamform response functions, which depend on array geometry, size (with respect to source position and distributions), and frequency. The Deconvolution Approach for the Mapping of Acoustic Sources (DAMAS) method removes beamforming characteristics from output presentations. A unique linear system of equations accounts for reciprocal influence at different locations over the array survey region. It makes no assumption beyond the traditional processing assumption of statistically independent noise sources. The full rank equations are solved with a new robust iterative method. DAMAS is quantitatively validated using archival data from a variety of prior high-lift airframe component noise studies, including flap edge/cove, trailing edge, leading edge, slat, and calibration sources. Presentations are explicit and straightforward, as the noise radiated from a region of interest is determined by simply summing the mean-squared values over that region. DAMAS can fully replace existing array processing and presentations methodology in most applications. It appears to dramatically increase the value of arrays to the field of experimental acoustics.
Author
Microphones; Phased Arrays; Aircraft Noise; Aeroacoustics; Acoustic Measurement; Noise Generators; Airframes

72
ATOMIC AND MOLECULAR PHYSICS

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

20080015756 Fermi National Accelerator Lab., Batavia, IL, USA
Radiation Calculations for the ILC Cryomodule
Apr. 2007; 12 pp.; In English
Report No.(s): DE2007-902540; FERMILAB-TM-2387-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The MARS15 radiation simulations were performed for the ILC cryomodule. The model assumes a uniform beam loss intensity of 1 W/m of 750-MeV and 250-GeV electron along the inner surface of the beam pipe and the cavity iris of the 12-m cryomodule. Two-dimensional distributions of radiation dose in the module were obtained. Absorbed dose rate and energy spectra of electrons, photons, neutrons and protons were also obtained at the three cryogenic thermometers locations by filling with silicon material in the appropreate locations, and radiation hardness of the thermometers was discussed. From the

obtained results, maximum absorbed dose of thermometers at the cooling pipe is 0.85mGy/sec (85 mRad/sec), that is 0.31 MGy (31 MRad) for 20 years.
NTIS
Cryogenics; Particle Accelerators; Simulation

20080015879 Lawrence Livermore National Lab., Livermore, CA USA
Determination of Optimum Conditions for Distinguishing the Pulse Height Distributions of Atomic and Polyatomic Ions
Kristo, M. J.; Dec. 13, 2006; 26 pp.; In English
Report No.(s): DE2007-902349; UCRL-TR-226799; No Copyright; Avail.: National Technical Information Service (NTIS)

This work explored the use of pulse height distributions (PHD) from multiplier-type detectors as a means of detecting and eliminating the effects of polyatomic interferences in secondary ion mass spectrometry (SIMS). We explored the behavior of PHD for 235U+, 208Pb27Al+ and 207Pb28Si+, all with a nominal mass-to-charge ratio of 235. In every case, the distribution for the atomic ion (235U+) was clearly shifted relative to the distributions for 208Pb27Al+ and 207Pb28Si+. When the first surface of the detector is metallic in character, the polyatomic ions are shifted to larger pulse heights relative to the atomic ion. When the first surface of the detector is oxide in character, the atomic ion is shifted to larger pulse heights relative to the polyatomic ions. The relative positioning appear to be stable for a given detector over time at the same secondary ion impact energy. Consequently, it appears to be feasible to use PHD data to detect interfering polyatomic ions and eliminate their deleterious effects using peak deconvolution techniques. Consequently, the updated Ultrafast RAE detector will be designed to make the pulse height information available to the data acquisition system.
NTIS
Atoms; Ions; Pulse Amplitude; Polyatomic Molecules; Mass Spectroscopy

20080016485 Lethbridge Univ., Lethbridge, Alberta, Canada; NASA Langley Research Center, Hampton, VA, USA
Measurements and Theoretical Calculations of N2-broadening and N2-shift Coefficients in the v2 band of CH3D
Predoi-Cross, A.; Hambrook, Kyle; Brawley-Tremblay, Marco; Bouanich, J. P.; Smith, Mary Ann H.; Journal of Molecular Spectroscopy; [2006]; Volume 235, Issue 1, pp. pp. 35-53; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 23-622-67-65; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.jms.2005.10.003

In this paper, we report measured Lorentz N2-broadening and N2-induced pressure-shift coefficients of CH3D in the v2 fundamental band using a multispectrum fitting technique. These measurements were made by analyzing 11 laboratory absorption spectra recorded at 0.0056 cm(exp -1) resolution using the McMath-Pierce Fourier transform spectrometer located at the National Solar Observatory on Kitt Peak, Arizona. The spectra were obtained using two absorption cells with path lengths of 10.2 and 25 cm. The total sample pressures ranged from 0.98 to 402.25 Torr with CH3D volume mixing ratios of 0.01 in nitrogen. We have been able to determine the N2 pressure- broadening coefficients of 368 v2 transitions with quantum numbers as high as J"= 20 and K = 16, where K' = K' equivalent to K (for a parallel band). The measured N2-broadening coefficients range from 0.0248 to 0.0742 cm(exp -1) atm(exp -1) at 296 K. All the measured pressure-shifts are negative. The reported N2-induced pressure-shift coefficients vary from about 0.0003 to 0.0094 cm(exp -1) atm(exp -1). We have examined the dependence of the measured broadening and shift parameters on the J', and K quantum numbers and also developed empirical expressions to describe the broadening coefficients in terms of m (m = -J', J', and J' + 1 in the (sup Q)P-, (sup Q)Q-, and (sup Q)R-branch, respectively) and K. On average, the empirical expressions reproduce the measured broadening coefficients to within 4.7%. The N2-broadening and pressureshift coefficients were calculated on the basis of a semiclassical model of interacting linear molecules performed by considering in addition to the electrostatic contributions the atom atom Lennard-Jones potential. The theoretical results of the broadening coefficients are in good overall agreement with the experimental data (8.7%). The N2-pressure shifts whose vibrational contribution is derived from parameters fitted in the (sup Q)Q-branch of self-induced shifts of CH3D, are also in reasonable agreement with the scattered experimental data (20% in most cases).
Author
Pressure Broadening; Methane; Deuterium Compounds; Mathematical Models; Lorentz Transformations; Molecular Spectroscopy; Nitrogen

20080016486 Lethbridge Univ., Lethbridge, Alberta, Canada

Room-temperature Broadening and Pressure-shift Coefficients in the nu(exp 2) Band of CH3D-O2: Measurements and Semi-classical Calculations

Predoi-Cross, Adriana; Hambrook, Kyle; Brawley-Tremblay, Shannon; Bouanich, Jean-Pierre; Devi, V. Malathy; Smith, Mary Ann H.; August 2006; 16 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-622-67-65; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1016/j.jms.2005.12.012

We report measured Lorentz O2-broadening and O2-induced pressure-shift coefficients of CH3D in the nu(exp 2) fundamental band. Using a multispectrum fitting technique we have analyzed 11 laboratory absorption spectra recorded at 0.011 cm(exp 1) resolution using the McMath-Pierce Fourier transform spectrometer, Kitt Peak, Arizona. Two absorption cells with path lengths of 10.2 and 25 cm were used to record the spectra. The total sample pressures ranged from 0.98 to 339.85 Torr with CH3D volume mixing ratios of 0.012 in oxygen. We report measurements for O2 pressure-broadening coefficients of 320 nu(exp 2) transitions with quantum numbers as high as J0(sup w) = 17 and K = 14, where K(sup w) = K' is equivalent to K (for a parallel band). The measured O2-broadening coefficients range from 0.0153 to 0.0645 cm(exp -1) atm(exp -1) at 296 K. All the measured pressure-shifts are negative. The reported O2-induced pressure-shift coefficients vary from about -0.0017 to -0.0068 cm(exp -1) atm(exp -1). We have examined the dependence of the measured broadening and shift parameters on the J(sup W), and K quantum numbers and also developed empirical expressions to describe the broadening coefficients in terms of m (m = -J(sup W), J(sup W), and J(sup w) + 1 in the QP-, QQ-, and QR-branch, respectively) and K. On average, the empirical expressions reproduce the measured broadening coefficients to within 4.4%. The O2-broadening and pressure shift coefficients were calculated on the basis of a semiclassical model of interacting linear molecules performed by considering in addition to the electrostatic contributions the atom-atom Lennard-Jones potential. The theoretical results of the broadening coefficients are generally larger than the experimental data. Using for the trajectory model an isotropic Lennard-Jones potential derived from molecular parameters instead of the spherical average of the atom-atom model, a better agreement is obtained with these data, especially for |m| <= 12 values (11.3% for the first calculation and 8.1% for the second calculation). The O2-pressure shifts whose vibrational contribution are either derived from parameters fitted in the QQ-branch of selfinduced shifts of CH3D or those obtained from pressure shifts induced by Xe in the nu(sup 3) band of CH3D are in reasonable agreement with the scattered experimental data (17.0% for the first calculation and 18.7% for the second calculation).

Author

Oxygen; Pressure Ratio; Methane; Spectroscopic Analysis; Quantum Numbers; Pressure Broadening

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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*.

20080015692 Piper Rudnick, LLP, Washington, DC, USA

Fiber Optic Laser-Induced Breakdown Spectroscopy Device and Methods of Use

Kumar, A., Inventor; Yu-Yueh, F., Inventor; Burgess, S. C., Inventor; Singh, J. P., Inventor; 16 Sep 03; 22 pp.; In English

Contract(s)/Grant(s): DE-FC26-98FT40395

Patent Info.: Filed Filed 16 Sep 03; US-Patent-Appl-SN-10-662 347

Report No.(s): PB2007-104747; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to an apparatus, a system and a method for detecting the presence or absence of trace elements in a biological sample using Laser-Induced Breakdown Spectroscopy. The trace elements are used to develop a signature profile which is analyzed directly or compared with the known profile of a standard. In one aspect of the invention, the apparatus, system and method are used to detect malignant cancer cells in vivo.

NTIS

Fiber Optics; Laser-Induced Breakdown Spectroscopy; Patent Applications; Spectroscopy; Trace Elements

20080016478 Department of the Army, Washington, DC, USA
Miniature High-Resolution Multi-Spectral Objective Lens
Bryant, K. R., Inventor; 9 Mar 04; 7 pp.; In English
Patent Info.: Filed Filed 9 Mar 04; US-Patent-Appl-SN-10-794 525
Report No.(s): PB2007-104746; No Copyright; Avail.: CASI: A02, Hardcopy

A multi-spectral objective lens comprising a primary lens for receiving light reflected from an object, the light including wavelengths in the SWIR and LWIR spectral bands, and optical elements spaced from the receiving means for simultaneously imaging the SWIR light in one focal plane and the LWIR light in another focal plane, thereby allowing real-time image and sensor fusion.
NTIS
Detection; High Resolution; Infrared Radiation; Lenses; Miniaturization; Patent Applications; Spectral Bands

20080016530 Los Alamos National Lab., NM USA
Xtreme Optics The Behavior of Cavity Optics for the Jefferson Lab Free-Electron Laser
Shinn, M.; Behre, C.; Benson, S.; Douglas, D.; Dylla, F.; January 2006; 5 pp.; In English
Report No.(s): DE2007-901542; No Copyright; Avail.: National Technical Information Service (NTIS)

The cavity optics within high power free-electron lasers based on energy-recovering accelerators are subjected to extreme conditions associated with illumination from a broad spectrum of radiation, often at high irradiances. This is especially true for the output coupler, where absorption of radiation by both the mirror substrate and coating places significant design restrictions to properly manage heat load and prevent mirror distortion. Besides the fundamental lasing wavelength, the mirrors are irradiated with light at harmonics of the fundamental, THz radiation generated by the bending magnets downstream of the wiggler, and x-rays produced when the electron beam strikes accelerator diagnostic components (e.g., wire scanners and view screens) or from inadvertent beam loss. The optics must reside within high vacuum at approximately 10(sup -8) Torr and this requirement introduces its own set of complications. This talk discusses the performance of numerous high reflector and output coupler optics assemblies and provides a detailed list of lessons learned gleaned from years of experience operating the Upgrade IR FEL, a 10 kW-class, sub-ps laser with output wavelength from 1 to 6 microns.
NTIS
Cavities; Free Electron Lasers

