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WHAT'S INSIDE

NASA STI Program ... in Profile

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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

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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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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

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

Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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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.

20070021375 Government Accountability Office, Washington, DC, USA

Reagan National Airport: Update on Capacity to Handle Additional Flights and Impact on Other Area Airports

Feb. 2007; 36 pp.; In English

Report No.(s): PB2007-107742; GAO-07-352; No Copyright; Avail.: CASI: A03, Hardcopy

In 1999, GAO reported that Reagan National Airport could accommodate at least 36 more slots, which are authorizations from the Department of Transportation (DOT) for a takeoff or landing. In 2000 and 2003, two federal statutes, known as AIR-21 and Vision 100, permitted DOT to award 44 new slots to airlines, 24 of which could be used for flights to cities more than 1,250 miles, which was the statutorily mandated limit for non stop flights from Reagan National. The DOT awards went to airlines serving six cities (Denver, Las Vegas, Los Angeles, Phoenix, Salt Lake City, and Seattle). For this year's reauthorization of the Federal Aviation Administration (FAA), GAO was asked for an update on the capacity of Reagan National to accommodate additional slots and the effect of relaxing the perimeter rule. GAO updated its 1999 study to answer these key questions: (1) To what extent can Reagan National accommodate additional flights; (2) Since AIR-21 and Vision 100, what changes have occurred in market share and fares for flights operating between the six beyond-perimeter cities and the three Washington, D.C., area airports. In commenting on this report, DOT and the airports authority generally agree with our findings but with one exception, the airports authority disagrees with DOT's estimate of slots because it disputes their methodological assumptions. We believe the department's methodology for estimating airport capacity is appropriate.

NTIS

Airports; United States; Air Transportation; Civil Aviation

20070021689 NASA Langley Research Center, Hampton, VA, USA

Tandem Cylinder Noise Predictions

Lockhard, David P.; Khorrami, Mehdi R.; CHoudhari, Meelan M.; Hutcheson, Florence V.; Brooks, Thomas F.; Stead, Daniel J.; May 23, 2007; 26 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 23-25 May 2007, Rome, Italy; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.18.03

Report No.(s): AIAA Paper-2007-3450; Copyright; Avail.: CASI: A03, Hardcopy

In an effort to better understand landing-gear noise sources, we have been examining a simplified configuration that still maintains some of the salient features of landing-gear flow fields. In particular, tandem cylinders have been studied because they model a variety of component level interactions. The present effort is directed at the case of two identical cylinders spatially separated in the streamwise direction by 3.7 diameters. Experimental measurements from the Basic Aerodynamic Research Tunnel (BART) and Quiet Flow Facility (QFF) at NASA Langley Research Center (LaRC) have provided steady surface pressures, detailed off-surface measurements of the flow field using Particle Image Velocimetry (PIV), hot-wire measurements in the wake of the rear cylinder, unsteady surface pressure data, and the radiated noise. The experiments were conducted at a Reynolds number of 166 105 based on the cylinder diameter. A trip was used on the upstream cylinder to insure a fully turbulent shedding process and simulate the effects of a high Reynolds number flow. The parallel computational effort uses the three-dimensional Navier-Stokes solver CFL3D with a hybrid, zonal turbulence model that turns off the turbulence production term everywhere except in a narrow ring surrounding solid surfaces. The current calculations further explore the influence of the grid resolution and spanwise extent on the flow and associated radiated noise. Extensive comparisons with the experimental data are used to assess the ability of the computations to simulate the details of the flow. The results show

that the pressure fluctuations on the upstream cylinder, caused by vortex shedding, are smaller than those generated on the downstream cylinder by wake interaction. Consequently, the downstream cylinder dominates the noise radiation, producing an overall directivity pattern that is similar to that of an isolated cylinder. Only calculations based on the full length of the model span were able to capture the complete decay in the spanwise correlation, thereby producing reasonable noise radiation levels.

Author

Aerodynamic Configurations; Landing Gear; Noise Prediction; Computational Fluid Dynamics; Navier-Stokes Equation; Cylindrical Bodies; Wind Tunnel Tests; Aerodynamic Noise

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.

20070021312 Smith (Wilbur) and Associates, Washington, DC, USA, Morrison-Maierle, Inc., Billings, MT, USA

Montana Air Service: Opportunities and Challenges

Keidel-Adams, P.; Arnold, S.; Nickum, R.; Maynard, M.; Orthmeyer, T.; Feb. 2007; 306 pp.; In English

Report No.(s): PB2007-107532; No Copyright; Avail.: CASI: A14, Hardcopy

This report analyzes the challenges facing Montana's commercial service airports and outlines the opportunities for air service and air cargo development. There are 15 commercial service airports in the state. Before opportunities could be recognized, this report researched various airport, state, and industry trends including historic and current service by airport; socioeconomic trends; impact of federal initiatives; airline bankruptcies and mergers; airline operating costs; low-fare carrier impact; and limitations of and changes to the Essential Air Service program. Current air passenger leakage at Montana airports was quantified and future passenger demand was estimated. The challenges to improving air service in Montana include the overlap of air service market areas, limited population, the current state of the airline industry, and the distance to hub airports. Realistic air service and air cargo opportunities are recommended in the form of a state marketing strategy. Statewide recommendations include developing a statewide air service committee, funding an air service development program, providing airport assistance, and creating a policy statement. Individual airport recommendations include establishing local catalyst and air service task force, working with current carriers, educating the community, and pursuing new air service opportunities.

NTIS

Air Transportation; Montana

20070021339 Government Accountability Office, Washington, DC, USA

Aviation Security: Cost Estimates Related to TSA Funding of Checked Baggage Screening Systems at Los Angeles and Ontario Airports

Mar. 2007; 38 pp.; In English

Report No.(s): PB2007-107720; GAO-07-445; No Copyright; Avail.: CASI: A03, Hardcopy

To meet the mandate to screen all checked baggage for explosives by December 31, 2003, the Transportation Security Administration (TSA) placed minivan-sized explosive detection systems (EDS) and other screening equipment in airport lobbies. However, these interim lobby solutions have caused operational inefficiencies, in part because they require a large number of screeners. According to TSA, in-line baggage screening--where EDS machines are integrated with an airport's baggage conveyor system--can be a more cost-effective and efficient alternative to lobby-based, stand-alone equipment. For example, in-line systems can increase the efficiency of airport, airline, and TSA operations, and lower costs by reducing the number of screeners. Moreover, in-line explosive detection systems can enhance security because they reduce congestion in airport lobbies, thus removing a potential target for terrorists. However, installing in-line systems can have large up-front costs, related to the need for airport modifications. To help defray these costs, in 2003, Congress authorized TSA to reimburse airports up to 75 percent of the cost to install these systems by entering 'letter of intent' (LOI) agreements. An LOI, though

not a binding commitment of federal funding, represents TSA's intent to provide the agreed-upon funds in future years if the agency receives sufficient appropriations to cover the agreement.
NTIS
Airport Security; Airports; Baggage; Cost Estimates; Ontario; Security; Transportation

20070021373 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aircraft Accident Report: Crash During Approach to Landing, Circuit City Stores, Inc., Cessna Citation 560, N500AT, Pueblo, Colorado, on February 16, 2005
Jan. 23, 2007; 86 pp.; In English
Report No.(s): PB2007-910403; NTSB/AAR-07/02; No Copyright; Avail.: CASI: A05, Hardcopy

This report explains the accident involving a Cessna Citation 560, N500AT, operated by Martinair, Inc., for Circuit City Stores, Inc., which crashed about 4 nautical miles east of Pueblo Memorial Airport, Pueblo, Colorado, while on an instrument landing system approach to runway 26R. The safety issues discussed in this report include inadequate training on operations in icing conditions, inadequate deice boot system operational guidance, the need for automatic deice boot systems, inadequate certification requirements for flight into icing conditions, and inadequate stall warning margins in icing conditions.
NTIS
Cessna Aircraft; Circuits; Colorado; Crashes; Safety Management; Transportation

20070021376 Government Accountability Office, Washington, DC, USA
Aviation Safety: Improved Data Collection Needed for Effective Oversight of Air Ambulance Industry
Feb. 2007; 66 pp.; In English
Report No.(s): PB2007-107743; GAO-07-353; No Copyright; Avail.: CASI: A04, Hardcopy

From 1998 to 2005, the air ambulance industry grew, largely in stand-alone (independent) operations, and experienced an increased number of accidents, resulting in added industry efforts to improve safety. Although there are few data on the industry's basic aspects, available data show increased numbers of helicopters and base stations between 2003 and 2005. Most of the base-station growth has been at airports and stand-alone helipads rather than hospital-based locations, a strong indication of the shift to stand-alone operations. The annual number of accidents increased from 1998 to 2003 but declined in 2004 and 2005. The decline may reflect added industry safety efforts, such as the creation of a study group that recommends best practices. However, the lack of actual flight-hour data prevents calculation of the industry's accident rate, making it difficult to determine whether the industry has become more or less safe. FAA's main challenge in providing safety oversight for air ambulances is that its oversight approach is not geared toward air ambulance operations. For example, FAA uses the same set of regulations to oversee air ambulance operations as it uses to oversee other air taxi services. Air ambulance flights are subject to greater risks than other helicopter operations because they often fly at night, in a variety of weather conditions, and to remote sights to provide medical attention. These transports also can involve multiple medical and aviation officials, increasing the potential for human error. The broad nature of the applicable regulations further inhibits FAA oversight because they may not fully address the potential risks air ambulance operations face. FAA has initiated many efforts to strengthen its oversight of air ambulances but does not evaluate the effectiveness of its efforts. FAA's efforts include establishing a task force to review air ambulance accidents, plans for hiring additional staff to oversee large operators, and issuing guidance to inspectors and operators promoting various safety practices. However, FAA does not track implementation of its voluntary guidance. Also, FAA cannot measure basic industry trends, such as accident rate changes. Measuring these trends requires actual flight-hour data, which FAA does not currently collect. Without this data, FAA cannot know if its efforts are achieving their intended results.
NTIS
Aircraft Safety; Ambulances; Data Acquisition; Emergencies; Flight Safety; Industries; Medical Services; Regulations

20070021475 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, Hendrix and Hendrix, Roswell, NM, USA
An Analysis of Preflight Weather Briefings
Prinzo, O. Veronica; Hendrix, Alfred M.; Hendrix, Ruby; February 2007; 24 pp.; In English
Contract(s)/Grant(s): AM-B-05-HRR-516
Report No.(s): DOT/FAA/AM-07/4; No Copyright; Avail.: CASI: A03, Hardcopy

Weather is often cited as a factor in general aviation (GA) accidents and mishaps, The type of weather information requested from, or provided by, automated flight service station (AFSS) specialists is dependent on weather conditions at the time the preflight briefing occurs. However, little is known about how this weather information is used by GA pilots. The

purpose of this research was to document the types of AFSS weather information that GA pilots requested and received and how this information might influence flight planning and weather-based decisions. A content analysis was performed on 306 GA pilot telephone conversations with AFSS specialists who staffed the preflight position. Twenty-four hours of continuous recordings of one good, typical, and bad weather day at an AFSS in the New England, Northwest Mountain, and Southwest Region were obtained prior to the Federal Aviation Administration contracting out those services. The data show that more calls were made on days of bad weather than on days of good and typical weather within the vicinity serviced by the AFSS. Approximately 78% of the pilots requested a preflight briefing (they requested a standard weather briefing more often than any other), and about 15% declined a weather briefing when asked by the AFSS specialist. Of the pilot-requested preflight weather briefings, specialists relayed the following weather items: Weather synopsis, sky conditions (clouds), visibility, and weather conditions at the departure, en route, and destination point. When pilots declined preflight weather briefings, as they did in 15.4% of the calls (good weather 16.7940, typical weather 5.0%, bad weather 20.6%), AFSS still relayed weather synopsis and sky conditions (clouds) in addition to any other weather conditions that might prove to be significant during a flight. Whether by asking for additional information or receiving weather information from specialists, 31 pilots decided that it was best to change their flight plans (46.9% delayed, 15.6% postponed or cancelled their flights, and 15.6940 looked for alternate routes and destination points). Surprisingly, 27% of the pilots who were told 'VFR Flight Not Recommended' went ahead and filed a VFR flight plan anyway.
Author
General Aviation Aircraft; Aircraft Accidents; Weather; Flight Plans; Visibility

20070021634 NASA Dryden Flight Research Center, Edwards, CA, USA
Flight Test Hazard Planning Near the Speed of Light
Henwood, Bart; Huete, Rod; [2007]; 46 pp.; In English; 2007 Flight Test Safety Workshop, 8-10 May 2007, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A viewgraph presentation describing flight test safety near the speed of light is shown. The topics include: 1) Concept; 2) Portal Content; 3) Activity to Date; 4) FTS Database Updatd FAA Program; 5) FAA Flight Test Risk Management; 6) CFR 14 Part 21.35 Current and proposed changes; 7) An Online Resource for Flight Test Safety Planning; 8) Data Gathering; 9) NTPS Role; 10) Example Maturation; 11) Many Varied Inputs; 12) Matured Stall Hazards; 13) Loss of Control Mitigations; 14) FAA Access; 15) NASA PBMA Website Link; 16) FAR Reference Search; 17) Record Field Search; 18) Keyword Search; and 19) Results of FAR Reference Search.
CASI
Flight Tests; Flight Safety; Hazards; Data Bases; Mission Planning

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\tStructural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20070021386 Naval Surface Warfare Center, Dahlgren, VA, USA
Payload Dispensing System Particularly Suited for Unmanned Aerial Vehicles
Rivers, E. P., Inventor; 25 Nov 03; 16 pp.; In English
Patent Info.: Filed Filed 25 Nov 03; US-Patent-Appl-SN-10-729-578
Report No.(s): PB2007-102552; No Copyright; Avail.: CASI: A03, Hardcopy

A payload dispensing system and a method of operation thereof are disclosed that comprises an on-board computer, a magazine, and a controller all of which operatively cooperate so that cartridge actuating devices may be selectively activated so that the contents of the payload being carried by an unmanned aerial vehicle can be accurately delivered to a target of interest.
NTIS
Cartridges; Dispensers; Payloads; Pilotless Aircraft

20070021457 NASA Dryden Flight Research Center, Edwards, CA, USA

The Hyper-X Flight Systems Validation Program

Redifer, Matthew; Lin, Yohan; Bessent, Courtney Amos; Barklow, Carole; May 2007; 53 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-214620; H-2693; Copyright; Avail.: CASI: A04, Hardcopy

For the Hyper-X/X-43A program, the development of a comprehensive validation test plan played an integral part in the success of the mission. The goal was to demonstrate hypersonic propulsion technologies by flight testing an airframe-integrated scramjet engine. Preparation for flight involved both verification and validation testing. By definition, verification is the process of assuring that the product meets design requirements; whereas validation is the process of assuring that the design meets mission requirements for the intended environment. This report presents an overview of the program with emphasis on the validation efforts. It includes topics such as hardware-in-the-loop, failure modes and effects, aircraft-in-the-loop, plugs-out, power characterization, antenna pattern, integration, combined systems, captive carry, and flight testing. Where applicable, test results are also discussed. The report provides a brief description of the flight systems onboard the X-43A research vehicle and an introduction to the ground support equipment required to execute the validation plan. The intent is to provide validation concepts that are applicable to current, follow-on, and next generation vehicles that share the hybrid spacecraft and aircraft characteristics of the Hyper-X vehicle.

Author

Hypersonic Flight; Supersonic Combustion Ramjet Engines; X-43 Vehicle; NASA Programs; Flight Tests; Systems Engineering

20070021458 NASA Ames Research Center, Moffett Field, CA, USA

Measurement and Characterization of Helicopter Noise in Steady-State and Maneuvering Flight

Schmitz, Fredric H.; Greenwood, Eric; Sickenberger, Richard D.; Gopalan, Gaurav; Sim, Ben Well-C; Conner, David; Moralez, Ernesto; Decker, William A.; May 1, 2007; 17 pp.; In English; AHS 63rd Annual Forum and Technology Display, 1-3 May 2007, Virginia Beach, VA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A special acoustic flight test program was performed on the Bell 206B helicopter outfitted with an in-flight microphone boom/array attached to the helicopter while simultaneous acoustic measurements were made using a linear ground array of microphones arranged to be perpendicular to the flight path. Air and ground noise measurements were made in steady-state longitudinal and steady turning flight, and during selected dynamic maneuvers. Special instrumentation, including direct measurement of the helicopter s longitudinal tip-path-plane (TPP) angle, Differential Global Positioning System (DGPS) and Inertial Navigation Unit (INU) measurements, and a pursuit guidance display were used to measure important noise controlling parameters and to make the task of flying precise operating conditions and flight track easier for the pilot. Special care was also made to test only in very low winds. The resulting acoustic data is of relatively high quality and shows the value of carefully monitoring and controlling the helicopter s performance state. This paper has shown experimentally, that microphones close to the helicopter can be used to estimate the specific noise sources that radiate to the far field, if the microphones are positioned correctly relative to the noise source. Directivity patterns for steady, turning flight were also developed, for the first time, and connected to the turning performance of the helicopter. Some of the acoustic benefits of combining normally separated flight segments (i.e. an accelerated segment and a descending segment) were also demonstrated.

Author

Helicopter Performance; Aircraft Noise; Acoustic Measurement; Noise Measurement; Maneuvers; Bell Aircraft; Display Devices; Inertial Navigation

20070021482 NASA Langley Research Center, Hampton, VA, USA

Recent Advances in Durability and Damage Tolerance Methodology at NASA Langley Research Center

Ransom, J. B.; Glaessgen, E. H.; Raju, I. S.; Harris, C. E.; [2007]; 20 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 732759.07.09; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021482

Durability and damage tolerance (D&DT) issues are critical to the development of lighter, safer and more efficient aerospace vehicles. Durability is largely an economic life-cycle design consideration whereas damage tolerance directly addresses the structural airworthiness (safety) of the vehicle. Both D&DT methodologies must address the deleterious effects of changes in material properties and the initiation and growth of damage that may occur during the vehicle s service lifetime.