75
PLASMA PHYSICS

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

20080015737 Plasma Processes, Inc., Huntsville, AL, USA
Plasma Processing of Lunar Regolith Simulant for Diverse Applications
Schofield, Elizabeth C.; Sen, Subhayu; O'Dell, J. Scott; February 10, 2008; 1 pp.; In English; Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA
Contract(s)/Grant(s): NAS8-02096; Copyright; Avail.: Other Sources; Abstract Only

Versatile manufacturing technologies for extracting resources from the moon are needed to support future space missions. Of particular interest is the production of gases and metals from lunar resources for life support, propulsion, and in-space fabrication. Deposits made from lunar regolith could yield highly emissive coatings and near-net shaped parts for replacement or repair of critical components. Equally important is development of high fidelity lunar simulants for ground based validation of potential lunar surface operations. Described herein is an innovative plasma processing technique for insitu production of gases, metals, coatings, and deposits from lunar regolith, and synthesis of high fidelity lunar simulant from NASA issued lunar simulant JSC-1. Initial plasma reduction trials of JSC-1 lunar simulant have indicated production of metallic iron and magnesium. Evolution of carbon monoxide has been detected subsequent to reduction of the simulant using the plasma process. Plasma processing of the simulant has also resulted in glassy phases resembling the volcanic glass and agglutinates found in lunar regolith. Complete and partial glassy phase deposits have been obtained by varying the plasma process variables. Experimental techniques, product characterization, and process gas analysis will be discussed.
Author
Plasmas (Physics); Space Missions; Lunar Resources; Gas Analysis; Regolith; Agglutination

20080015870 Lawrence Livermore National Lab., Livermore, CA USA

Laser-Matter Interactions with a 527 nm Drive

Glenzer, S.; Niemann, C.; Witman, P.; Wegner, P.; Mason, D.; Feb. 21, 2007; 23 pp.; In English

Report No.(s): DE2007-902354; UCRL-TR-228230; No Copyright; Avail.: National Technical Information Service (NTIS)

The primary goal of this Exploratory Research is to develop an understanding of laser-matter interactions with 527-nm light (2w) for studies of interest to numerous Laboratory programs including inertial confinement fusion (ICF), material strength, radiation transport, and hydrodynamics. In addition, during the course of this work we will develop the enabling technology and prototype instrumentation to diagnose a high fluence laser beam for energy, power, and near field intensity profile at 2w.

NTIS

Electromagnetic Interactions; Inertial Confinement Fusion; Lasers; Plasma Control

76
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*.

20080015672 Brinks Hofer Gilson and Lione, Chicago, IL, USA

Doped Semiconductor Nanocrystals

Guyot-Sionnest, S., Inventor; Shim, M., Inventor; Wang, C., Inventor; 21 Apr 05; 12 pp.; In English

Contract(s)/Grant(s): NIH-DMR-9731642

Patent Info.: Filed Filed 21 Apr 05; US-Patent-Appl-SN-11/111/153

Report No.(s): PB2007-106033; No Copyright; Avail.: CASI: A03, Hardcopy

A particle, includes a semiconductor nanocrystal. The nanocrystal is doped.

NTIS

Doped Crystals; Nanocrystals; Semiconductors (Materials)

20080015682 National Inst. of Standards and Technology, Gaithersburg, MD, USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Interstitial Solutes and Deformation in Nb and Nb Single Crystals

Ricker, R. E.; Pitchure, D. J.; Myneni, G. R.; January 2006; 12 pp.; In English

Report No.(s): DE2007-902839; No Copyright; Avail.: National Technical Information Service (NTIS)

Experiments were conducted on high purity single and polycrystalline niobium to determine the influence of low concentrations of interstitial impurities on mechanical properties and to evaluate the feasibility of using measurements of mechanical properties to detect, identify, and quantify the diffusible interstitial content.

NTIS

Crystals; Deformation; Interstitials; Niobium; Single Crystals; Solutes

20080015719 Iandiorio and Teska., Walthan, MA, USA

Chip Package Sealing Method

Farrell, B., Inventor; Jaynes, P., Inventor; Taylor, M., Inventor; 14 Apr 05; 20 pp.; In English

Contract(s)/Grant(s): DAAH01-00-C-R070

Patent Info.: Filed Filed 14 Apr 05; US-Patent-Appl-SN-11-105 835

Report No.(s): PB2007-106039; No Copyright; Avail.: CASI: A03, Hardcopy

A method of manufacturing a package including manufacturing a substrate to include at least one layer of LCP material, manufacturing a cover made of LCP material to include a lower lip, and sealing the cover to the substrate by heating the interface between the lower lip and the substrate.

NTIS

Chips; Patent Applications; Sealing; Substrates

20080015932 Bhabha Atomic Research Centre, Mumbai, India

Modeling and Application of Piezoelectric Materials in Smart Structures

Samal, M. K.; Seshu, P.; Dutta, B. K.; International Journal of COMADEM, Vol. 10, No. 2; April 2007, pp. pp. 30-42; In English; See also 20080015928; Copyright; Avail.: Other Sources

There is an increasing awareness of the benefits to be derived from the development and exploitation of smart materials and structures in application ranging from hydrospace to aerospace. With the ability to respond autonomously to changes in their environment, smart materials systems can offer a simplified approach to the control of various material and system characteristics such as noise, shape and vibration, etc. Piezoelectric materials find wide applications in difference smart structures because of their unique properties. With the ability to develop high strains and act with small or suitably modeled hysteresis, these materials offer engineers the opportunity to micro-manipulate optical devices, small robots, ultrasonic motors, and other system components. This paper discusses the basic modeling issues of piezoelectric materials under different levels of mechanical and electrical fields. The nonlinear modeling techniques developed by the authors under weak electric fields have been described with application to non-linear response of ultrasonic motor actuators. The use of piezoelectric materials in online structural health monitoring through Lamb waves is also discussed.

Author

Electric Fields; Nonlinearity; Piezoelectricity; Smart Materials; Smart Structures; Models; Piezoelectric Ceramics

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*.

20080015722 Massachusetts Inst. of Tech., Cambridge, MA, USA

Measurement of the Ratio of Branching Fractions B(BS --> DS- DS+) /B (B0 --> D- DS+) with the CDF Detector

Iyutin, B.; Mar. 01, 2007; 154 pp.; In English

Report No.(s): DE2007-902544; No Copyright; Avail.: National Technical Information Service (NTIS)

All the high energy experimental data gathered by now is accounted for by the Standard Model of Particle Physics. According to this model, all matter is made of fermions, particles with spin 1/2, and all interactions between particles are carried by bosons, particles with integer spin. There are twelve known elementary fermions. Six of them are quarks and six of them are leptons.

NTIS

Standard Model (Particle Physics); Fermions; High Energy Interactions; Branching (Physics); Ratios

20080015734 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Rapidity and Species Dependence of Particle Production at Large Transverse Momentum for d+Au Collisions at psNN=200 GeV

Abelev, B. I.; Aggarwal, M. M.; Ahammed, Z.; Amonett, J.; Anderson, B. D.; Dec. 19, 2006; 15 pp.; In English

Report No.(s): DE2007-902461; LBNL-62243; No Copyright; Avail.: National Technical Information Service (NTIS)

The mechanisms for particle production in d+Au collisions at RHIC may be different at forward and backward rapidities. The partons from the deuteron-side (forward rapidity) are expected to undergo multiple scattering while traversing the gold nucleus. Those on the gold-side (backward rapidity) are likely to be affected by the properties of the nucleus. A comparative study of particle production at forward and backward rapidity can be carried out using a ratio called the rapidity asymmetry.

NTIS

Charged Particles; Collisions; Particle Production; Partons; Transverse Momentum

20080015754 Oklahoma Univ., Norman, OK, USA

Observation and Properties of X (3872) at D0

Hall, I. C.; Apr. 01, 2007; 151 pp.; In English

Report No.(s): DE2007-902537; FERMILAB-THESIS-2007-03; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2003 the Belle collaboration announced the discovery of a new particle known as X(3872), so named for its mass at

3872 MeV. In this paper, the study of this particle at the DO detector will be discussed, as well as attempts to identify the quark content and properties of this new state.
NTIS
High Energy Interactions; Hypothetical Particles; Particle Production

20080015761 Barcelona Univ., Spain; Fermi National Accelerator Lab., Batavia, IL, USA
Search for Gluino and Squark Production in Multi-Jets Plus Missing Transverse Energy Final States at the Tevatron using the CDF Detector
Bueso, X. P. I.; Jan. 01, 2007; 184 pp.; In English
Report No.(s): DE2007-902543; No Copyright; Avail.: National Technical Information Service (NTIS)

The Standard Model (SM) is currently the most comprehensive theoretical framework that describes the physics related to the elementary particles. The model describes three of the four fundamental forces (gravity is not included) between particles: electromagnetism, weak and strong. All these forces are mediated by carrier particles which obey Bose-Einstein statistics and are called gauge bosons. The model also encloses the matter constituents of the universe which are particles called fermions which follow Fermi-Dirac statistics. There are two fundamentally different types of fermions: quarks and leptons. They both interact via the electroweak force but only the quarks feel the strong force. There are six type of quarks and six type of leptons and they are all arranged in three groups or families with certain properties. In addition, all the fundamental particles which constitute matter have a partner with opposite charge that form the antimatter.
NTIS
Elementary Particles; Quarks; Fermions; Standard Model (Particle Physics)

20080015764 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
FERMI and Elettra Accelerator Technical Optimization Final Report
Cornacchia, M.; Craievich, P.; Di Mitri, S.; Tireste, S.; Pogorelov, I.; Jul. 06, 2006; 90 pp.; In English
Report No.(s): DE2007-901513; LBNL-60958; No Copyright; Avail.: National Technical Information Service (NTIS)

This chapter describes the accelerator physics aspects, the engineering considerations and the choice of parameters that led to the accelerator design of the FERMI Free-Electron-Laser. The accelerator (also called the electron beam delivery system) covers the region from the exit of the injector to the entrance of the first FEL undulator. The considerations that led to the proposed configuration were made on the basis of a study that explored various options and performance limits. This work follows previous studies of x-ray FEL facilities (SLAC LCLS (1), DESY XFEL (2), PAL XFEL (3), MIT (4), BESSY FEL(5), LBNL LUX (6), Daresbury 4GLS (7)) and integrates many of the ideas that were developed there. Several issues specific to harmonic cascade FELs, and that had not yet been comprehensively studied, were also encountered and tackled. A particularly difficult issue was the need to meet the requirement for high peak current and small slice energy spread, as the specification for the ratio of these two parameters (that defines the peak brightness of the electron beam) is almost a factor of two higher than that of the LCLSs SASE FEL. Another challenging aspect was the demand to produce an electron beam with as uniform as possible peak current and energy distributions along the bunch, a condition that was met by introducing novel beam dynamics techniques.
NTIS
Linear Accelerators; Electron Beams; Electron Accelerators; Harmonics

20080015765 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Mobility of Tritium in Engineered and Earth Materials at the NuMI Facility, Fermilab
Finsterle, S.; Conrad, M.; Kennedy, M.; Kneafsey, T.; Pruess, K.; Mar. 2007; 86 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-901523; LBNL-61798; No Copyright; Avail.: National Technical Information Service (NTIS)

This report details the work mainly done between June 13 and September 30, 2006 by Lawrence Berkeley National Laboratory (LBNL) scientists to assist Fermi National Accelerator Laboratory (Fermilab) staff in understanding tritium transport at the Neutrino at the Main Injector (NuMI) facility. The report has been modified between October 1, 2006 and February 28, 2007 to address comments by Fermilab staff. As a byproduct of beamline operation, the facility produces (among other radionuclides) tritium in engineered materials and the surrounding rock formation. Once the tritium is generated, it may be contained at the source location, migrate to other regions within the facility, or be released to the surrounding environment. The main issue that prompted Fermilab to seek LBNL's assistance in understanding tritium transport at the NuMI facility was the observation that tritium levels in collected drainage water showed only a modest decline after the beam was turned off in

February 2006. This behavior was unexpected and raised the question of where the tritium was coming from, and how it made its way into air and water collected along the facility. An understanding of tritium behavior in engineered and earth materials as well as through underground openings is needed to address key environmental concerns about possible tritium levels when the beamline is operated for longer durations and/or at higher intensities.
NTIS
Migration; Mobility; Radioactive Isotopes; Tritium; Neutrinos