The result of unanticipated D&DT response is often manifested in the form of catastrophic and potentially fatal accidents. As such, durability and damage tolerance requirements must be rigorously addressed for commercial transport aircraft and NASA spacecraft systems. This paper presents an overview of the recent and planned future research in durability and damage tolerance analytical and experimental methods for both metallic and composite aerospace structures at NASA Langley Research Center (LaRC).
Author
Damage; Durability; Tolerances (Mechanics); Methodology; Molecular Dynamics; Aerospace Vehicles; Aircraft Design

20070021483 NASA Langley Research Center, Hampton, VA, USA
Plans and Status of Wind-Tunnel Testing Employing an Aeroservoelastic Semispan Model
Perry, Boyd, III; Silva, Walter A.; Florance, James R.; Wieseman, Carol D.; Pototzky, Anthony S.; Sanetrik, Mark D.; Scott, Robert C.; Keller, Donald F.; Cole, Stanley R.; Coulson, David A.; [2007]; 20 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07.20.03
Report No.(s): AIAA 2007-1770; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the research objectives, summarizes the pre-wind-tunnel-test experimental results to date, summarizes the analytical predictions to date, and outlines the wind-tunnel-test plans for an aeroservoelastic semispan wind-tunnel model. The model is referred to as the Supersonic Semispan Transport (S4T) Active Controls Testbed (ACT) and is based on a supersonic cruise configuration. The model has three hydraulically-actuated surfaces (all-movable horizontal tail, all-movable ride control vane, and aileron) for active controls. The model is instrumented with accelerometers, unsteady pressure transducers, and strain gages and will be mounted on a 5-component sidewall balance. The model will be tested twice in the Langley Transonic Dynamics Tunnel (TDT). The first entry will be an 'open-loop' model-characterization test; the second entry will be a 'closed-loop' test during which active flutter suppression, gust load alleviation and ride quality control experiments will be conducted.
Author
Aeroservoelasticity; Wind Tunnel Tests; Semispan Models; Supersonic Transports; Active Control; Accelerometers; Pressure Sensors; Strain Gages; Ailerons; Vibration Damping

20070021633 NASA Dryden Flight Research Center, Edwards, CA, USA
Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908
Bowers, Al; Cole, Jennifer Hansen; Martin, Cam; [2007]; 60 pp.; In English; 63rd Anniversary Region, AFF Pilot School, 7 May 2007, Ontario, Canada; Original contains color illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021633

This viewgraph presentation reviews the experiments that the Wright Brothers conducted prior to their first powered flight in 1903 to developing the first practical aircraft in 1905. Many pictures of the gliders and other devices are used to illustrate the gradual development and experimentation that proceeded the first powered flight,
CASI
Gliders; Gliding; Flight Vehicles; Flight Test Vehicles; Research Vehicles

20070021685 NASA Dryden Flight Research Center, Edwards, CA, USA
Build-up Approach to Updating the Mock Quiet Spike(TM)Beam Model
Herrera, Claudia Y.; Pak, Chan-gi; May 2007; 21 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2007-214621; H-2719; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021685

A crucial part of aircraft design is ensuring that the required margin for flutter is satisfied. A trustworthy flutter analysis, which begins by possessing an accurate dynamics model, is necessary for this task. Traditionally, a model was updated manually by fine tuning specific stiffness parameters until the analytical results matched test data. This is a time consuming iterative process. The NASA Dryden Flight Research Center has developed a mode matching code to execute this process in a more efficient manner. Recently, this code was implemented in the F-15B/Quiet Spike (Gulfstream Aerospace Corporation, Savannah, Georgia) model update. A build-up approach requiring several ground vibration test configurations and a series of model updates was implemented to determine the connection stiffness between aircraft and test article. The mode matching

code successfully updated various models for the F-15B/Quiet Spike project to within 1 percent error in frequency and the modal assurance criteria values ranged from 88.51-99.42 percent.
Author
Aircraft Models; Flutter Analysis; F-15 Aircraft; Mathematical Models; Flight Tests; Beams (Supports)

20070021688 NASA Langley Research Center, Hampton, VA, USA
Flaperon Modification Effect on Jet-Flap Interaction Noise Reduction for Chevron Nozzles
Thomas, Russell H.; Mengle, Vinod G.; Stoker, Robert W.; Brusniak, Leon; Elkoby, Ronen; May 21, 2007; 20 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA 2007-3666; Copyright; Avail.: CASI: A03, Hardcopy

Jet-flap interaction (JFI) noise can become an important component of far field noise when a flap is immersed in the engine propulsive stream or is in its entrained region, as in approach conditions for under-the-wing engine configurations. We experimentally study the effect of modifying the flaperon, which is a high speed aileron between the inboard and outboard flaps, at both approach and take-off conditions using scaled models in a free jet. The flaperon modifications were of two types: sawtooth trailing edge and mini vortex generators (vg s). Parametric variations of these two concepts were tested with a round coaxial nozzle and an advanced chevron nozzle, with azimuthally varying fan chevrons, using both far field microphone arrays and phased microphone arrays for source diagnostics purposes. In general, the phased array results corroborated the far field results in the upstream quadrant pointing to JFI near the flaperon trailing edge as the origin of the far field noise changes. Specific sawtooth trailing edges in conjunction with the round nozzle gave marginal reduction in JFI noise at approach, and parallel co-rotating mini-vg s were somewhat more beneficial over a wider range of angles, but both concepts were noisier at take-off conditions. These two concepts had generally an adverse JFI effect when used in conjunction with the advanced chevron nozzle at both approach and take-off conditions.
Author
Jet Flaps; Flaperons; Ailerons; Aerodynamic Noise; Wing Flaps; Noise Reduction; Coaxial Nozzles; Aerodynamic Configurations

20070021731 NASA Langley Research Center, Hampton, VA, USA
Deployable System for Crash-Load Attenuation
Kellas, Sotiris; Jackson, Karen E.; May 2007; 18 pp.; In English; AHS 63rd Annual Forum and Technology Display, 1-3 May 2007, Virginia Beach, VA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

An externally deployable honeycomb structure is investigated with respect to crash energy management for light aircraft. The new concept utilizes an expandable honeycomb-like structure to absorb impact energy by crushing. Distinguished by flexible hinges between cell wall junctions that enable effortless deployment, the new energy absorber offers most of the desirable features of an external airbag system without the limitations of poor shear stability, system complexity, and timing sensitivity. Like conventional honeycomb, once expanded, the energy absorber is transformed into a crush efficient and stable cellular structure. Other advantages, afforded by the flexible hinge feature, include a variety of deployment options such as linear, radial, and/or hybrid deployment methods. Radial deployment is utilized when omnidirectional cushioning is required. Linear deployment offers better efficiency, which is preferred when the impact orientation is known in advance. Several energy absorbers utilizing different deployment modes could also be combined to optimize overall performance and/or improve system reliability as outlined in the paper. Results from a series of component and full scale demonstration tests are presented as well as typical deployment techniques and mechanisms. LS-DYNA analytical simulations of selected tests are also presented.
Author
Crashes; Honeycomb Structures; Light Aircraft; Loads (Forces); Attenuation; Rotary Wing Aircraft; Fabrication

20070021748 NASA Langley Research Center, Hampton, VA, USA
A Turbine-powered UAV Controls Testbed
Motter, Mark A.; High, James W.; Guerreiro, Nelson M.; Chambers, Ryan S.; Howard, Keith D.; May 07, 2007; 8 pp.; In English; Infotech\@Aerospace 2007 Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2007-2751; Copyright; Avail.: CASI: A02, Hardcopy

The latest version of the NASA Flying Controls Testbed (FLiC) integrates commercial-off-the-shelf components including

airframe, autopilot, and a small turbine engine to provide a low cost experimental flight controls testbed capable of sustained speeds up to 200 mph. The series of flight tests leading up to the demonstrated performance of the vehicle in sustained, autopiloted 200 mph flight at NASA Wallops Flight Facility's UAV runway in August 2006 will be described. Earlier versions of the FLiC were based on a modified Army target drone, AN/FQM-117B, developed as part of a collaboration between the Aviation Applied Technology Directorate at Fort Eustis, Virginia and NASA Langley Research Center. The newer turbine powered platform (J-FLiC) builds on the successes using the relatively smaller, slower and less expensive unmanned aerial vehicle developed specifically to test highly experimental flight control approaches with the implementation of C-coded experimental controllers. Tracking video was taken during the test flights at Wallops and will be available for presentation at the conference. Analysis of flight data from both remotely piloted and autopiloted flights will be presented. Candidate experimental controllers for implementation will be discussed. It is anticipated that flight testing will resume in Spring 2007 and those results will be included, if possible.
Author
Drone Vehicles; Flight Tests; Pilotless Aircraft; Turbine Engines

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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

20070021635 NASA Dryden Flight Research Center, Edwards, CA, USA
Suborbital Telepresence and Over-the-Horizon Networking
Freudinger, Lawrence C.; May 11, 2007; 16 pp.; In English; Annual American Society for Photogrammetry and Remote Sensing Conference: Identifying Geospatial Solutions, 7-11 May 2007, Tampa, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021635

A viewgraph presentation describing the suborbital telepresence project utilizing in-flight network computing is shown. The topics include: 1) Motivation; 2) Suborbital Telepresence and Global Test Range; 3) Tropical Composition, Cloud, and Climate Coupling Experiment (TC4); 4) Data Sets for TC4 Real-time Monitoring; 5) TC-4 Notional Architecture; 6) An Application Integration View; 7) Telepresence: Architectural Framework; and 8) Disruption Tolerant Networks.
CASI
Teleoperators; Suborbital Flight; Computer Networks; Airborne/Spaceborne Computers; Space Exploration; Aircraft Communication; Earth Sciences

20070021636 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Dryden Flight Research Center C-17 Research Overview
Miller, Chris; 23 May 2007; 12 pp.; In English; Air Force/Boeing - Test Program management Review, 23 May 2007, Long Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021636

A general overview of NASA Dryden Flight Research Center's C-17 Aircraft is presented. The topics include: 1) 2006 Activities PHM Instrumentation Refurbishment; 2) Acoustic and Vibration Sensors; 3) Gas Path Sensors; 4) NASA Instrumentation System Racks; 5) NASA C-17 Simulator; 6) Current Activities; 7) Future Work; 8) Lawn Dart ; 9) Weight Tub; and 10) Parachute Test Vehicle.
CASI
C-17 Aircraft; General Overviews; Aircraft Design; Aeronautical Engineering; Test Vehicles

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.

20070021389 Bachman and Lapointe, P.C., New Haven, CT, USA
Split Vane Flow Blocker
Coull, J. A., Inventor; Nikkanen, J. P., Inventor; 16 Dec 03; 6 pp.; In English
Contract(s)/Grant(s): N00019-02-C-3003
Patent Info.: Filed Filed 16 Dec 03; US-Patent-Appl-SN-10-737 599
Report No.(s): PB2007-102566; No Copyright; Avail.: CASI: A02, Hardcopy

A gas path flow blocker comprising a plurality of vanes each comprising a forward portion and an aft portion defining a plurality of gas paths, a forward ring comprising a central axis about which is circumferentially disposed the plurality of forward portions, and an aft ring disposed about the central axis about which is circumferentially disposed the plurality of aft portions wherein the forward ring and the aft ring are moveable with respect to each other to at least partially block the flow of a gas through the gas paths.
NTIS
Vanes; Gas Flow; Blocking

20070021391 Honeywell International, Inc., Morristown, NJ, USA
Gas Turbine High Temperature Turbine Blade Outer Air Seal Assembly
Morris, M. C., Inventor; Halfmann, S. H., Inventor; Wilson, C. A., Inventor; Pollock, S. J., Inventor; Larson, C. A., Inventor; 11 Dec 03; 15 pp.; In English
Contract(s)/Grant(s): DAAJ02-94-C-0030; F33615-94-C-2507
Patent Info.: Filed Filed 11 Dec 03; US-Patent-Appl-SN-10-734 922
Report No.(s): PB2007-102565; No Copyright; Avail.: CASI: A03, Hardcopy

A turbine shroud assembly includes forward and aft hangers, an axisymmetric plenum assembly, ceramic shroud segments, ceramic spacers, and forward and aft rope seals. The plenum assembly supplies impingement cooling to the shroud and the hangers. The impingement cooling to the forward and aft hangers is controlled independently to improve blade tip clearance. The rope seals are radially inward from the hangers and reduce cooling flow leakage. The turbine shroud assembly can operate in a higher temperature environment using less cooling flow than the prior art.
NTIS
Gas Turbines; High Temperature; Seals (Stoppers); Shrouds; Turbine Blades; Turbines

20070021686 NASA Dryden Flight Research Center, Edwards, CA, USA
The X-43A Flight Research Program: Lessons Learned on the Road to Mach 10
Peebles, Curtis; [2007]; 311 pp.; In English; No Copyright; Avail.: CASI: A14, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021686

During an aerospace engineer's undergraduate studies, he or she will attend classes in aerodynamics, thermodynamics, structures, stability and control, dynamics, design, propulsion, and computer science, along with the related courses in mathematics, physics, statistics, and chemistry required to understand the material. Upon graduation, the new engineer will have acquired a basic knowledge of how to build an aerospace vehicle. What only comes through experience, however, is the understanding of the inevitable imperfect process through which an aerospace vehicle is built. This is the adventure of turning a basic concept into functional hardware. Engineers working on a project must often deal with ambiguous situations. They are routinely asked by management to provide risk assessments of a project, yet even after careful analysis uncertainties remain. The project must be accomplished within finite limits of time and money. The question an engineer answers is whether the solution to potential problem is worth the cost and schedule delay, or if the solution might actually be worse than the problem it is meant to solve. Review protocols are established to ensure that an unknown has not been overlooked. But these cannot protect against an unknown unknown. Examples of these situations can be found in the history of the X-43A Hyper-X (Hypersonic Experiment) program. In this NASA project, a supersonic combustion ramjet (scramjet) engine was flight tested on a subscale vehicle. The X-43A Hyper-X Research Vehicle (HXRV) was launched from a B-52B mothership, then boosted to the test speed by a modified Pegasus rocket first stage, called the Hyper-X Launch Vehicle (HXLV). Once at the proper speed and altitude, the X-43A separated from the booster, stabilized itself, and then the engine test began. Although

wind-tunnel scramjet engine tests had begun in the late 1950s, before the Hyper-X program there had never been an actual in-flight test of such an engine integrated with an appropriate airframe. Thus, while the scramjet had successfully operated in the artificial airflow of wind tunnels, the concept had yet to be proven in real air. These conditions meant changes in density and temperature, as well as changes in angle of attack and sideslip of a free-flying vehicle. A wind tunnel is limited in its ability to simulate these subtle factures, which have a major impact on almost any vehicle, but especially that of a scramjet's performance. The Hyper-X project was to provide a real-world benchmark of the ground test data. The full scale X-43A engine would be operated in the wind tunnel, and then flown, and the data from its operation would then be compared with projections. If these matched, the wind tunnel data would be considered a reliable design tool for future scramjet. If there were significant differences, the reasons for these would have to be identified. Until such information was available, scramjets would lack the technological maturity to be considered for future space launch or high-speed atmospheric flight vehicles.
Derived from text

Supersonic Combustion Ramjet Engines; Wind Tunnel Tests; X-43 Vehicle; Mach Number; Hypersonic Speed; Aerospace Engineering; Research Projects

20070021697 NASA Langley Research Center, Hampton, VA, USA

Small UAV Research and Evolution in Long Endurance Electric Powered Vehicles

Logan, Michael J.; Chu, Julio; Motter, Mark A.; Carter, Dennis L.; Ol, Michael; Zeune, Cale; May 07, 2007; 7 pp.; In English; Infotech\@Aerospace 2007 Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07

Report No.(s): AIAA 2007-2730; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021697

This paper describes recent research into the advancement of small, electric powered unmanned aerial vehicle (UAV) capabilities. Specifically, topics include the improvements made in battery technology, design methodologies, avionics architectures and algorithms, materials and structural concepts, propulsion system performance prediction, and others. The results of prototype vehicle designs and flight tests are discussed in the context of their usefulness in defining and validating progress in the various technology areas. Further areas of research need are also identified. These include the need for more robust operating regimes (wind, gust, etc.), and continued improvement in payload fraction vs. endurance.
Author

Electric Batteries; Flight Tests; Pilotless Aircraft; Time; Fly By Wire Control

08
AIRCRAFT STABILITY AND CONTROL

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

20070021638 NASA Dryden Flight Research Center, Edwards, CA, USA

Guidance and Control of an Autonomous Soaring Vehicle with Flight Test Results

Allen, Michael J.; May 08, 2007; 21 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021638

A guidance and control method was developed to detect and exploit thermals for energy gain. Latency in energy rate estimation degraded performance. The concept of a UAV harvesting energy from the atmosphere has been shown to be feasible with existing technology. Many UAVs have similar mission constraints to birds and sailplanes. a) Surveillance; b) Point to point flight with minimal energy; and c) Increased ground speed.
Derived from text

Flight Tests; Surveillance; Autonomy; Soaring; Gliders; Pilotless Aircraft

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20070021480 NASA Dryden Flight Research Center, Edwards, CA, USA
Dryden Flight Research Center: The World's Premiere Installation for Atmospheric Flight Research
Ratnayake, Nalin Asela; April 27, 2007; 19 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021480

This viewgraph presentation reviews NASA Dryden's capabilities, the work that Dryden has done for NASA, and its current research. Dryden's Mission is stated to advance technology and science through flight. The mission elements are: (1) Perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology, (2) Validate space exploration concepts, (3) Conduct airborne remote sensing and science observations, (4) Support operations of the Space Shuttle and the ISS for NASA and the Nation.
CASI
Aeronautical Engineering; Research; Test Facilities; Research Facilities; Flight Tests

13
ASTRODYNAMICS

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

20070021535 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mission Design for the Lunar Reconnaissance Orbiter
Beckman, Mark; [2007]; 17 pp.; In English; 29th Annual AAS Guidance and Control Conference, 4-8 Feb. 2006, Breckenridge, CO, USA; Original contains black and white illustrations
Report No.(s): AAS-07--057; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021535

The Lunar Reconnaissance Orbiter (LRO) will be the first mission under NASA's Vision for Space Exploration. LRO will fly in a low 50 km mean altitude lunar polar orbit. LRO will utilize a direct minimum energy lunar transfer and have a launch window of three days every two weeks. The launch window is defined by lunar orbit beta angle at times of extreme lighting conditions. This paper will define the LRO launch window and the science and engineering constraints that drive it. After lunar orbit insertion, LRO will be placed into a commissioning orbit for up to 60 days. This commissioning orbit will be a low altitude quasi-frozen orbit that minimizes stationkeeping costs during commissioning phase. LRO will use a repeating stationkeeping cycle with a pair of maneuvers every lunar sidereal period. The stationkeeping algorithm will bound LRO altitude, maintain ground station contact during maneuvers, and equally distribute periselene between northern and southern hemispheres. Orbit determination for LRO will be at the 50 m level with updated lunar gravity models. This paper will address the quasi-frozen orbit design, stationkeeping algorithms and low lunar orbit determination.
Author
Lunar Orbits; Mission Planning; Lunar Satellites; Unmanned Spacecraft; Lunar Orbiter

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20070021296 InDyne, Inc., Cocoa Beach, FL, USA
Chronology of KSC and KSC Related Events for 2006
Liston, Elaine E.; February 2007; 279 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2007-214727; Copyright; Avail.: CASI: A13, Hardcopy

This document is intended to serve as a record of KSC events and is a reference source for historians and other

researchers. Arrangement is by day and month and individual articles are attributed to published sources. Materials were researched and compiled by the KSC Library Archivist for KSC Library Services Contractor, InDyne, Inc.
Author
Chronology; NASA Programs; Spacecraft Launching; Reports; Documents; Summaries

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

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

20070021588 NASA Johnson Space Center, Houston, TX, USA
The Disposal of Spacecraft and Launch Vehicle Stages in Low Earth Orbit
Johnson, Nicholas L.; [2007]; 9 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021588

Spacecraft and launch vehicle stages abandoned in Earth orbit have historically been a primary source of debris from accidental explosions. In the future, such satellites will become the principal cause of orbital debris via inadvertent collisions. To curtail both the near-term and far-term risks posed by derelict spacecraft and launch vehicle stages to operational space systems, numerous national and international orbital debris mitigation guidelines specifically recommend actions which could prevent or limit such future debris generation. Although considerable progress has been made in implementing these recommendations, some changes to existing vehicle designs can be difficult. Moreover, the nature of some missions also can present technological and budgetary challenges to be compliant with widely accepted orbital debris mitigation measures.
Author
Space Debris; Launch Vehicles; Collisions; Low Earth Orbits; Risk; Accidents; Spacecraft Launching

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*.