20080015873 Lawrence Livermore National Lab., Livermore, CA USA
First LQCD Physics Runs with MILC and P4RHMC
Soltz, R.; Gupta, R.; Jan. 22, 2007; 10 pp.; In English
Report No.(s): DE2007-902360; UCRL-TR-227373; No Copyright; Avail.: National Technical Information Service (NTIS)

An initial series of physics LQCD runs were submitted to the BG/L science bank with the milc and p4rhmc. Both runs were for lattice dimensions of 32(2)x8. The p4 calculation was performed with v2.0 QMP MPI.X (semioptomized p4 code using qmp over mpi) and milc v7.2, also using RHMC, but not specifically optimized for BlueGene. Calculations were performed along lines of constant physics, with the light quark masses 2-3 times their physics values and the strange quark mass set by mud = 0.1ms. Job submissions was performed using the standard milc and p4 scripts provided on the ubgl cluster. Initial thermalized lattices for each code were also provided in this way. The only modifications for running on BG/L were to the directory names and the mT parameter which determines job durations (24 hrs on BG/L vs. 4 hrs on ubgl). The milc scripts were set to resubmit themselves 10 times, and the p4 scripts were submitted serially using the psub -d job dependency option. The runp4rhmc.tcsh could not be used to resubmit due to the 30m time limit imposed on interactive jobs. Most jobs were submitted to the smallest, 512 node partitions, but both codes could also run on the 1024 node partitions with a gain of only 30-50%. The majority of jobs ran without error. Stalled jobs were often indicative of a communication gap within a partition that LC was able to fix quickly. On some occasion a zero-length lattice file was deleted to allow jobs to restart successfully. Approximately 1000 trajectories were calculated for each beta value.
NTIS
Quantum Chromodynamics; Directories; Lattices (Mathematics)

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080016496 National Academy of Sciences - National Research Council, Washington, DC, USA
Grading NASA's Solar System Exploration Program: A Midterm Report
[2008]; 101 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NASW-01001; DG133R04C00009; Copyright; Avail.: Other Sources

The Committee on Assessing the Solar System Exploration Program has reviewed NASA's progress to date in implementing the recommendations made in the National Research Council's (NRC's) solar system exploration decadal survey covering the period 2003-2013, New Frontiers in the Solar System, and in its Mars Architecture report, Assessment of NASA s Mars Architecture 2007-2016. The committee assessed NASA's progress with respect to each individual recommendation in these two reports, assigning an academic-style grade, explaining the rationale for the grade and trend, and offering recommendations for improvement. The committee generally sought to develop recommendations in cases where it determined that the grade, the trend, or both were worrisome and that the achievement of a decadal survey recommendation would require some kind of corrective action on NASA's part. This usually meant that the committee sought to offer a recommendation when the grade was a 'C' or lower. However, the committee did offer recommendations in connection with some higher grades when it believed that minor corrective action was possible and desirable. More importantly, the committee did not offer recommendations for some of the activities given lower grades, particularly in the enabling technologies area (Chapter 6), because the committee determined that only the restoration of funding and the development of a strategic technology development program would solve these problems.
Derived from text
Progress; NASA Programs; Assessments; Evaluation

20080016497 National Academy of Sciences - National Research Council, Washington, DC, USA
Assessment of the NASA Astrobiology Institute
[2008]; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-01001; Copyright; Avail.: Other Sources

Astrobiology is a scientific discipline devoted to the study of life in the universe--its origins, evolution, distribution, and future. It brings together the physical and biological sciences to address some of the most fundamental questions of the natural world: How do living systems emerge? How do habitable worlds form and how do they evolve? Does life exist on worlds other than Earth? As an endeavor of tremendous breadth and depth, astrobiology requires interdisciplinary investigation in order to be fully appreciated and examined. As part of a concerted effort to undertake such a challenge, the NASA Astrobiology Institute (NAI) was established in 1998 as an innovative way to develop the field of astrobiology and provide a scientific framework for flight missions. Now that the NAI has been in existence for almost a decade, the time is ripe to assess its achievements. At the request of NASA's Associate Administrator for the Science Mission Directorate (SMD), the Committee on the Review of the NASA Astrobiology Institute undertook the assignment to determine the progress made by the NAI in developing the field of astrobiology. It must be emphasized that the purpose of this study was not to undertake a review of the scientific accomplishments of NASA's Astrobiology program, in general, or of the NAI, in particular. Rather, the objective of the study is to evaluate the success of the NAI in achieving its stated goals of: 1. Conducting, supporting, and catalyzing collaborative interdisciplinary research; 2. Training the next generation of astrobiology researchers; 3. Providing scientific and technical leadership on astrobiology investigations for current and future space missions; 4. Exploring new approaches, using modern information technology, to conduct interdisciplinary and collaborative research among widely distributed investigators; and 5. Supporting outreach by providing scientific content for use in K-12 education programs, teaching undergraduate classes, and communicating directly with the public. The committee s assessment of the NAI's progress in these five areas is presented in Chapters 2 to 6, respectively.
Author
Exobiology; Progress; NASA Programs; University Program; Assessments; Evaluation; Education

20080016498 National Academy of Sciences - National Research Council, Washington, DC, USA
NASA's Elementary and Secondary Education Program: Review and Critique
Quinn, Helen R., Editor; Schweingruber, Heidi A., Editor; Feder, Michael A., Editor; [2008]; 163 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNH05CC15C; Copyright; Avail.: Other Sources

The federal role in precollege science, technology, engineering, and mathematics (STEM) education is receiving increasing attention in light of the need to support public understanding of science and to develop a strong scientific and technical workforce in a competitive global economy. Federal science agencies, such as the National Aeronautics and Space Administration (NASA), are being looked to as a resource for enhancing precollege STEM education and bringing more young people to scientific and technical careers. For NASA and other federal science agencies, concerns about workforce and public understanding of science also have an immediate local dimension. The agency faces an aerospace workforce skewed toward those close to retirement and job recruitment competition for those with science and engineering degrees. In addition, public support for the agency s missions stems in part from public understanding of the importance of the agency s contributions in science, engineering, and space exploration.
Derived from text
Education; NASA Programs; Occupation; Learning; Assessments; Evaluation

20080016499 National Academy of Sciences - National Research Council, Washington, DC, USA
Space Science and the International Traffic in Arms Regulations: Summary of a Workshop
Finarelli, Margaret G.; Alexander, Joseph K.; [2008]; 45 pp.; In English
Contract(s)/Grant(s): NASW-01001; Copyright; Avail.: Other Sources

The USA seeks to protect its security and foreign-policy interests, in part, by actively controlling the export of goods, technologies, and services that are or may be useful for military development in other nations. 'Export' is defined not simply as the sending abroad of hardware but also as the communication of related technology and know-how to foreigners in the USA and overseas. The U.S. government mechanism for controlling dual-use items--items in commerce that have potential military use is the Export Administration Regulations (EAR) administered by the Department of Commerce; items defined in law as defense articles fall under the jurisdiction of the Department of State and the International Traffic in Arms Regulations (ITAR). Because of the potential military implications of the export of defense articles, the ITAR regime imposes much greater burdens (on both the applicant and the government) than does the EAR regime during the process of applying for, and

implementing the provisions of, licenses and technical-assistance agreements. Until the early 1990s export control activity related to all space satellites (commercial and scientific) was handled under ITAR. Between 1992 and 1996 the George H.W. Bush and the Clinton administrations transferred jurisdiction over the licensing of civilian communications satellites to the Commerce Department under EAR. In 1999, however, in response to broad concerns about Chinese attempts to acquire U.S. high technology, the U.S. House of Representatives convened the Select Committee on U.S. National Security and Military/Commercial Concerns with the People s Republic of China, also known as the Cox Committee. One of the many consequences of the Cox Committee's report was Congress's mandate that jurisdiction over export and licensing of satellites and related equipment and services, irrespective of military utility, be transferred from the Department of Commerce to the State Department and that such equipment and services be covered as defense articles under ITAR. Scientific satellites were explicitly included despite their use for decades in peaceful internationally conducted cooperative scientific research. It is widely recognized that the shift in regulatory regime from EAR to ITAR has had major deleterious effects on international scientific research activities that depend on satellites, spaceflight hardware, and other items that are now controlled by ITAR. Furthermore, contravening U.S. interests in attracting foreign students to U.S. universities, the capture of space technology by ITAR has caused serious problems in the teaching of university space science and engineering classes, virtually all of which include non-U.S. students. This report is a summary of a September 2007 workshop in which participants from the space research communities and the export-control administration and policy communities came together to discuss problems, effects, and potential solutions regarding the application of ITAR to space science. The principal themes and ideas that emerged from the discussions are summarized.

Author

Foreign Policy; International Trade; Regulations; Security; United States; Prohibition; Aerospace Sciences

20080016500 National Academy of Sciences - National Research Council, Washington, DC, USA

Opening New Frontiers in Space: Choices for the Next New Frontiers Announcement of Opportunity

[2008]; 83 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NASW-01001; Copyright; Avail.: Other Sources

NASA has initiated two missions in the New Frontiers Program and plans to issue an announcement of opportunity in 2008 to enable teams led by a principal investigator to compete for the third New Frontiers mission. NASA has asked the National Research Council to provide criteria and guiding principles for determining the list of candidate missions for this new competition. The New Frontiers Program was established at the recommendation of the 2003 National Research Council solar system exploration decadal survey, New Frontiers in the Solar System: An Integrated Exploration Strategy.1 The decadal survey recommended five medium-size missions as options for the New Frontiers Program. Three of those options remain to be implemented. In addition, the decadal survey listed five other medium-size missions that it did not specifically recommend for implementation. The Committee on New Opportunities in Solar System Exploration has sought to follow the guidance of the decadal survey in recommending principles for the next New Frontiers competition.

Derived from text

Recommendations; Space Exploration; Space Missions; NASA Space Programs; Selection

20080016540 Government Accountability Office, Washington, DC, USA

Space Acquisitions: DOD is Making Progress to Rapidly Deliver Low Cost Space Capabilities, but Challenges Remain. Report to the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate

April 2008; 21 pp.; In English

Report No.(s): GAO-08-516; No Copyright; Avail.: CASI: A03, Hardcopy

Since GAO last reported on DOD's operationally responsive space (ORS) efforts in 2006, the department has taken several steps toward establishing a program management structure for ORS and executing research and development efforts. On the programmatic side, DOD provided Congress with a plan that lays out an organizational structure and defines the responsibilities of the newly created Joint ORS Office, and describes an approach for satisfying warfighters needs. DOD has also begun staffing the office. On the research and development side, DOD has launched one of its TacSat satellites--small experimental satellites intended to quickly provide a capability that meets an identified need within available resources--and has begun developing several others. It has also made progress in developing interface standards for satellite buses--the platform that provides power, altitude, temperature control, and other support to the satellite in space--and continued its sponsorship of efforts aimed at acquiring low cost launch vehicles. Despite this progress, it is too early to determine the overall success of these efforts because most are still in their initial phases. Achieving success in ORS will be challenging. With relatively modest resources, the Joint ORS Office must quickly respond to the warfighter s urgent needs, while continuing research and development efforts that are necessary to help reduce the cost and time of future space acquisitions. As it

negotiates these priorities, the office will need to coordinate its efforts with a broad array of programs and agencies in the science and technology, acquisition, and operational communities. Historically, it has been difficult to transition programs from the science and technology environment to the acquisition and operational environment. At this time, DOD lacks a plan that lays out how it will direct its investments to meet current operational needs while pursuing innovative approaches and new technologies.
Author
Cost Reduction; Launch Vehicles; Project Management; Government Procurement

82
DOCUMENTATION AND INFORMATION SCIENCE

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

20080015898 NASA Marshall Space Flight Center, Huntsville, AL, USA
UID...Now That's Gonna Leave a Mark
Schramm, Harry F.; February 26, 2008; 45 pp.; In English; Department of Defense for Unique Identification and eBusiness Forum, 26-27 Feb. 2008, Crystal City, VA, USA; Original contains black and white illustrations; No Copyright; Avail.:
CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015898