20070021234 Jacobs Engineering Group, Inc., Albuquerque, NM, USA
ISO 14624 Series - Space Systems - Safety and Compatibility of Materials Flammability Assessment of Spacecraft Materials
Hirsch, David B.; May 2007; 5 pp.; In English; International Standardization Organization ISO TC 20/SC 14, Space Systems and Operations, 21-25 May 2007, Beijing, China
Report No.(s): WSTF # PPP-07-0160; Copyright; Avail.: CASI: A01, Hardcopy

A viewgraph presentation on the flammability of spacecraft materials is shown. The topics include: 1) Spacecraft Fire Safety; 2) Materials Flammability Test; 3) Impetus for enhanced materials flammability characterization; 4) Exploration Atmosphere Working Group Recommendations; 5) Approach; and 6) Status of implementation
CASI
Aerospace Systems; Flammability; Systems Compatibility; Spacecraft Construction Materials; Aerospace Safety

20070021628 NASA Johnson Space Center, Houston, TX, USA
Safety Critical Mechanisms
Robertson, Brandan; [2008]; 23 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021628

Spaceflight mechanisms have a reputation for being difficult to develop and operate successfully. This reputation is well earned. Many circumstances conspire to make this so: the environments in which the mechanisms are used are extremely severe, there is usually limited or no maintenance opportunity available during operation due to this environment, the environments are difficult to replicate accurately on the ground, the expense of the mechanism development makes it impractical to build and test many units for long periods of time before use, mechanisms tend to be highly specialized and

not prone to interchangeability or off-the-shelf use, they can generate and store a lot of energy, and the nature of mechanisms themselves, as a combination of structures, electronics, etc. designed to accomplish specific dynamic performance, makes them very complex and subject to many unpredictable interactions of many types. In addition to their complexities, mechanism are often counted upon to provide critical vehicle functions that can result in catastrophic events should the functions not be performed. It is for this reason that mechanisms are frequently subjected to special scrutiny in safety processes. However, a failure tolerant approach, along with good design and development practices and detailed design reviews, can be developed to allow such notoriously troublesome mechanisms to be utilized confidently in safety-critical applications.
Derived from text
Space Flight; Mechanical Engineering; Mechanism; Aerospace Safety

20070021629 NASA, Washington, DC, USA
Redefining Safety
Sirota, Leonard B.; May 14, 2007; 9 pp.; In English; Second IAASS Conference: Space Safety in a Global World, 14-16 May 2007, Chicago, IL, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021629

NASA and the Aerospace community have traditionally included both risk to humans and hardware in the definition of 'Safety'. This leads to miscommunication with the public and can be an impediment to decision making. This paper offers two alternative aproaches: first, applying the term 'safety' only to humans and referring to the risk of damage or loss of hardware as an element of 'mission success' and second, using different notation for each type of 'safety'
Author
Aerospace Safety; Aerospace Industry; Space Shuttles; International Space Station; NASA Space Programs

20070021819 NASA Glenn Research Center, Cleveland, OH, USA
The Effects of Lunar Dust on EVA Systems During the Apollo Missions
Gaier, James R.; April 2007; 73 pp.; In English; This printing, numbered as NASA/TM-2005-213610/REV1, April 2007, replaces the previous version, NASA/TM-2005-213610, March 2005, (20050160460)in its entirety.
Contract(s)/Grant(s): WBS 22-614-30-02-02
Report No.(s): NASA/TM-2005-213610/REV1; E-15071-1/REV1; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021819

Mission documents from the six Apollo missions that landed on the lunar surface have been studied in order to catalog the effects of lunar dust on Extra-Vehicular Activity (EVA) systems, primarily the Apollo surface space suit. It was found that the effects could be sorted into nine categories: vision obscuration, false instrument readings, dust coating and contamination, loss of traction, clogging of mechanisms, abrasion, thermal control problems, seal failures, and inhalation and irritation. Although simple dust mitigation measures were sufficient to mitigate some of the problems (i.e., loss of traction) it was found that these measures were ineffective to mitigate many of the more serious problems (i.e., clogging, abrasion, diminished heat rejection). The severity of the dust problems were consistently underestimated by ground tests, indicating a need to develop better simulation facilities and procedures.
Author
Lunar Dust; Extravehicular Activity; Space Suits; Temperature Control; Lunar Surface; Contamination; Coating; Irritation; Abrasion

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

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

20070021681 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Telecommunications Protocol Processing Subsystem Using Reconfigurable Interoperable Gate Arrays
Pang, Jackson; Pingree, Paula; Torgerson, J. Leigh; July 2006; 19 pp.; In English; 2nd IEEE International Conference on Space Mission Challenges for Information Technology, July 2006, Pasadena,CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39900

Deep Space Telecommunications Requirements: 1) Automated file transfer across inter-planetary distances; 2) Limited

communication periods; 3) Reliable transport; 4) Delay and Disruption Tolerant; and 5) Asymmetric Data Channels.
Derived from text
Telecommunication; Deep Space 1 Mission; Channels (Data Transmission); Protocol (Computers)

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*.

20070021231 NASA White Sands Test Facility, NM, USA
Comparison of ASTM E595 and CSS-Q-70-02A Data
Hirsch, David; May 2007; 5 pp.; In English; International Standardization Organization ISO TC 20/SC 14, Space Systems and Operations, 21-25 May 2007, Beijing, China
Report No.(s): WSTF # PPP-07-0162; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021231

A viewgraph presentation describing a comparison of data from ASTM E595 used by NASA and JAXA, and data from ECSS-Q-70-02A used by ESA is shown.
CASI
Data Processing; Materials Tests; Spacecraft Construction Materials; Aerospace Systems

20070021484 NASA Langley Research Center, Hampton, VA, USA
Best Practices for Reliable and Robust Spacecraft Structures
Raju, Ivatury S.; Murthy, P. L. N.; Patel, Naresh R.; Bonacuse, Peter J.; Elliott, Kenny B.; Gordon, S. A.; Gyekenyesi, J. P.; Daso, E. O.; Aggarwal, P.; Tillman, R. F.; [2007]; 14 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 510505.03.07.01.11
Report No.(s): AIAA 2007-2270; Copyright; Avail.: CASI: A03, Hardcopy

A study was undertaken to capture the best practices for the development of reliable and robust spacecraft structures for NASA s next generation cargo and crewed launch vehicles. In this study, the NASA heritage programs such as Mercury, Gemini, Apollo, and the Space Shuttle program were examined. A series of lessons learned during the NASA and DoD heritage programs are captured. The processes that 'make the right structural system' are examined along with the processes to 'make the structural system right'. The impact of technology advancements in materials and analysis and testing methods on reliability and robustness of spacecraft structures is studied. The best practices and lessons learned are extracted from these studies. Since the first human space flight, the best practices for reliable and robust spacecraft structures appear to be well established, understood, and articulated by each generation of designers and engineers. However, these best practices apparently have not always been followed. When the best practices are ignored or short cuts are taken, risks accumulate, and reliability suffers. Thus program managers need to be vigilant of circumstances and situations that tend to violate best practices. Adherence to the best practices may help develop spacecraft systems with high reliability and robustness against certain anomalies and unforeseen events.
Author
Spacecraft Structures; Reliability; Launch Vehicles; NASA Programs; Procedures; Space Shuttles

20070021525 NASA Langley Research Center, Hampton, VA, USA
The Calipso Thermal Control Subsystem
Gasbarre, Joseph F.; Ousley, Wes; Valentini, Marc; Thomas, Jason; Dejoie, Joel; [2007]; 8 pp.; In English; 6th IAA Symposium on Small Satellites for Earth Observation, 23-26 Apr. 2007, Berlin, Germany; Original contains color illustrations
Contract(s)/Grant(s): WBS 653967.07.05.08
Report No.(s): Paper No. IAA-B6-0706P; Copyright; Avail.: CASI: A02, Hardcopy

The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) is a joint NASA-CNES mission to study the Earth s cloud and aerosol layers. The satellite is composed of a primary payload (built by Ball Aerospace) and a spacecraft platform bus (PROTEUS, built by Alcatel Alenia Space). The thermal control subsystem (TCS) for the CALIPSO

satellite is a passive design utilizing radiators, multi-layer insulation (MLI) blankets, and both operational and survival surface heaters. The most temperature sensitive component within the satellite is the laser system. During thermal vacuum testing of the integrated satellite, the laser system s operational heaters were found to be inadequate in maintaining the lasers required set point. In response, a solution utilizing the laser system s survival heaters to augment the operational heaters was developed with collaboration between NASA, CNES, Ball Aerospace, and Alcatel-Alenia. The CALIPSO satellite launched from Vandenberg Air Force Base in California on April 26th, 2006. Evaluation of both the platform and payload thermal control systems show they are performing as expected and maintaining the critical elements of the satellite within acceptable limits. Author

CALIPSO (Pathfinder Satellite); Temperature Control; Control Systems Design; Multilayer Insulation; Payload Control; Satellite Instruments; Aerosols; Optical Radar

20070021569 NASA Johnson Space Center, Houston, TX, USA

Investigation of Boundary Conditions for Flexible Multibody Spacecraft Dynamics

MacLean, John R.; Huynh, An; Quiocho, Leslie J.; [2007]; 9 pp.; In English; ASME 2007 International Design Engineering Technical Conferences and Comupters and Information in Engineering Conference - 6th International Conference on Multibody Systems, Nonlinear Dynamics and Control ..., 4-7 Sep. 2007, Las Vegas, NV, USA; Original contains color illustrations

Report No.(s): DETC2007-35511; Copyright; Avail.: CASI: A02, Hardcopy

In support of both the Space Shuttle and International Space Station programs, a set of generic multibody dynamics algorithms integrated within the Trick simulation environment have addressed the variety of on-orbit manipulator simulation requirements for engineering analysis, procedures development and crew familiarization/training at the NASA Johnson Space Center (JSC). Enhancements to these dynamics algorithms are now being driven by a new set of Constellation program requirements for flexible multibody spacecraft simulation. One particular issue that has been discussed within the NASA community is the assumption of cantilever-type flexible body boundary conditions. This assumption has been commonly utilized within manipulator multibody dynamics formulations as it simplifies the computation of relative motion for articulated flexible topologies. Moreover, its use for modeling of space-based manipulators such as the Shuttle Remote Manipulator System (SRMS) and Space Station Remote Manipulator System (SSRMS) has been extensively validated against flight data. For more general flexible spacecraft applications, however, the assumption of cantilever-type boundary conditions may not be sufficient. This paper describes the boundary condition assumptions that were used in the original formulation, demonstrates that this formulation can be augmented to accommodate systems in which the assumption of cantilever boundary conditions no longer applies, and verifies the approach through comparison with an independent model previously validated against experimental hardware test data from a spacecraft flexible dynamics emulator.