Since 1975 bar codes on products at the retail counter have been accepted as the standard for entering product identity for price determination. Since the beginning of the 21st century, the Data Matrix symbol has become accepted as the bar code format that is marked directly on a part, assembly or product that is durable enough to identify that item for its lifetime. NASA began the studies for direct part marking Data Matrix symbols on parts during the Return to Flight activities after the Challenger Accident. Over the 20 year period that has elapsed since Challenger, a mountain of studies, analyses and focused problem solutions developed by and for NASA have brought about world changing results. NASA Technical Standard 6002 and NASA Handbook 6003 for Direct Part Marking Data Matrix Symbols on Aerospace Parts have formed the basis for most other standards on part marking internationally. NASA and its commercial partners have developed numerous products and methods that addressed the difficulties of collecting part identification in aerospace operations. These products enabled the marking of Data Matrix symbols in virtually every situation and the reading of symbols at great distances, severe angles, under paint and in the dark without a light. Even unmarkable delicate parts now have a process to apply a chemical mixture, recently trademarked as Nanocodes, that can be converted to Data Matrix information through software. The accompanying intellectual property is protected by ten patents, several of which are licensed. Direct marking Data Matrix on NASA parts dramatically decreases data entry errors and the number of parts that go through their life cycle unmarked, two major threats to sound configuration management and flight safety. NASA is said to only have people and stuff with information connecting them. Data Matrix is one of the most significant improvements since Challenger to the safety and reliability of that connection.
Author
Aerospace Systems; Coding; Configuration Management; Handbooks; Life (Durability); Identities; Flight Safety

20080015914 NASA Marshall Space Flight Center, Huntsville, AL, USA
A New Handbook for the Development of Space Vehicle Terrestrial Environment Design Requirements
Johnson, Dale L.; Vaughan, William W.; January 20, 2008; 12 pp.; In English; 13th Conference on Aviation, Range and Aerospace Meteorology, 20-24 Jan. 2008, New Orleans, LA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A new NASA document entitled 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development (NASA-HDBK-IOO1A) has been developed. The Handbook provides terrestrial environment information, data bases, models, recommendations, etc. for use in the design, development, trade studies, testing, and mission analyses for space (or launch) vehicles. This document is organized into fourteen specific natural environment disciplines of which some are winds, atmospheric models, thermal radiation, precipitation-for-icing, cloud cover, atmospheric electricity, geologic hazards, toxic chemical release by propulsion systems, and sea state. Atmospheric phenomena play a significant role in the design and flight of aerospace vehicles and in the integrity of the associated aerospace systems and structures. Environmental design criteria guidelines in this document are based on measurements and observations of atmospheric and climatic phenomena relative to various aerospace development, operational, and vehicle launch locations. The natural environment criteria guidelines data presented in this Handbook were formulated based on discussions with and requests from engineers involved

in aerospace vehicle development and operations. Therefore, they represent responses to actual engineering problems and are not just a general compilation of environmental data. The Handbook addresses the basis for the information presented, the interpretations of the terrestrial environment guideline given in the Handbook, and its application to the development of aerospace vehicle design requirements. Specific examples of the Handbook content and associated 'lessons lenmed' are given in this paper.
Author
Design Analysis; Handbooks; Aerospace Systems; Launch Vehicles; Environmental Quality; Environment Effects; Environment Protection; Spacecraft Launching

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*.

20080015770 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA
The 2004 NASA Aerospace Battery Workshop
August 2006; In English; 37th NASA Aerospace Battery Workshop, 14-16 Nov. 2004, Hunstville, AL, USA; See also 20080015771 - 20080015801; CD-ROM contains full text document in PDF format
Report No.(s): NASA/CP-2006-214599; M-1168; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Super NiCd(TradeMark) Energy Storage for Gravity Probe-B Relativity Mission; Hubble Space Telescope 2004 Battery Update; The Development of Hermetically Sealed Aerospace Nickel-Metal Hydride Cell; Serial Charging Test on High Capacity Li-Ion Cells for the Orbiter Advanced Hydraulic Power System; Cell Equalization of Lithium-Ion Cells; The Long-Term Performance of Small-Cell Batteries Without Cell-Balancing Electronics; Identification and Treatment of Lithium Battery Cell Imbalance under Flight Conditions; Battery Control Boards for Li-Ion Batteries on Mars Exploration Rovers; Cell Over Voltage Protection and Balancing Circuit of the Lithium-Ion Battery; Lithium-Ion Battery Electronics for Aerospace Applications; Lithium-Ion Cell Charge Control Unit; Lithium Ion Battery Cell Bypass Circuit Test Results at the U.S. Naval Research Laboratory; High Capacity Battery Cell By-Pass Switches: High Current Pulse Testing of Lithium-Ion; Battery By-Pass Switches to Verify Their Ability to Withstand Short-Circuits; Incorporation of Physics-Based, Spatially-Resolved Battery Models into System Simulations; A Monte Carlo Model for Li-Ion Battery Life Projections; Thermal Behavior of Large Lithium-Ion Cells; Thermal Imaging of Aerospace Battery Cells; High Rate Designed 50 Ah Li-Ion Cell for LEO Applications; Evaluation of Corrosion Behavior in Aerospace Lithium-Ion Cells; Performance of AEA 80 Ah Battery Under GEO Profile; LEO Li-Ion Battery Testing; A Review of the Feasibility Investigation of Commercial Laminated Lithium-Ion Polymer Cells for Space Applications; Lithium-Ion Verification Test Program; Panasonic Small Cell Testing for AHPS; Lithium-Ion Small Cell Battery Shorting Study; Low-Earth-Orbit and Geosynchronous-Earth-Orbit Testing of 80 Ah Batteries under Real-Time Profiles; Update on Development of Lithium-Ion Cells for Space Applications at JAXA; Foreign Comparative Technology: Launch Vehicle Battery Cell Testing; 20V, 40 Ah Lithium Ion Polymer Battery for the Spacesuit; Low Temperature Life-Cycle Testing of a Lithium-Ion Battery for Low-Earth-Orbiting Spacecraft; and Evaluation of the Effects of DoD and Charge Rate on a LEO Optimized 50 Ah Li-Ion Aerospace Cell.
Derived from text
Lithium Batteries; Aerospace Engineering; Electric Batteries; Energy Storage; Electrolytic Cells; Control Equipment; Nickel Compounds; Roving Vehicles; Short Circuits

20080015771 NEA Electronics, Inc., CA, USA
High Capacity Battery Cell By-Pass Switches: High Current Pulse Testing of Lithium-Ion Battery By-Pass Switches to Verify Their Ability to Withstand Short-Circuits
Rudoy, Edward; Woll, Pete; The 2004 NASA Aerospace Battery Workshop; August 2006; 34 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NEA switches successfully demonstrated their performance ability on numerous satellites in flight, spacecraft qualification testing, battery qualification testing and component level qualification testing. Performance characteristics of the switch in the battery highly depend upon the configuration of the electrical and mechanical integration in the battery. The rules for successful switch integration are similar to basic battery design:a) position the switch with shortest electrical connections

to the battery elements to reduce the resistance of its electrical interface connections, b) keep termination and cabling consistent with the peak current density of the switch.
Derived from text
Switches; Electric Connectors; Bypasses; Performance Tests; Current Density; Electric Batteries; Metal Ions; Lithium; High Current

20080015772 South Carolina Univ., Columbia, SC, USA
Incorporation of Physics-Based, Spatially-Resolved Battery Models into System Simulations
Dougal, Roger A.; Liu, Shengyi; White, Ralph E.; Guo, Qingzhi; The 2004 NASA Aerospace Battery Workshop; August 2006; 33 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Wrapper was developed to incorporate lithium ion and lithium/polymer battery models into VTB. Tests prove the wrappers work correctly and allow the advanced battery models to now be used to study more complex systems. Satellite power systems that use these battery models now allow realistic study of cycling and aging phenomena and cell balancing effects.
Derived from text
Electric Batteries; Lithium Batteries; Simulation; Complex Systems; Aging (Materials); Cycles; Lithium

20080015773 Tsenter Inc., Atlanta, GA, USA
Identification and Treatment of Lithium Battery Cell Imbalance under Flight Conditions
Tsenter, Boris; The 2004 NASA Aerospace Battery Workshop; August 2006; 18 pp.; In English; See also 20080015770; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Parallel connection of flying lithium cell to battery cell provides flexible cell capacity equalization. Flying cell relaxes the problem of high internal resistance of battery cell. Voltage difference is manifestation of cell diversity: capacity imbalance and internal resistance differences. Parameters measured in transient period of switching current certify quality of cell.
Derived from text
Flight Conditions; Lithium Batteries; Electric Potential; Electric Batteries

20080015774 Eagle-Picher Technologies, LLC, Joplin, MO, USA
Cell Equalization of Lithium-Ion Cells
Miller, Greg; Shimp, Phillip; Pennock, Tim; Studyvin, William; The 2004 NASA Aerospace Battery Workshop; August 2006; 4 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With increased use of Lithium-Ion (Li-Ion) batteries in military and space applications, it is important to understand individual cell performance. The performance of the individual cells in two 4 cell, 45 amp hour Li-Ion batteries was obtained through repeated cycle testing. To show the effects of cell equalization, battery 1 was subjected to 500 cycles consisting of bulk charging at 20 amperes, followed by cell equalization at 4.1 volts/5 amperes, and followed by battery discharge at 20 amperes. Battery 2 was subjected to 500 cycles consisting of bulk charging at 20 amperes, followed by battery discharge at 20 amperes. At the end of 500 bulk charge-discharge cycles without equalization, battery 2 was subjected to 7 equalization cycles consisting of bulk charge, cell equalization and battery discharge. After 500 cycles with equalization, battery 1 capacity decreased by 3 Ahr to 42 Ahr. The capacity of battery 2 decreased by 9 Ahr to 36 Ahr after 500 cycles without cell equalization.
Derived from text
Electric Batteries; Lithium; Metal Ions

20080015775 AEA Technology, Abingdon, UK
The Long-Term Performance of Small-Cell Batteries Without Cell-Balancing Electronics
Pearson, C.; Thwaite, C.; Curzon, D.; Rao, G.; The 2004 NASA Aerospace Battery Workshop; August 2006; 23 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tests approx.8 yrs ago showed Sony HC do not imbalance. AEA developed a theory (ESPC 2002): a) Self-discharge (SD) decreases with state-of-charge (SOC); b) Cells diverge to a state of dynamic equilibrium; c) Equilibrium spread depends on cell SD uniformity. Balancing model verified against test data. Short-term measures of SD difficult in Sony cells and very

small values, depends on technique. Long-term evidence supports lower SD at low SD. Battery testing best proof of performance, typically mission specific tests.
Derived from text
Electric Batteries; Performance Tests; Proving

20080015776 NASA Glenn Research Center, Cleveland, OH, USA
Lithium-Ion Verification Test Program
McKissock, Barbara; Manzo, Michelle; Miller, Thomas; Reid, Concha; Bennett, William; Gemeiner, Russel; The 2004 NASA Aerospace Battery Workshop; August 2006; 18 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Need for technology verification for aerospace applications. Structure flexible program that will allow assessment of current technology capabilities. Provide information about various vendors. Provide for assessment of technology developments. Developed statistical DOE to interpret relationships in data and to address program test goals and resource limitations. Data will be used to develop a model to predict life of cells as a function of DOD, temperature, and EOCV.
Derived from text
Proving; Lithium; Metal Ions; Aerospace Engineering

20080015777 Mine Safety Appliances Co., Sparks, MD, USA
Evaluation of Corrosion Behavior in Aerospace Lithium-Ion Cells
Sitter, L. T.; Matthias, C. L.; Shah, P. M.; Isaacs, N. D.; The 2004 NASA Aerospace Battery Workshop; August 2006; 30 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Cyclic Voltammograms Show Film Formation during Initial Scans. Conditioning Cycling Results Similar to Cyclic Voltammograms. In All Potentiostatic Tests, Final Currents Anodic and Low. Final Average Current Always <6 nA. Data Show No Corrosion of Polarized Samples. Greater than 400 h Required for Sample To Be Fully Passivated & Approach Final Current Level. Due to Low Currents, Instrument Noise on Aluminum Tests. Light Microscopy & SEM Showed Passive Film Formation. Electrolyte Chemical Analyses Show Trace Amounts or No Al. No Evidence of Corrosion Observed With Materials and Welded Joints in MSA s Lithium Ion Cell Design Under Worst Case Conditions at Room Temperature. Destructive Physical Analysis (DPA) an Integral Part of MSA s Battery Performance Testing.
Derived from text
Lithium; Metal Ions; Corrosion; Electric Batteries; Performance Tests; Low Currents; Chemical Analysis; Aluminum; Anodes