Author

Flexible Spacecraft; Boundary Conditions; Flexible Bodies; Space Station Mobile Servicing System; Manipulators; International Space Station; Remote Manipulator System

20070021637 NASA Dryden Flight Research Center, Edwards, CA, USA

X-43A Project Overview: Adventures in Hypersonics

Davis, Mark; Grindle, Laurie; [2007]; 23 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021637

A viewgraph presentation describing the hypersonics program at NASA Dryden Flight Research Center is shown. The topics include: 1) X-43A Program Overview; 2) Vehicle Description; 3) Flight 1, MIB & Return to Flight; 4) Flight 2 and Results; 5) Flight 3 and Results; and 6) Concluding Remarks

CASI

Hypersonics; X-43 Vehicle; General Overviews; Flight Tests; Research Vehicles; Aircraft Configurations

20070021678 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

NASA Handbook for Spacecraft Structural Dynamics Testing

Kern, Dennis L.; Scharton, Terry D.; June 15, 2004; 10 pp.; In English; 5th International Symposium on Environmental Testing for Space Programmes, 15-17 Jun. 2004, Noordwijk, Netherlands; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39967

Recent advances in the area of structural dynamics and vibrations, in both methodology and capability, have the potential

to make spacecraft system testing more effective from technical, cost, schedule, and hardware safety points of view. However, application of these advanced test methods varies widely among the NASA Centers and their contractors. Identification and refinement of the best of these test methodologies and implementation approaches has been an objective of efforts by the Jet Propulsion Laboratory on behalf of the NASA Office of the Chief Engineer. But to develop the most appropriate overall test program for a flight project from the selection of advanced methodologies, as well as conventional test methods, spacecraft project managers and their technical staffs will need overall guidance and technical rationale. Thus, the Chief Engineer's Office has recently tasked JPL to prepare a NASA Handbook for Spacecraft Structural Dynamics Testing. An outline of the proposed handbook, with a synopsis of each section, has been developed and is presented herein. Comments on the proposed handbook is solicited from the spacecraft structural dynamics testing community.
Author
Handbooks; Dynamic Structural Analysis; Vibration; Dynamic Response; Spacecraft

20070021683 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A 'Super Bowl' Approach to Mars Rover Touchdown Loads Analysis
Peng, Chia-Yen; Ortiz, Gary; June 27, 2006; 23 pp.; In English; Spacecraft and Lauch Vehicle Dynamic Environments Workshop, 27-29 Jun. 2006, Hawthorne, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39907

Touchdown Driving Requirement: The mechanical system surface element shall be capable of facilitating a safe, stable landing at terrain angles up to 15 degrees, given an initial vertical velocity of 1 m/sec, horizontal velocity of 0.5 m/sec, and Z-axis spin rate of [4] deg/sec.Touchdown Loads Development: A multi-year development effort has been successfully conducted leading to an innovative analytical methodology for the prediction of rover touchdown design loads and the assessment of rover touchdown stability.
Derived from text
Roving Vehicles; Touchdown; Mars Surface; Loads (Forces)

20070021759 NASA Glenn Research Center, Cleveland, OH, USA, Akron Univ., Akron, OH, USA
Crew Exploration Vehicle (CEV) Water Landing Simulation
Littell, Justin D.; Lawrence, Charles; Carney, Kelly S.; May 14, 2007; 22 pp.; In English; Original contains color illustrations Report No.(s): NASA/TM-2007-214681; Copyright; Avail.: CASI: A03, Hardcopy

Crew Exploration Vehicle (CEV) water splashdowns were simulated in order to find maximum acceleration loads on the astronauts and spacecraft under various landing conditions. The acceleration loads were used in a Dynamic Risk Index (DRI) program to find the potential risk for injury posed on the astronauts for a range of landing conditions. The DRI results showed that greater risks for injury occurred for two landing conditions; when the vertical velocity was large and the contact angle between the spacecraft and the water impact surface was zero, and when the spacecraft was in a toe down configuration and both the vertical and horizontal landing velocities were large. Rollover was also predicted to occur for cases where there is high horizontal velocity and low contact angles in a toe up configuration, and cases where there was a high horizontal velocity with high contact angles in a toe down configuration.
Author
Water Landing; Crew Exploration Vehicle; Spacecraft Design; Landing Simulation; Acceleration (Physics)

20070021821 ISRO Satellite Centre, Peenya, Bangalore, India
Journal of Spacecraft Technology Vol. 17, No. 1
Thyagarajan, K., Editor; Jain, Y. K., Editor; Narayana, K. Badari, Editor; Sridhar, M. S., Editor; Venkateswaralu, A., Editor; Hebbvar, P. Santosh, Editor; January 2007; ISSN 0971-1600; 86 pp.; In English; See also 20070021822 - 20070021831; Original contains color and black and white 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) Simulation and Implementation of a Tunable C-Band Dielectric Resonator Oscillator; 2) Development of Gravity Compensation System for Satellite Reflector by Helium Balloon; 3) Autonomous Star Tracker for Agile Spacecraft; 4) Opto Mechanical Design of Fine Analog Sun Sensor for Space Capsule Recovery Experiment Project; 5) Large Unfurlable Antenna Reflector; 6) Rigid Body Motion using FEM - A Case Study of Pan Camera Release System; 7) Performance of Single Stage Split Stirling Cryocooler Development Model; 8) Latch-Up Shock Analysis of

Reflector Deployment Considering Flexibility of Mechanism; 9) Reliability Prediction of Spacecraft Mechanisms; 10) Automated Test Facility for Characterisation of Hinge Assemblies for Solar Panel Deployment Mechanism.
Derived from text
Technology Utilization; Spacecraft Design; ISRO; Research and Development

20070021822 ISRO Satellite Centre, Peenya, Bangalore, India
Development of Gravity Compensation System for Satellite Reflector by Helium Balloon
Danabalan, T. L.; Sahu, Shree Niwas; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 14-19; In English; See also 20070021821; Copyright; Avail.: Other Sources

A communication satellite undergoes an extensive ground validation test program to ensure in-orbit reliability and performance in space. During testing on Earth, however, the structural behaviour is altered by the effect of gravity. Payload performance and characterization of a communication satellite is carried out in Compact Antennae Test Facility (CATF). Measurements include radiation pattern, gain and cross polarization of satellite reflectors. Satellite reflectors are deployed during these measurements. The reflector weight due to one 'g' on earth acts on its hinges. This causes a large error in antennae measurement. To obtain reliable predictions for the behaviour of a satellite in space, the influence of gravity during ground tests is required to be minimized by a suitable gravity-compensation system. Though various gravity compensation systems are devised for various satellite applications, the gravity-compensation system for satellite reflector in CATF imposes many constraints and challenges. A gravity compensation system using a helium balloon is developed for satellite reflectors. The system is based on the Archimedes buoyancy principle. Helium balloon and subsystems viz. load scale, balloon-handling, ballast etc. are developed for the system. A suitable technique is devised to control bulges ill the balloon. The full-scale gravity compensation system with helium balloon is developed and studied for helium leak rate, lift variations during scanning and net lift. The system meets requirements of zero-g simulation to the satellite reflector. Air drag, large size arid helium leak rate of the balloons are the limitations of this system. The paper brings out design considerations, system description and test results of the gravity-compensation system by helium balloon.
Author
Gravitational Effects; Reflectors; Communication Satellites; Helium; Balloons; Aerodynamic Drag

20070021823 Bangalore Inst. of Technology, Bangalore, India
Rigid Body Motion using FEM: A Case Study of Pan Camera Release System
Nikhil, B. K.; Kapadia, Jai; Alexander, Sean C. P.; VInaya, M. M.; Nataraju, B. S.; Kumar, H. N. Suresha; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 45-48; In English; See also 20070021821; Copyright; Avail.: Other Sources

The panchromatic camera (pan-camera) is a payload on the Indian Remote Sensing Satellite IRS-1C. The camera is steered by the payload steering mechanism (PSM). During launch, the pan-camera is held to the deck by a hold down and release mechanism (HRM) to isolate the launch loads and prevent them from being transferred to the PSM. It is released when the satellite is in orbit. This paper presents the details of the transient dynamic analysis carried out on the pan-camera using a standard finite element analysis package. The process of solving a rigid-body motion problem involves deriving the equations of motion for the body and solving them. Generally, Newton's method or Lagrange's approach is used for deriving the differential equations of motion. These are solved numerically to get the time-displacement and other characteristics of motion of an object. Commercially available special purpose packages like ADAMS, DADS etc., are used extensively for rigid body motion analysis. It is also customary to use finite element methods (FEM) for activities like stress analysis, frequency analysis, response analysis etc. However, a successful and novel attempt has been made to solve a rigid body motion problem using a standard FEM package. The release dynamics of the pan-camera has been studied using the software package NISA. The results of the study have been observed to be agreeing well with the corresponding test data and also with the results of conventional analysis.
Author
Cameras; Finite Element Method; Remote Sensing; Rigid Structures; Steering; Indian Spacecraft

20070021825 ISRO Satellite Centre, Peenya, Bangalore, India
Latch-Up Shock Analysis of Reflector Deployment Considering Flexibility of Mechanism
Jaiswal, Sanjay; Kumar, H. N. Suresha; Viswanatha, N.; Nataraju, B. S.; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 55-59; In English; See also 20070021821; Copyright; Avail.: Other Sources

Deployment mechanisms for reflectors consist of hold-down and hinge assemblies. The mechanism is subjected to

dynamic loads during launch and latch-up shock loads at the end of deployment. For estimation of shock loads the earlier approaches considered only the flexibility of the reflector, while the hinges were considered to be rigid. As an improvement over previous modeling the present study considers the flexibility of the brackets of the deployment mechanism as well. Transient dynamic analysis has been carried out to determine the latch-up shock moments, modelling the system as an initial velocity problem. The latch up velocity obtained from the deployment dynamics is taken as the initial condition. The addition of brackets makes the system more flexible and thus a reduction in values of root moment has been observed in comparison with the earlier model where the brackets were assumed to be rigid. The values have been observed to be well within the corresponding specifications thus providing a useful design feedback with regard to the margins available for root shock moment. The present paper provides details of these activities along with the results of analysis.
Author
Deployment; Flexibility; Reflectors; Shock Loads; Mathematical Models; Latch-Up; Communication Satellites

20070021826 ISRO Satellite Centre, Peenya, Bangalore, India
Reliability Prediction of Spacecraft Mechanisms
Shankarnarayan, Y. S.; Singh, Paramjeet; Arunachalam, R.; Rao, H. S. Rama; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 60-67; In English; See also 20070021821; Copyright; Avail.: Other Sources

Spacecraft use many deployable mechanisms such as those for reflector deployment and solar array deployment, which are mission critical appendages. These mechanisms help keep the appendages stowed (folded) during launch in order to meet launch vehicle envelope constraints and are deployed once the spacecraft reaches its orbit. As these mechanisms are mission-critical, successful deployment of these mechanisms is a must for a spacecraft to achieve its mission goal. Hence reliability prediction and assurance is an essential part of system engineering. There are many methods available for reliability prediction, we have to choose an appropriate method depending upon various factors like: number of samples available, type of data available, and prior knowledge of probability distributions. Strength-stress interference approach is appropriate for the reliability prediction of a mechanism, which can be more appropriately termed 'torque-friction interference' approach. A deployable mechanism derives energy for deployment from either passive elements like springs or active elements like motors/actuators. The torque produced by these devices must overcome system friction to successfully complete their function. As the number of data points available is limited, Monte Carlo simulation can be used to generate more data points to improve the accuracy of prediction. This paper presents a case study of reliability prediction of a spacecraft mechanism using a combination of strength-stress interference approach and Monte Carlo simulation.
Author
Reliability Analysis; Monte Carlo Method; Spacecraft Design; Mathematical Models; Solar Reflectors

20070021827 ISRO Satellite Centre, Peenya, Bangalore, India
Large Unfurlable Antenna Reflector
Undale, Milind; Shamrao; AbdulHameed, H.; Yadav, Subash; Nararaj, B. P.; Viswanatha, N.; Murali, N. S.; Nataraju, B. S.; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 34-44; In English; See also 20070021821; Copyright; Avail.: Other Sources

Large onboard reflectors are key elements of high-gain antenna systems for spacecraft, particularly for carrying land-mobile telecommunication payloads, where the need is to keep the mobile ground terminals small like hand-held systems This kind of reflector is larger than the size of the basic spacecraft. These reflectors have to be folded to a compact size for launch and deployed and opened to full size and shape in orbit. The key problem is to ensure accurate shaping of the reflecting surface on opening with a suitable deployment mechanism. The paper describes the design and fabrication of Large Unfurlable antenna (LUFA), which is currently under development and qualification for an Indian geo-synchronous communication satellite. The design features of Deployable Rim Truss (DRT), Cable Network, Hold-down Release and Primary Deployment Mechanism are described with different option studies. A parametric study with different nested rings has been carried out to arriive at statically determinate cable net configurations. Software has been developed using cable element to arrive at pre-defined cable-net configuration with positive tension in all cables. Hold-down release mechanism has been designed to withstand the separation and launch loads, and to prevent the unfurling before the arm locks to the required orientation. Primary deployment mechanism is designed to deploy the antenna reflector through a predefined angle and lock to the desired orientation. Issues related to surface profile measurement and corrections are also discussed. A brief summary of tests to be conducted for qualification of the LUFA reflector is also presented. A 5.5m aperture reflector model, has been fabricated and assembled, and the functioning successfully demonstrated.
Author
Antenna Design; Large Deployable Reflector; Large Space Structures; Trusses; Fabrication

20070021828 Indian Space Research Organization, Bangalore, India

Opto Mechanical Design of Fine Analog Sun Sensor for Space Capsule Recovery Experiment Project

Lohar, K. A.; Sridevi, T. V.; Viswanatha, N.; Kamalakar, J. A.; Jain,Y. K.; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 26-33; In English; See also 20070021821; Copyright; Avail.: Other Sources

A high accuracy sun sensor with an accuracy of plus or minus 0.1 degree for a linear range of plus or minus 10 degrees is designed for SRE spacecraft. This is realised by making suitable design changes in the mechanical housing and optics of the existing coarse analog sun sensor (CASS) which has an accuracy of plus or minus 0.5 degrees for linear range of plus or minus 25 degrees. The reliability of this sensor is the same as that of CASS, since the qualified processing electronics of CASS is used without any change. This paper presents the optics design, design of mechanical components and test results.
Author

Mechanical Engineering; Solar Sensors; Space Capsules; Sun; Optoelectronic Devices; Analogs

20070021829 Indian Space Research Organization, Bangalore, India

Autonomous Star Tracker for Agile Spacecraft

Ganesan, M.; Padmasree, S.; Rao, G. Nagendra; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 20-25; In English; See also 20070021821; Copyright; Avail.: Other Sources

Low inertia spacecraft are required to carry out sudden transient maneuvers for payload pointing, star and sun pointing routinely in present and future ISRO missions. These missions demand higher angular rates in the spacecraft body. Star trackers provide the precise attitude for spacecraft control. The main drawback of previous generation star trackers is their inability to track the stars in the case of angular maneuvers for agile spacecraft. This paper proposes an algorithm to solve the problem of star tracking for agile spacecraft. An algorithm is developed to estimate angular rate of spacecraft using star-tracker measurements that are helpful star tracking. This algorithm uses the a fixed-gain Kalman Filter and is tested with maximum angular rates of up to 1 degree/second in IRS-P5 onboard operations. The rate estimation and tracking performance of the tracker are satisfactory. Star-tracker derived body rates are also comparable with gyro-derived rates. The algorithm is tested with maximum angular rates of up to 2.5degrees/s. with presently available star trackers to cater to the requirement of agile spacecraft such as Cartosat-2.
Author

Star Trackers; Attitude Control; Spacecraft Maneuvers; Spacecraft Control; Algorithms; Angular Velocity; Autonomy

20070021830 Indian Space Research Organization, Bangalore, India

Automated Test Facility for Characterisation of Hinge Assemblies for Solar Panel Deployment Mechanism

Reddy, K. Sita Manohar; Ranganath, R.; Sridhara, C. D.; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 68-77; In English; See also 20070021821; Copyright; Avail.: Other Sources

Accordion deployment of a spacecraft solar array in orbit is a mission critical operation. Most of the deployable appendages derive the necessary deployment energy from preloaded torsion springs mounted on hinges. To ensure positive deploymernt, a minimum spring margin of 100% on the friction torque is provided at the hinges at the end of the deployment. Hence, the performance characterization of hinge assemblies, which lead to the measurement of torque margins, is an important and crucial testing activity. This paper describes the development of an automated hinge characterization test facility, which is extremely useful in ascertaining the performance characteristics of hinge assembly pairs in the entire range of its operation with higher accuracy and repeatability than the conventional method hitherto adopted. Hinge assemblies characterized using this facility have been successfully flown on GSAT-3 (EDUSAT) and INSAT-4A satellites.
Author

Characterization; Deployment; Solar Arrays; Test Facilities; Automatic Control; Hinges; Indian Spacecraft

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20070021670 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

THz Instrumentation for the Herschel Space Observatory's Heterodyne Instrument for Far Infrared

Pearson, J. C.; Mehdi, I.; Ward, J. S.; Maiwald, F.; Ferber, R. R.; Leduc, H. G.; Schlecht, E. T.; Gill, J. J.; Hatch, W. A.; Kawamura, J. H.; Stern, J. A.; Gaier, T. C.; Samoska, L. A.; Weinreb, S.; Bumble, B.; Pukala, D. M.; Javadi, H. H.; Finamore, B. P.; Lin, R. H.; Dengler, R. J.; Velebir, J. R.; Luong, E. M.; Tsang, R.; Peralta, A .; Wells, M., et al.; June 24, 2004; 12 pp.; In English; Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39943

The Heterodyne Instrument for Far Infrared (HIFI) on ESA's Herschel Space Observatory utilizes a variety of novel RF components in its five SIS receiver channels covering 480-1250 GHz and two HEB receiver channels covering 1410-1910 GHz. The local oscillator unit will be passively cooled while the focal plane unit is cooled by superfluid helium and cold helium vapors. HIFI employs W-band GaAs amplifiers, InP HEMT low noise IF amplifiers, fixed tuned broadband planar diode multipliers, high power W-bapd Isolators, and novel material systems in the SIS mixers. The National Aeronautics and Space Administration through the Jet Propulsion Laboratory is managing the development of the highest frequency (1119-1250 GHz) SIS mixers, the local oscillators oscillators for the three highest frequency receivers as well as W-band power amplifiers, high power W-band isolators, varactor diode devices for all high frequency multipliers and InP HEMT components for all the receiver channels intermediate frequency amplifiers. The NASA developed components represent a significant advancement in the available performance. This paper presents an update of the performance and the current state of development.