20080015778 Japan Aerospace Exploration Agency, Japan
A Review of the Feasibility Investigation of Commercial Laminated Lithium-Ion Polymer Cells for Space Applications
Xianming Wang; Chisa Yamada; Hitoshi Naito; Go Segami; Yoshitsugu Sone; Saburo Kuwajima; The 2004 NASA Aerospace Battery Workshop; August 2006; 45 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

JY-Type Lithium-Ion Polymer Cells have good cycling performance at temperature from 10 C to 30 C in a vacuum and excellent endurance in a space environment(vacuum, vibration, radiation).
Derived from text
Lithium; Vacuum; Vibration; Metal Ions; Cycles; Extraterrestrial Radiation

20080015779 NASA Johnson Space Center, Houston, TX, USA
20V, 40 Ah Lithium Ion Polymer Battery for the Spacesuit
Darcy, Eric; Wilburn, Monique; Hall, Dan; Roth, Peter; Das Gupta, Sankar; Jacobs, Jim; Bhola, Rakesh; Milicic, Gordan; Vandemeer, Dave; The 2004 NASA Aerospace Battery Workshop; August 2006; 41 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Objective: Consider a new battery design for EMU. Results: a) Electrovaya s aerospace cell production line is improving, but must further improve to achieve acceptable reliability; b) Completed functional, vibration, and thermal cycling of LIB; c) So far, electrical safety tests have produced good results; d) Completed functional, vibration, thermal cycling, power quality

and EMI of LIB Charger; e) Completed CDR on 9/23/04; and f) Manufacturing Readiness Review for flight cell/battery production scheduled for Dec 04.
Derived from text
Space Suits; Electric Batteries; Thermal Cycling Tests; Metal Ions; Lithium; Extravehicular Mobility Units

20080015780 NASA Glenn Research Center, Cleveland, OH, USA
Low Temperature Life-Cycle Testing of a Lithium-Ion Battery for Low-Earth-Orbiting Spacecraft
Reid, Concha; The 2004 NASA Aerospace Battery Workshop; August 2006; 25 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A flight-qualified, lithium-ion (Li-ion) battery developed for the Mars Surveyor Program 2001 Landeris undergoing life-testing at low temperature under a low-Earth-orbit (LEO) profile to assess its capability to provide long term energy storage for aerospace missions. NASA has embarked upon an ambitious course to return humans to the moon by 2015-2020 in preparation for robotic and human exploration of Mars and robotic exploration of the moons of outer planets. Li-ion batteries are excellent candidates to provide power and energy storage for multiple aspects of these missions due to their high specific energy, high energy density, and excellent low temperature performance. Laboratory testing of Li-ion technology is necessary in order to assess lifetime, characterize multi-cell battery-level performance under aerospace conditions, and to gauge safety aspects of the technology. Life-cycle testing provides an opportunity to examine battery-level performance and the dynamics of individual cells in the stack over the entire life of the battery. Data generated through this testing will be critical to establish confidence in the technology for its widespread use in manned and unmanned missions.
Author
Electric Batteries; Low Temperature; Energy Storage; Lithium; Metal Ions; Low Earth Orbits; Aerospace Environments; Robotics

20080015781 Mitsubishi Electric Corp., Japan
Cell Over Voltage Protection and Balancing Circuit of the Lithium-Ion Battery
Toshiyuki Kimura; The 2004 NASA Aerospace Battery Workshop; August 2006; 15 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Mitsubishi Electric Corporation (MELCO) has developed Lithium-Ion Battery with Cell Protection Circuit. The Cell Protection Circuit is necessary to avoid overcharge, because the Lithium-Ion Battery has no saturating voltage like Ni-Cd & Ni-H2. Our Cell Protection Circuit has the following functions: a) Over Charge Protection Function; b) Cell Balancing Function; c) Cell Charge & Discharge Function with a cell open failure; and e) Parallel Connection possible.
Derived from text
Electric Potential; Electrolytic Cells; Lithium; Metal Ions; Circuits; Cytology; Electric Batteries

20080015782 Lockheed Martin Space Systems Co., Sunnyvale, CA, USA
A Monte Carlo Model for Li-Ion Battery Life Projections
Isaacson, Mark J.; The 2004 NASA Aerospace Battery Workshop; August 2006; 19 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Monte Carlo model developed for Li-ion satellite battery. Model inputs include cell-to-cell property distributions and cell random failure (short and open) probabilities. Model output includes battery BOL and EOL property distribution functions. Accuracy of Battery Monte Carlo Model predictions are limited by accuracy of cell capacity fade models.
Derived from text
Monte Carlo Method; Electric Batteries; Probability Theory

20080015783 AEA Technology, Abingdon, UK
LEO Li-Ion Battery Testing
Russel, N.; Curzon, D.; Thwaite, C.; Shamir, Rami; The 2004 NASA Aerospace Battery Workshop; August 2006; 30 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Battery is of a robust enough design to cope with the variable discharge profiles including high current peaks of a typical

LEO mission profile. Overdischarge does not necessarily result in catastrophic failure. Real time LEO battery lifetest correlates with AEA capacity fade tool. Future: Continue EM cycling to 13000 cycles at 90 min; Decrease duration to 75 minutes; Maintain average discharge capacity of 3.3Ah; and Perform on an additional module 200000 1% DOD cycles.
Derived from text
Electric Batteries; High Current; Cycles; Real Time Operation

20080015784 Mine Safety Appliances Co., Sparks, MD, USA
Evaluation of the Effects of DoD and Charge Rate on a LEO Optimized 50 Ah Li-Ion Aerospace Cell
Baker, J. W.; Shah, P.M.; Stein, B. J.; George, D. S.; Isaacs, N. D.; The 2004 NASA Aerospace Battery Workshop; August 2006; 26 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Purpose: To determine effects of DoD and charge rate on cycle life for LEO cycling regime. Goals: a) Control Temperature to 24 C; b) Monitor End of Discharge Potential (EODP) vs Cycle; c) Monitor LEO Rate Capacity of Cells; d) Monitor C/2 Rate Capacity of Cells; e) Monitor Residual C/10 Capacity; f) Track Cell Impedance; g) Track Cell Resistance. 50 Ah Cell: Cells on track to deliver 30,000 or more LEO cycles at 40% DoD. Evaluation of DoD & Charge Rate (In Process): a) Thermal platens provide better temperature control than controlled environment (thermal differences between groups may still contribute to results); b) Increasing DoD decreases cycle life; c) Charge rate effects not clear (possible interactions, adjustments to charge protocol may alter final outcome); d) Lower internal impedance at fully charged state; e) Impedance increases with cycle life.
Derived from text
Low Earth Orbits; Impedance; Life (Durability); Temperature Control

20080015785 SAFT America, Inc., Cockeysville, MD, USA
Low-Earth-Orbit and Geosynchronous-Earth-Orbit Testing of 80 Ah Batteries under Real-Time Profiles
Staniewicz, Robert J.; Willson, John; Briscoe, J. Douglas; Rao, Gopalakrishna, M.; The 2004 NASA Aerospace Battery Workshop; August 2006, pp. 1-22; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To date the LEO battery has completed 5000 nominal cycles.The EODV is trending down by 50mV per 1000 cycles. To date the GEO battery has completed 2 nominal shadow periods and currently in sunlight period. Batteries testing after one year looks encouraging for aerospace application. There are no discrepancies between the current data and extensive testing conducted at Saft over the past 5 years.
Author
Electric Batteries; Real Time Operation; Low Earth Orbits; Cycles; Geosynchronous Orbits

20080015786 AEA Technology, Abingdon, UK
Lithium-Ion Small Cell Battery Shorting Study
Pearson, Chris; Curzon, David; Blackmore, Paul; Rao, Gopalakrishna; The 2004 NASA Aerospace Battery Workshop; August 2006, pp. 1-23; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Positive Temperature Coefficient (PTC) provides adequate sustained hard short protection for AEA batteries with up to 8 cells in series. PTC cannot protect against sustained hard short in AEA batteries with 10 cells or more in series. Protective fused connector is a proven way to protect larger batteries from hard short damage: a) Hard short not credible in unmanned missions; b) However, recommended during ground handling; c) Inexpensive item. Preliminary diode protection scheme has passed manned space safety requirements for high voltage batteries. SCM confirmed fused connector did not affect battery health, however, this affect of hard short on the its long calendar and cycle life performance needs to be verified.
Author
Electric Batteries; Lithium; Metal Ions; High Voltages; Life (Durability); Aerospace Safety; Connectors; Diodes

20080015787 Japan Aerospace Exploration Agency, Kanagawa, Japan
Update on Development of Lithium-Ion Cells for Space Applications at JAXA
Yamada, Chisa; Wang, Xianming; Naito, Hitoshi; Sone, Yoshitsugu; Segami, Go; Uno, Masatoshi; Kuwajima, Saburo; The 2004 NASA Aerospace Battery Workshop; August 2006; 28 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lithium-Ion Batteries in Development for Space Applications. A promising alternative to current alkaline batteries.

Prototype with improving performance: 1) High-rate specification: reduce active-material thickness; 2) High reliability: improve safety vent design and welding process. On-ground cycle-life testing from 1998: 1) Capacity: 10 - 100 Ah; 2) LEO operation (DOD: 25% and 40%): max. 25,000 cycles; 3) GEO operation (DOD: 80%): max. 1,500 cycles. On-going Engineering Test Mission (HAYABUSA): 1) Identical performance with ground test data; 2) Flying smoothly toward the asteroid 'ITOKAWA'
Derived from text
Metal Ions; Electric Batteries; Ground Tests; Life (Durability); Lithium; Low Earth Orbits; Alkaline Batteries

20080015788 AEA Technology, Abingdon, UK
Panasonic Small Cell Testing for AHPS
Pearson, C.; Blackmore, P.; Lain, M.; Walpole, A.; Darcy, Eric; The 2004 NASA Aerospace Battery Workshop; August 2006; 25 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

AEA selection and successful Interim Design Review for AHPS proves maturity of small cell approach for very large batteries. Cells show excellent opportunity for battery mass reduction for AHPS and other low cycle applications. Lack of cycle and extended calendar life make EOL battery performance difficult (AHPS 8 year mission). Preliminary design, AEA retained SONY 18650HC cell as baseline: a) Well characterized performance; b) Wealth of safety test data.
Derived from text
Electric Batteries; Design Analysis; Life (Durability)

20080015789 Japan Storage Battery Co. Ltd., Kyoto, Japan; GSY-USA, Inc., San Francisco, CA, USA
High Rate Designed 50 Ah Li-Ion Cell for LEO Applications
Takefumi Inoue; Nobutaka Imamura; Hiroaki Joshida; Kanemi Komada; Xianming Wang; Yoshitsugu Sone; Go Segami; Saburo Kuwajima; The 2004 NASA Aerospace Battery Workshop; August 2006; 21 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The cells with 1.50X surface area shows best performance on 20Ah charge/discharge cycling LEO mission profile, even at 50%DOD cycling. It has other benefits such as low heat generation and high discharge capability. These design features will be incorporated into a new space cell series. Reduced heat generation during operation. (easy control). Less heat is another essential reason of longer life. High rate discharge pulse capability is significantly increased
Derived from text
Cycles; Heat Generation; Lithium; Metal Ions; Electric Batteries

20080015790 AEA Technology, Abingdon, UK
Performance of AEA 80 Ah Battery Under GEO Profile
Russel, N.; Curzon, D.; Ng, K.; Lee, L.; Rao, G.; The 2004 NASA Aerospace Battery Workshop; August 2006; 25 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

To date completed three Solar Dynamic Observatory SDO real-time eclipse seasons. Sony 18650HC has a low rate of capacity fade under GEO cycling regime. Real time test results correlate with accelerated GEO lifetest data and AEA capacity fade prediction tool. This data, together with other AEA test data, justify the SDO Project decision to baseline Lithium-Ion chemistry for the spacecraft battery.
Derived from text
Geosynchronous Orbits; Real Time Operation; Electric Batteries; Ionic Reactions; Lithium; Metal Ions

20080015791 NASA Glenn Research Center, Cleveland, OH, USA
Lithium-Ion Cell Charge Control Unit
Reid, Concha; Button, Robert; Manzo, Michelle; McKissock, Barbara; Miller, Thomas; Gemeiner, Russel; Bennett, William; Hand, Evan; The 2004 NASA Aerospace Battery Workshop; August 2006; 24 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Life-test data of Lithium-Ion battery cells is critical in order to establish their performance capabilities for NASA missions and Exploration goals. Lithium-ion cells have the potential to replace rechargeable alkaline cells in aerospace applications, but

they require a more complex charging scheme than is typically required for alkaline cells. To address these requirements in our Lithium-Ion Cell Test Verification Program, a Lithium-Ion Cell Charge Control Unit was developed by NASA Glenn Research Center (GRC). This unit gives researchers the ability to test cells together as a pack, while allowing each cell to charge individually. This allows the inherent cell-to-cell variations to be addressed on a series string of cells and results in a substantial reduction in test costs as compared to individual cell testing. The Naval Surface Warfare Center at Crane, Indiana developed a power reduction scheme that works in conjunction with the Lithium-Ion Cell Charge Control Unit. This scheme minimizes the power dissipation required by the circuitry to prolong circuit life and improve its reliability.
Author
Aerospace Engineering; Life (Durability); Control Equipment; Lithium; Electric Batteries; Metal Ions; Reliability; Alkaline Batteries

20080015792 Northrop Grumman Corp., USA
Foreign Comparative Technology: Launch Vehicle Battery Cell Testing
Merideth, Brent; El-Sherief, Hossny; Williamson, John; Luddeke, Tim; Younker, Tom; The 2004 NASA Aerospace Battery Workshop; August 2006; 24 pp.; In English; See also 20080015770; 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

Objectives: a) Ensure foreign technologies are considered in future launch vehicle development; b) Fair tests that demonstrate the range of capabilities for the cell technology; c) Determine the strengths of the cells; d) Establish alternatives to current power technologies; and e) Develop a reference for future testing of cells or batteries. Results: a) Tested ten different Li-ion cells from three vendors; b) Results show most cells have a viable potential for use in launch vehicles; and c) Anomalies are not show stoppers - proper adherence to vendor recommendations will eliminate most concerns
Derived from text
Electric Batteries; Launch Vehicles; Anomalies

20080015793 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Battery Control Boards for Li-Ion Batteries on Mars Exploration Rovers
Ewell, R.; Ratnakumar, B. V.; Smart, M.; Chin, K. B.; Whitcanack, L.; Narayanan, S. R.; Surampudi, S.; The 2004 NASA Aerospace Battery Workshop; August 2006; 35 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Rechargeable Lithium-ion batteries have been operating successfully on both Spirit and Opportunity rovers for the last two years, which includes six months of Assembly Launch and Test Operations (ATLO), seven months of cruise and about eleven months of surface operations. The Battery Control Boards designed and fabricated in-house would protect cells against overcharge and over-discharge and provide cell balance. Their performance has thus far been quite satisfactory. The ground data o the mission simulation battery project little capacity loss of less than 3% during cruise and 180 sols. Batteries are poised to extend the mission beyond six months, if not a couple of years.
Derived from text
Lithium; Metal Ions; Electric Batteries; Ground Tests; Data Acquisition; Control Boards

20080015794 Lithion, Inc., Pawcatuck, CT, USA
Lithium-Ion Battery Electronics for Aerospace Applications
Wagner, Scott; Jones, Ed; Gitzendanner, Rob; The 2004 NASA Aerospace Battery Workshop; August 2006; 30 pp.; In English; See also 20080015770; 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

Battery Electronics have gone from optional to standard section of batteries. Electronics are progressing from a necessary pain to personal trainer for the battery. Electronics provide ‘Plug and Play’ with existing installations. Options available such as adjustable current shunting, Modularity and scalability shorten design cycle, decrease new product development costs.
Derived from text
Lithium; Metal Ions; Aerospace Engineering; Electric Batteries; Training Devices

20080015795 Lockheed Martin Space Systems Co., Sunnyvale, CA, USA
Hubble Space Telescope 2004 Battery Update
Hollandsworth, Roger; Armantrout, Jon; Whitt, Tom; Rao, Gopalakrishna M.; The 2004 NASA Aerospace Battery Workshop; August 2006; 48 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Battery cell wear out mechanisms and signatures are examined and compared to orbital data from the six on-orbit Hubble

Space Telescope (HST) batteries, and the Flight Spare Battery (FSB) Test Bed at Marshall Space Flight Center (MSFC), which is instrumented with individual cell voltage monitoring. The on-orbit HST batteries were manufactured on an expedited basis after the Challenger Shuttle Disaster in 1986. The original design called for the HST to be powered by six 50 Ah Nickel Cadmium batteries, which would have required a shuttle mission every 5 years for battery replacement. The decision to use NiH2 instead has resulted in a longer life battery set which was launched with HST in April 1990, with a design life of 7 years that has now exceeded 14+ years of orbital cycling. This chart details the specifics of the original HST NiH2 cell design. The HST replacement batteries for Service Mission 4, originally scheduled for Spring 2005, are currently in cold storage at NASA Goddard Space Flight Center (GSFC). The SM4 battery cells utilize slurry process electrodes having 80% porosity.
Derived from text
Electric Batteries; Hubble Space Telescope; Wear; Test Stands; Electrolytic Cells; Nickel Cadmium Batteries

20080015796 Electro Energy Mobile Products Incorporated, Colorado Springs, CO, USA
Super NiCd(TradeMark) Energy Storage for Gravity Probe-B Relativity Mission
Hayden, Jeffrey W.; French, Bob; Mason, Gary; Shawky, Shehata; The 2004 NASA Aerospace Battery Workshop; August 2006; 5 pp.; In English; See also 20080015770; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Gravity Probe-B (GP-B) Relativity Mission is a scientific mission that was conceived over 40 years ago to verify two predictions of Albert Einstein s General Theory of Relativity (1, 2) . The concept for the experiment came from Professor Leonard Schiff of Stanford University and G.E. Pugh (3) . Main components of the experiment are four ultra-precise gyroscopes, instrumentation to detect and measure small changes in gyros spin direction, and a telescope used to sight a reference star and maintain spacecraft alignment. The instruments will measure how the Earth's rotation drags space-time around with it, and how space and time are warped by the presence of the Earth. The GP-B spacecraft is orbiting the earth in a 640 km (400 mile) polar orbit and is spin stabilized, rotating at approximately 1 revolution per minute. Two 35 ampere-hour, 22 cell Super NiCd(TradeMark) batteries store power generated from 4 solar arrays, and provide power to the spacecraft during eclipse periods. Power generated by the solar arrays is sinusoidal in nature, and requires a battery that can efficiently accept this type of charging. Super NiCd battery technology was chosen for this mission for reliability and ability to fulfill spacecraft and payload operating requirements. Super NiCd batteries are an integral part of the GP-B power system, and were manufactured by Electro Energy, Mobile Products Inc. (formerly the Power Systems Department of EaglePicher Technologies, LLC) under contract to Lockheed Martin. Acceptance testing was performed on the two flight batteries to demonstrate workmanship and required electrical performance. Two 35 ampere-hour 8 cell test batteries were assembled and tested to establish and optimize battery operating parameters for the flight batteries. Within this paper, there is a description of the GP-B 35 Ampere-hour Super NiCd battery, and a summary of the flight batteries electrical performance data. This paper also contains an overview of the test batteries parametric test data that was used to develop the method of in-orbit charge control using voltage temperature compensated (V/T) limits. Data presented will demonstrate that the 35 Ah Super NiCd(TradeMark) battery can successfully meet the mission requirements.
Author
Nickel Cadmium Batteries; Energy Storage; Gravity Probe B; Relativity; Electric Batteries; Electric Potential; Gyroscopes

20080015797 NASA Johnson Space Center, Houston, TX, USA
Serial Charging Test on High Capacity Li-Ion Cells for the Orbiter Advanced Hydraulic Power System
Jeevarajan, Judith A.; Irlbeck, Brad; The 2004 NASA Aerospace Battery Workshop; August 2006; 26 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Although it looks like module level voltage drives the cutoff for charge, the actual cutoff is due to unbalanced cell voltages that drive the module voltage up. Individual cell voltage drives the cutoff for discharge Low resistance cells are the first to reach the low-voltage cutoff Cell-to-Cell voltage differences are generally small and show similar trends for each cycle Increase for a distinct window during charge and at the end of discharge Increase in max to min cell voltage difference with time/cycles Decrease in max to min cell voltage difference during high current pulses with time/cycles Individual cell voltage trends (with respect to other cells) are very repeatable from cycle to cycle, although voltage slowly degrades with time/cycles (resistance growth) Much more difference observed near end of discharge Little change in order of cell voltage (cell with highest voltage to cell with lowest voltage) Temp sensor on the side of cell (between 2 cells) shows much greater rise during discharge than for single cell tests (18 C vs 5 C) Conclusion: Serial Charging of this string of cells is feasible as it has only a minor impact on useful capacity
Derived from text
Electric Potential; Electrolytic Cells; Low Voltage; High Current; Cycles

20080015798 Naval Center for Space Technology, Washington, DC, USA

Lithium Ion Battery Cell Bypass Circuit Test Results at the U.S. Naval Research Laboratory

Garner, J. Christopher; The 2004 NASA Aerospace Battery Workshop; August 2006; 27 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Battery Level Charge Control Possible With Lithium Ion For Short Duration Missions. Must Incorporate Means To Equalize Battery Cell Voltage At Either Charge or Discharge. Concept use of battery cell bypass electronics as ground support equipment. Battery cell bypass electronics for FAME GEO mission support 2.5years in accelerated GEO cycle test. Charge currents for small GEO spacecraft low. Design may not work for LEO spacecraft with higher charge rates.

Author

Bypasses; Lithium; Electronic Equipment Tests; Electrolytic Cells; Electric Batteries; Accelerated Life Tests; Metal Ions

20080015799 Aerospace Corp., El Segundo, CA, USA

Thermal Behavior of Large Lithium-Ion Cells

Zimmerman, Albert H.; Quinzio, Michael V.; The 2004 NASA Aerospace Battery Workshop; August 2006; 15 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The heat generation behavior of battery cells is critical to the design of the thermal control portion of power systems for satellites and other space vehicles. Lithium-ion batteries require an adequately maintained thermal environment if they are to work properly for long periods of time. If lithium-ion batteries are allowed to get too warm, they can undergo accelerated degradation. If they get too cold their resistance can climb to unacceptably high levels. The properly designed thermal control system will be able to provide just enough cooling to the battery at both the beginning and the end of life. Precision thermal measurements have not been widely reported for many of the large lithium-ion cells that are now being considered for use in space power systems. Here we report such measurements for several designs of 40-50 Ah cells using a dynamic calorimeter1 to determine heat generation while the cells are charging and discharging at various rates. The Dynamic Calorimetry method is capable of determining heat generation in battery cells during high rate operation, since it has a time constant on the order of 30 seconds. Here we report the heat generation rate in lithium-ion cells while operating at charge and discharge currents up to C/2, at temperatures of 10, 20, and 30 C. The heat generation behavior of battery cells is typically expressed in terms of the thermoneutral potential, which is the potential at which the cell neither produces nor consumes heat. In ideal situations the thermoneutral potential is the enthalpy of reaction for the battery cell. Heat generation can be readily calculated from the thermoneutral potential by multiplying the difference between the cell voltage and the thermoneutral potential times the current. For most types of battery cells the enthalpy of reaction is essentially constant over the operating state of charge range of the cell. However, for lithium-ion cells the various stages of lithium intercalation of the anode and cathode can cause the voltage and the enthalpy to change dramatically as the cell is charged or discharged. It is expected that the unique state of charge dependence of the free energy and enthalpy of reaction in a lithium-ion cell will have a significant effect on its heat generation behavior. This will be examined here, and we will analyze a range of calorimetry measurements to evaluate the key issues in understanding and developing a model that can generally predict heat generation in lithium-ion cells.

Author

Heat Generation; Electric Batteries; Electrolytic Cells; Heat Measurement; Spacecraft Power Supplies; Temperature Effects; Thermal Environments

20080015800 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Imaging of Aerospace Battery Cells

Shue, Jack; Ramirez, Julian B.; Sullivan, David; Lee, Leonine; Rao, Gopalakrishna; The 2004 NASA Aerospace Battery Workshop; August 2006; 27 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Surface Thermal Profiles of Eagle Picher rabbit-ear 50Ah NiH2 and of Saft 40 Ah Li-ion cylindrical cells have been studied using ThermCAM S60 FLIR Systems. Popping Phenomenon in NiH2 cell is demonstrated Temperature gradient in NiH2 is slightly higher than normally considered, for example. Middle of stack to top or bottom is about 12.9 C compared to <7 C (may be due to passive cooling). Less than 1 C thermal gradient on the Li-Ion cell vessel surface. Significantly lower heat generation in Li-Ion cell compared to NiH2 cell. -May be due to a favorable charge method used for Li-Ion cell.

Derived from text

Temperature Gradients; Electric Batteries; Thermal Mapping; FLIR Detectors; Heat Generation

20080015801 Sanyo Electric Co. Ltd., Japan

The Development of Hermetically Sealed Aerospace Nickel-Metal Hydride Cell

Kazuhiro Uchiyama; Hitoshi Maeda; Toshiyuki Nohma; Ikuo Yonezu; Kensuke Nakatani; Hiroaki Kusawake; Yoshitsugu Sone; Saburo Kuwajima; The 2004 NASA Aerospace Battery Workshop; August 2006; 27 pp.; In English; See also 20080015770; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Artificial satellites generate electricity by using solar panels to collect solar energy during periods of sunshine. The secondary batteries supply the satellite with electricity during eclipse periods. The Secondary batteries play an important roll in the satellite s operation. (1) We have developed aerospace Ni-MH cells(10Ah to approx. 20Ah- 35Ah)for use in medium-sized and small satellites. We have examined the long-life characteristics of our aerospace Ni-MH cells. We have completed the development of cells, which have high reliability, are compact and have a long life. (2) Our 20Ah Ni-MH batteries in MDS-1 showed good performance as the main power source of the satellite during periods of eclipse. (3)13Ah Ni-MH cells are used for OICETS and SELENE.

Derived from text

Nickel Compounds; Metal Hydrides; Artificial Satellites; Electric Batteries; Storage Batteries; Solar Energy; Solar Cells

20080016579 Tokyo Inst. of Tech., Tokyo, Japan; Tokyo Inst. of Tech., Tokyo, Japan; Tokyo Inst. of Tech., Tokyo, Japan; Tokyo Inst. of Tech., Tokyo, Japan

Flight Performance of Planetary Atmospheric Flight Airship (PLAS)

The IPSI BgD Transactions on Advanced Research: Multi-, Inter-, and Trans-disciplinary Issues in Computer Science and Engineering, Volume 3, No. 1; January 2007, pp. pp. 5-8; In English; See also 20080016574; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

This paper studies flight performance of airship employed to observe scientifically the atmosphere of planet including Mars and Venus with little effort or fuel expenditure (Planetary Atmospheric Flight Airship: PLAS). The flight region of the planetary airship is determined taking into consideration the temperature and pressure on Mars and Venus, as well as basic [imitations of airships. The performance of the atmospheric flight airship is studied on its longitudinal dynamical feature. Result of the study shows some interesting features of the airship flying on Mars and Venus

Author

Flight Characteristics; Planetary Atmospheres; Airships; Planetary Temperature

89
ASTRONOMY

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

20080016532 Stanford Linear Accelerator Center, Stanford, CA, USA

Flat Decay Phase in the Early X-ray Afterglows of Swift GRBs

Granot, J.; Mar. 2007; 8 pp.; In English

Report No.(s): DE2007-901580; SLAC-PUB-12418; No Copyright; Avail.: National Technical Information Service (NTIS)

Many Swift GRBs show an early phase of shallow decay in their X-ray afterglows, lasting from t approximately 10(sup 2.5)s to approximately 10(sup 4)s after the GRB, where the flux decays as approximately t(sup -0.2) - t(sup 0.8). This is perhaps the most mysterious of the new features discovered by Swift in the early X-ray afterglow, since it is still not clear what causes it. I discuss different possible explanations for this surprising new discovery, as well as their potential implications for the gamma-ray efficiency, the afterglow kinetic energy, and perhaps even for the physics of collisionless relativistic shocks. NTIS

Afterglows; X Rays; Gamma Ray Bursts; Gamma Ray Astronomy; Gamma Ray Sources (Astronomy)

90
ASTROPHYSICS

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

20080015686 Lawrence Livermore National Lab., Livermore, CA USA
Floating into Thin Air
Hazi, A. U.; Feb. 08, 2007; 6 pp.; In English
Report No.(s): DE2007-902619; UCRL-TR-227893; No Copyright; Avail.: Department of Energy Information Bridge

On May 18, 2005, a giant helium balloon carrying the High Energy Focusing Telescope (HEFT) sailed into the spring sky over the deserts of New Mexico. The spindly steel and aluminum gondola that houses the optics, detectors, and other components of the telescope floated for 25 hours after its launch from Fort Sumner, New Mexico. For 21 of those hours, the balloon was nearly 40 kilometers above Earth's surface--almost four times higher than the altitude routinely flown by commercial jet aircraft. In the upper reaches of Earth's atmosphere, HEFT searched the universe for x-ray sources from highly energetic objects such as binary stars, galaxy clusters, and supermassive black holes.
NTIS
Earth Atmosphere; Floating; Universe; X Ray Sources

20080015689 Lawrence Livermore National Lab., Livermore, CA USA
Use of Nuclear Explosives to Disrupt or Divert Asteroids
Dearborn, D. S.; Patenaude, S.; Managan, R. A.; Mar. 02, 2007; 23 pp.; In English
Report No.(s): DE2007-902607; UCRL-PROC-228569; No Copyright; Avail.: National Technical Information Service (NTIS)

Nuclear explosives are a mature technology with well-characterized effects. Proposed utilizations include a near asteroid burst to ablate surface material and nudge the body to a safer orbit, or a direct sub-surface burst to fragment the body. For this latter method, previous estimates suggest that for times as short as 1000 days, over 99.999% of the material is diverted, and no longer impacts the Earth, a huge mitigation factor. To better understand these possibilities, we have used a multidimensional radiation/hydrodynamics code to simulate sub-surface and above surface bursts on an inhomogeneous, 1 km diameter body with an average density of 2 g/cc. The body, or fragments (up to 750,000) are then tracked along 4 representative orbits to determine the level of mitigation achieved. While our code has been well tested in simulations on terrestrial structures, the greatest uncertainty in these results lies in the input. These results, particularly the effort to nudge a body into a different orbit, are dependant on NEO material properties, like the dissipation of unconsolidated material in a low gravity environment, as well as the details on an individual body's structure. This problem exists in simulating the effect of any mitigation technology. In addition to providing an greater understanding of the results of applying nuclear explosives to NEO-like bodies, these simulations suggest what must be learned about these bodies to improve the predictive capabilities. Finally, we will comment on some of the popular misinformation abounding about the utility of nuclear explosives.
NTIS
Asteroids; Disrupting; Explosives

20080015700 Naples Univ., Italy
GRBs from the First Stars
Iocco, F.; Apr. 2007; 2 pp.; In English
Report No.(s): DE2007-902481; SLAC-PUB-12457; No Copyright; Avail.: Department of Energy Information Bridge

The authors present an estimate of the Gamma Ray Bursts which should be expected from metal-free, elusive first generation of stars known as PopulationIII (PopIII). We derive the GRB rate from these stars from the the Stellar Formation Rate obtained in several Reionization scenarios available in the literature. In all of the analyzed models we find that GRBs from PopIII are subdominant with respect to the standard (PopII) ones up to z (approximately) 10.
NTIS
Astrophysics; Gamma Ray Bursts; Stars

20080015712 Stanford Univ., Stanford, CA, USA
Identification of High Energy Gamma-Ray Sources and Source Populations in the Era of Deep All-Sky Coverage
Reimer, O.; Torres, D. F.; Apr. 2007; 6 pp.; In English
Report No.(s): DE2007-902495; SLAC-PUB-12459; No Copyright; Avail.: National Technical Information Service (NTIS)

A large fraction of the anticipated source detections by the Gamma-ray Large Area Space Telescope (GLAST-LAT) will

initially be unidentified. We argue that traditional approaches to identify individuals and/or populations of gamma ray sources will encounter procedural limitations. Those limitations are discussed on the background of source identifications from EGRET observations. Generally, our ability to classify (faint) source populations in the anticipated GLAST dataset with the required degree of statistical confidence will be hampered by sheer source wealth. A new paradigm for achieving the classification of gamma ray source populations is discussed.
NTIS
Astrophysics; Gamma Rays; Populations

20080015713 Stanford Univ., Stanford, CA, USA
Demystifying an Unidentified EGERT Source by VHE Gamma-Ray Observations
Reimer, O.; Funk, S.; Apr. 2007; 4 pp.; In English
Report No.(s): DE2007-902496; SLAC-PUB-12464; No Copyright; Avail.: National Technical Information Service (NTIS)

In a novel approach in observational high-energy gamma-ray astronomy, observations carried out by imaging atmospheric Cherenkov telescopes provide necessary templates to pinpoint the nature of intriguing, yet unidentified EGRET gamma-ray sources. Using GeV-photons detected by CGRO EGRET and taking advantage of high spatial resolution images from H.E.S.S. observations, we were able to shed new light on the EGRET observed gamma-ray emission in the Kookaburra complex whose previous coverage in the literature is somewhat contradictory. 3EGJ14206038 very likely accounts for two GeV gamma-ray sources (E>1 GeV), both in positional coincidence with the recently reported pulsar wind nebulae (PWN) by HESS in the Kookaburra/Rabbit complex. PWN associations at VHE energies, supported by accumulating evidence from observations in the radio and X-ray band, are indicative for the PSR/plerionic origin of spatially coincident, but still unidentified Galactic gamma-ray sources from EGRET. This not only supports the already suggested connection between variable, but unidentified low-latitude gamma-ray sources with pulsar wind nebulae (3EGJ14206038 has been suggested as PWN candidate previoulsy), it also documents the ability of resolving apparently confused EGRET sources by connecting the GeV emission as measured from a large-aperture space-based gamma-ray instrument with narrow field-of-view but superior spatial resolution observations by ground-based atmospheric Cherenkov telescopes, a very promising identification technique for achieving convincing individual source identifications in the era of GLAST-LAT.
NTIS
Astrophysics; Gamma Rays

20080015868 Lawrence Livermore National Lab., Livermore, CA USA
Stellar Astrophysics and a Fundamental Description of Thermonuclear Reactions 04-ERD-058 Final Report
Ormand, W. E.; Navratil, P.; Libby, S. B.; Feb. 23, 2007; 26 pp.; In English
Report No.(s): DE2007-902351; UCRL-TR-228314; No Copyright; Avail.: Department of Energy Information Bridge

The primary goal of the project was to investigate new methods to provide a comprehensive understanding of how reactions between light nuclei proceed in hot, dense environments, such as stellar interiors. The project sought to develop an entirely new theoretical framework to describe the dynamics of nuclear collisions based on the fundamental nuclear interactions. Based on the new theoretical framework, new computational tools were developed to address specific questions in nuclear structure and reactions. A full study of the true nature of the three-nucleon interaction was undertaken within the formalism of effective field theory. We undertook a preliminary theoretical study of the quantum corrections to electron screening in thermal plasmas to resolve a discrepancy exhibited in previous theoretical approaches.
NTIS
Astrophysics; Stars; Thermonuclear Reactions; Nucleons; Nuclear Structure; Nuclear Interactions; Nuclear Reactions

20080015994 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Experimental Probe of Inflationary Cosmology: A Mission Concept Study for NASA's Einstein Inflation Probe
February 2008; 201 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001
Report No.(s): JPL Publication 08-4; Copyright; Avail.: CASI: A10, Hardcopy

The report describes a feasibility study for the Inflation Probe, Experimental Probe of Inflationary Cosmology (EPIC). The starting point for EPIC is the Task Force Cosmic Microwave Background (CMB) Research (TFCR), a joint National Science Foundation (NSF) / National Aeronautics and Space Administration (NASA)/Department of Energy (DOE) report describing the scientific goals of the Inflation Probe, and provides a technology roadmap leading to its realization. EPIC takes full advantage of the unique advantages of a space-borne observation: all-sky coverage with a redundant scan strategy optimized

for polarization, high sensitivity, multiple frequency bands for foreground removal, and rigorous control of systematic errors. EPIC uses high-sensitivity scan-modulated bolometer arrays in broad frequency bands ranging from 30 to 300 GHz. We studied two possible architectures, a low-cost option with six 30-cm telescopes targeted to search only for Inflationary polarization, and a comprehensive-science option with a single 4-m telescope with angular resolution sufficient to also study polarization from density fluctuations and gravitational lensing.
Author
Cosmology; Feasibility; Cosmic Microwave Background Radiation; NASA Programs; High Frequencies

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

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

20080015738 Missouri Univ., Rolla, MO, USA; Missouri Univ., Rolla, MO, USA; Missouri Univ., Rolla, MO, USA
Characterization and Glass Formation of JSC-1 Lunar and Martian Soil Simulants
Sen, Subhayu; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM
Contract(s)/Grant(s): NAS8-02096; Copyright; Avail.: Other Sources; Abstract Only

The space exploration mission of NASA requires long duration presence of human being beyond the low earth orbit (LEO), especially on Moon and Mars. Developing a human habitat or colony on these planets would require a diverse range of materials, whose applications would range from structural foundations, (human) life support, (electric) power generation to components for scientific instrumentation. A reasonable and cost-effective approach for fabricating the materials needed for establishing a self-sufficient human outpost would be to primarily use local (in situ) resources on these planets. Since ancient times, glass and ceramics have been playing a vital role on human civilization. A long term project on studying the feasibility of developing glass and ceramic materials using Lunar and Martian soil simulants (JSC-1) as developed by Johnson Space Center has been undertaken. The first step in this on-going project requires developing a data base on results that fully characterize the simulants to be used for further investigations. The present paper reports characterization data of both JSC-1 Lunar and JSC Mars-1 simulants obtained up to this time via x-ray diffraction analysis, scanning electron microscopy, thermal analysis (DTA, TGA) and chemical analysis. The critical cooling rate for glass formation for the melts of the simulants was also measured in order to quantitatively assess the glass forming tendency of these melts. The importance of the glasses and ceramics developed using in-situ resources for constructing human habitats on Moon or Mars is discussed.
Author
Ceramics; Chemical Analysis; Glass; In Situ Resource Utilization; Lunar Soil; Thermogravimetry; Thermal Analysis; Mars Surface

20080015767 NASA Marshall Space Flight Center, Huntsville, AL, USA
Is There Water on the Moon? NASA's LCROSS Mission
Noneman, Steven; November 09, 2007; 19 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015767

NASA is preparing for its return to the moon with the Lunar CRater Observation and Sensing Satellite (LCROSS) mission. This secondary payload spacecraft will travel with the Lunar Reconnaissance Orbiter (LRO) satellite to the Moon on the same Atlas-V 401 Centaur rocket launched from Cape Canaveral Air Force Station, Florida. The LCROSS mission will robotically seek to determine the presence of water ice at the Moon's South Pole. The 1000kg Secondary Payload budget is efficiently used to provide a highly modular and reconfigurable LCROSS Spacecraft with extensive heritage to accurately guide the expended Centaur into the crater. Upon separation, LCROSS flies through the impact plume, telemetering real-time images and characterizing water ice in the plume with infrared cameras and spectrometers. LCROSS then becomes a 700kg impactor itself, to provide a second opportunity to study the nature of the Lunar Regolith. LCROSS provides a critical ground-truth for Lunar Prospector and LRO neutron and radar maps, making it possible to assess the total lunar water inventory. This presentation contains a reference to video animation of the LCROSS mission that will be covered separately.
Derived from text
Lunar Exploration; Lunar Craters; Mission Planning; Moon; Extraterrestrial Water; Lunar Satellites

20080015768 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Space Homestead and Creation of Real Estate and Industry Beyond Earth

Curreri, Peter A.; Detweiler, Michael K.; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Copyright; Avail.: Other Sources; Abstract Only

During the 1970's large habitats were proposed by G. K. O'Neill and studied by NASA that could house 10,000 to 4 million people in Earth/Moon space. These peoples would be employed in building space solar satellites and more habitats for new settlers. Such a program, the NASA studies concluded, could reach financial break even in 17 to 30 years of peak Apollo level expenditures. During the STAIF 2007 conference the first author presented a proposal to begin human settlement not by building city size structures but with a minimum technology habitat that could provide subsistence for a human family (10 people) and be capable of producing new habitats with extraterrestrial materials and energy. Such a habitat would be the equivalent of a space homestead. Later these habitats could cooperate to form towns and cities in a free ad hoe manner similar to the development of the American west. In addition the approach could provide a quicker return on investment and lower start up costs, and would be of a scale that could be developed and tested within the planned transportation and lunar base architecture of the Exploration Vision. This paper examines the population growth kinetics of humans in space, and the development of space solar power industry for the space homestead in comparison to larger habitat designs considered in the 1970's.

Author

Habitats; Spacecrews; Buildings; Extraterrestrial Matter; Lunar Bases; Populations; Artificial Satellites

20080015910 NASA Johnson Space Center, Houston, TX, USA

NASA and Caterpillar: An Innovative Partnership

Savely, Robert T.; March 03, 2008; 10 pp.; In English; Earth and Space Conference 2008: 11th International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, 3-5 Mar. 2008, Long Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

This viewgraph presentation reviews the partnership between NASA and the Caterpillar Corporation. Through the Innovative Partnerships Program (IPP) NASA is providing leveraged technology for projects that are new initiatives that enhance NASA's ability to meet mission technology goals by providing seed funding to initiate cost-shared, joint-development partnerships. This relationship will assist NASA in the development of lunar In Situ resource utilization (ISRU) and surface handling equipment control and hardware requirements and the human-system interaction processes for time delayed remote operations.

CASI

In Situ Resource Utilization; NASA Programs; Lunar Resources; Lunar Excavation Equipment; Lunar Construction Equipment

20080015990 NASA Marshall Space Flight Center, Huntsville, AL, USA

Is There Water on the Moon? NASA's LCROSS Mission [Supplemental Video]

November 09, 2007; In English; See also 20080015767; Video is on CD-ROM, Sound, Color, 4.15 min.; No Copyright; Avail.: CASI: C01, CD-ROM

Presents a supplemental video supporting the original conference presentation under the same title. The conference presentation discussed NASA's preparation for its return to the moon with the Lunar CRater Observation and Sensing Satellite (LCROSS) mission which will robotically seek to determine the presence of water ice at the Moon's South Pole. This secondary payload spacecraft will travel with the Lunar Reconnaissance Orbiter (LRO) satellite to the Moon on the same Atlas-V 401 Centaur rocket launched from Cape Canaveral Air Force Station, Florida. The 1000kg Secondary Payload budget is efficiently used to provide a highly modular and reconfigurable LCROSS Spacecraft with extensive heritage to accurately guide the expended Centaur into the crater. Upon separation, LCROSS flies through the impact plume, telemetering real-time images and characterizing water ice in the plume with infrared cameras and spectrometers. LCROSS then becomes a 700kg impactor itself, to provide a second opportunity to study the nature of the Lunar Regolith. LCROSS provides a critical ground-truth for Lunar Prospector and LRO neutron and radar maps, making it possible to assess the total lunar water

inventory. The video contains an animated simulation of the Centaur launch, LRO separation, LRO high resolution lunar survey, LCROSS mission elements and LCROSS impactor separation and impact observations.
CASI
Lunar Exploration; Lunar Craters; Mission Planning; Moon; Extraterrestrial Water; Lunar Satellites

20080015993 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Ares V: Application to Solar System Scientific Exploration
Reh, Kim; Spilker, Tom; Elliott, John; Balint, Tibor; Donahue, Ben; McCormick, Dave; Smith, David B.; Tandon, Sunil; Woodcock, Gordon; January 2008; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-03001
Report No.(s): JPL Publication 08-3; Copyright; Avail.: CASI: A03, Hardcopy

A wide range of science missions could be launched by Ares V that would not be possible otherwise. Ares V capability is expected to open up lunar, Mars, near Earth and solar system missions for heavy payloads, and might even enable reasonable sample return missions from the far reaches of the solar system. Furthermore, Ares V, configured with an upper stage, could enable vastly more capable missions that could bring the search for habitability at far reaches of the solar system much closer. To make maximum use of this capability, design requirements specific to challenging solar system exploration missions must be identified for consideration during Ares V development. Follow-on studies should be considered to examine in detail the capability of the Ares V vehicle to enable large, complex solar system exploration missions, the results of which will be valuable to NASA s programs for both human and robotic exploration.
Author
Ares 5 Cargo Launch Vehicle; Space Exploration; Sample Return Missions; Mars Missions; NASA Programs; Robotics; Complex Systems; Habitability

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SOLAR PHYSICS

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

20080015820 Science Applications International Corp., San Diego, CA, USA
An Alternative Interpretation of the Relationship between the Inferred Open Solar Flux and the Interplanetary Magnetic Field
Riley, Pete; Astrophysical Journal; September 20, 2007; Volume 667, pp. L97-L100; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG05EE09C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/522001

Photospheric observations at the Wilcox Solar Observatory (WSO) represent an uninterrupted data set of 32 years and are therefore unique for modeling variations in the magnetic structure of the corona and inner heliosphere over three solar cycles. For many years, modelers have applied a latitudinal correction factor to these data, believing that it provided a better estimate of the line-of-sight magnetic field. Its application was defended by arguing that the computed open flux matched observations of the interplanetary magnetic field (IMF) significantly better than the original WSO correction factor. However, no physically based argument could be made for its use. In this Letter we explore the implications of using the constant correction factor on the value and variation of the computed open solar flux and its relationship to the measured IMF. We find that it does not match the measured IMF at 1 AU except at and surrounding solar minimum. However, we argue that interplanetary coronal mass ejections (ICMEs) may provide sufficient additional magnetic flux to the extent that a remarkably good match is found between the sum of the computed open flux and inferred ICME flux and the measured flux at 1 AU. If further substantiated, the implications of this interpretation may be significant, including a better understanding of the structure and strength of the coronal field and I N providing constraints for theories of field line transport in the corona, the modulation of galactic cosmic rays, and even possibly terrestrial climate effects.
Author
Interplanetary Magnetic Fields; Solar Flux; Solar Magnetic Field; Coronal Mass Ejection; Coronas; Galactic Cosmic Rays; Magnetic Field Configurations

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*.

20080016495 National Academy of Sciences - National Research Council, Washington, DC, USA
Managing Space Radiation Risk in the New Era of Space Exploration
[2008]; 153 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH05CC16C; Copyright; Avail.: Other Sources

Space exploration is a risky enterprise. Rockets launch astronauts at enormous speeds into a harsh, unforgiving environment. Spacecraft must withstand the bitter cold of space and the blistering heat of reentry. Their skin must be strong enough to keep the inside comfortably pressurized and tough enough to resist damage from micrometeoroids. Spacecraft meant for lunar or planetary landings must survive the jar of landing, tolerate dust, and be able to take off again. For astronauts, however, there is one danger in space that does not end when they step out of their spacecraft. The radiation that permeates space -- unattenuated by Earth s atmosphere and magnetosphere -- may damage or kill cells within astronauts bodies, resulting in cancer or other health consequences years after a mission ends. The National Aeronautics and Space Administration (NASA) has recently embarked on Project Constellation to implement the Vision for Space Exploration -- a program announced by President George W. Bush in 2004 with the goal of returning humans to the Moon and eventually transporting them to Mars. To adequately prepare for the safety of these future space explorers, NASA s Exploration Systems Mission Directorate requested that the Aeronautics and Space Engineering Board of the National Research Council establish a committee to evaluate the radiation shielding requirements for lunar missions and to recommend a strategic plan for developing the radiation mitigation capabilities needed to enable the planned lunar mission architecture
Derived from text
Aerospace Engineering; Extraterrestrial Radiation; NASA Programs; Space Exploration; Aerospace Environments; Bioastronautics; Extraterrestrial Environments; Constellation Program; Planetary Environments; Lunar Environment

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GENERAL

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

20080015866 NASA Dryden Flight Research Facility, Edwards, CA, USA
[NASA] in the 21st Century
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This viewgraph presentation reviews the NASA programs in support of Aeronautical and Space research. This research involves imagining the future of air travel. There are three major Aeronautics technology programs: (1) Fundamental Aeronautics, (2) Aviation Safety and (3) Airspace Systems. The aim of exploring the depths of the universe through earth based and space based assets. Other Space programs include the plans for exploration of the moon and Mars.
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