Author

Heterodyning; Far Infrared Radiation; Infrared Instruments; Radio Receivers; Satellite-Borne Instruments; SIS (Superconductors); Oscillators; Multipliers; High Electron Mobility Transistors

20070021672 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Sub-nanometer Level Model Validation of the ESA Interferometer

Korechoff, Robert P.; Hoppe, Daniel; Wang, Xu; June 21, 2004; 24 pp.; In English; SPIE New Frontiers in Stellar Interferometry, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39962

The Space Interferometer Mission (ESA) flight instrument will not undergo a full performance, end-to-end system test on the ground due to a number of constraints. Thus, analysis and physics-based models will play a significant role in providing confidence that ESA will meet its science goals on orbit. The various models themselves are validated against the experimental results obtained from the MicroArcsecond Metrology (MAM) testbed adn the Diffraction testbed (DTB). The metric for validation is provided by the ESA astrometric error budget.

Author

Interferometers; Space Missions; Flight Instruments; Performance Tests; End-to-End Data Systems; Astrometry

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SPACECRAFT PROPULSION AND POWER

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

20070021468 Institute for Scientific Research, Fairmont, WV, USA

Core Physics and Kinetics Calculations for the Fissioning Plasma Core Reactor

Butler, C.; Albright, D.; January 2007; 84 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): MAP-2003-V-F045; NCC8-225

Report No.(s): NASA/CR-2007-214724; M-1181; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021468

Highly efficient, compact nuclear reactors would provide high specific impulse spacecraft propulsion. This analysis and numerical simulation effort has focused on the technical feasibility issues related to the nuclear design characteristics of a novel reactor design. The Fissioning Plasma Core Reactor (FPCR) is a shockwave-driven gaseous-core nuclear reactor, which uses Magneto Hydrodynamic effects to generate electric power to be used for propulsion. The nuclear design of the system depends on two major calculations: core physics calculations and kinetics calculations. Presently, core physics calculations have concentrated on the use of the MCNP4C code. However, initial results from other codes such as COMBINE/VENTURE and SCALE4a. are also shown. Several significant modifications were made to the ISR-developed QCALC1 kinetics analysis code. These modifications include testing the state of the core materials, an improvement to the calculation of the material properties of the core, the addition of an adiabatic core temperature model and improvement of the first order reactivity correction model. The accuracy of these modifications has been verified, and the accuracy of the point-core kinetics model used by the QCALC1 code has also been validated. Previously calculated kinetics results for the FPCR were described in the ISR report, 'QCALC1: A code for FPCR Kinetics Model Feasibility Analysis' dated June 1, 2002.

Author

Plasma Core Reactors; Nuclear Reactors; Magnetohydrodynamics; Reactor Design; Specific Impulse; Design Analysis

20070021756 NASA Glenn Research Center, Cleveland, OH, USA

Development of Advanced Stirling Radioisotope Generator for Space Exploration

Chan, Jack; Wood, J. Gary; Schreiber, Jeffrey G.; May 14, 2007; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 138494.04.01.01

Report No.(s): NASA/TM-2007-214806; E-15939; Copyright; Avail.: CASI: A03, Hardcopy

Under the joint sponsorship of the Department of Energy and NASA, a radioisotope power system utilizing Stirling power conversion technology is being developed for potential future space missions. The higher conversion efficiency of the Stirling cycle compared with that of Radioisotope Thermoelectric Generators (RTGs) used in previous missions (Viking, Pioneer, Voyager, Galileo, Ulysses, Cassini, and New Horizons) offers the advantage of a four-fold reduction in PuO2 fuel, thereby saving cost and reducing radiation exposure to support personnel. With the advancement of state-of-the-art Stirling technology development under the NASA Research Announcement (NRA) project, the Stirling Radioisotope Generator program has evolved to incorporate the advanced Stirling convertor (ASC), provided by Sunpower, into an engineering unit. Due to the reduced envelope and lighter mass of the ASC compared to the previous Stirling convertor, the specific power of the flight generator is projected to increase from 3.5 to 7 We/kg, along with a 25 percent reduction in generator length. Modifications are being made to the ASC design to incorporate features for thermal, mechanical, and electrical integration with the engineering unit. These include the heat collector for hot end interface, cold-side flange for waste heat removal and structural attachment, and piston position sensor for ASC control and power factor correction. A single-fault tolerant, active power factor correction controller is used to synchronize the Stirling convertors, condition the electrical power from AC to DC, and to control the ASCs to maintain operation within temperature and piston stroke limits. Development activities at Sunpower and NASA Glenn Research Center (GRC) are also being conducted on the ASC to demonstrate the capability for long life, high reliability, and flight qualification needed for use in future missions.

Author

Space Exploration; Stirling Cycle; Radioisotope Heat Sources; Thermoelectric Generators; Mechanical Engineering; Power Factor Controllers

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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*.

20070021238 California Univ., Berkeley, CA, USA
Surgical Instrument for Adhering to Tissues
Sverduk, L., Inventor; Sahai, R., Inventor; Fearing, R. S., Inventor; 4 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): NFS-IIS 0083472; NFS-DMII 0115091; ONR-MURI-N00014-98-0671
Patent Info.: Filed Filed 4 Oct 04; US-Patent-Appl-SN-10-959-002
Report No.(s): PB2007-102489; No Copyright; Avail.: CASI: A03, Hardcopy

A surgical device capable of adhering to tissues is disclosed herein. The surgical device includes a micromechanical frame moveably linked to a plurality of micromechanical appendages. A plurality of nano-fibers that mimic adhesion of the Tokay Gecko are disposed at the terminus of each protrusion.
NTIS
Appendages; Micromechanics; Patent Applications; Surgical Instruments

20070021240 White [James P], New York, NY, USA
Synthesis of Derivatives of Ginkgolide C
Nakanishi, K., Inventor; Jaracz, S., Inventor; Stromgaard, K., Inventor; 24 Aug 04; 39 pp.; In English
Contract(s)/Grant(s): NIH-MH068817
Patent Info.: Filed Filed 24 Aug 04; US-Patent-Appl-SN-10-925-209
Report No.(s): PB2007-102486; No Copyright; Avail.: CASI: A03, Hardcopy

The subject invention provides ginkgolide C derivatives or an optically pure enantiomer of the compound. Additionally, the subject invention provides methods of inhibiting the activity of a glycine receptor using these compounds.
NTIS
Derivation; Patents

20070021249 Lawrence Livermore National Lab., Livermore, CA USA
Opportunities in Plutonium Metallurgical Research
Schwartz, A. J.; Jan. 03, 2007; 14 pp.; In English
Report No.(s): DE2007-898429; No Copyright; Avail.: National Technical Information Service (NTIS)

This is an exciting time to be involved in plutonium metallurgical research. Over the past few years, there have been significant advances in our understanding of the fundamental materials science of this unusual metal, particularly in the areas of self-irradiation induced aging of Pu, the equilibrium phase diagram, the homogenization of d-phase alloys, the crystallography and morphology of the a-phase resulting from the isothermal martensitic phase transformation, and the phonon dispersion curves, among many others. In addition, tremendous progress has been made, both experimentally and theoretically, in our understanding of the condensed matter physics and chemistry of the actinides, particularly in the area of electronic structure. Although these communities have made substantial progress, many challenges still remain. This brief overview will address a number of important challenges that we face in fully comprehending the metallurgy of Pu with a specific focus on aging and phase transformations.
NTIS
Plutonium; Metallurgy

20070021258 Westinghouse Savannah River Co., Aiken, SC, USA
Advancement of Nucleic Acid-Based Tools for Monitoring In Situ Reductive Dechlorination
Vangelas, K.; Edwards, E.; Loffler, F.; Nov. 17, 2006; 23 pp.; In English
Contract(s)/Grant(s): DEAC09-96-SR18500
Report No.(s): DE2007-898370; WSRC-STI-2006-00332; No Copyright; Avail.: National Technical Information Service (NTIS)

Regulatory protocols generally recognize that destructive processes are the most effective mechanisms that support natural attenuation of chlorinated solvents. In many cases, these destructive processes will be biological processes and, for chlorinated compounds, will often be reductive processes that occur under anaerobic conditions. The existing EPA guidance

(EPA, 1998) provides a list of parameters that provide indirect evidence of reductive dechlorination processes. In an effort to gather direct evidence of these processes, scientists have identified key microorganisms and are currently developing tools to measure the abundance and activity of these organisms in subsurface systems. Drs. Edwards and Loffler are two recognized leaders in this field. The research described herein continues their development efforts to provide a suite of tools to enable direct measures of biological processes related to the reductive dechlorination of TCE and PCE. This study investigated the strengths and weaknesses of the 16S rRNA gene-based approach to characterizing the natural attenuation capabilities in samples. The results suggested that an approach based solely on 16S rRNA may not provide sufficient information to document the natural attenuation capabilities in a system because it does not distinguish between strains of organisms that have different biodegradation capabilities. The results of the investigations provided evidence that tools focusing on relevant enzymes for functionally desired characteristics may be useful adjuncts to the 16S rRNA methods.
NTIS
Nucleic Acids; Solvents; Chlorination; Microorganisms

20070021259 Westinghouse Savannah River Co., Aiken, SC, USA
Analysis of Solvent Recovered from Wright Industries, Incorporated Testing
Poirier, M. R.; Peters, T. B.; Fondeur, F. F.; Fink, S. D.; Jan. 11, 2006; 9 pp.; In English
Report No.(s): DE2007-898369; WRSC-STI-2007-00011; No Copyright; Avail.: Department of Energy Information Bridge
Washington Savannah River Company (WSRC) began designing and building a Modular Caustic Side Solvent Extraction (CSSX) Unit (MCU) at the Savannah River Site (SRS) to process liquid waste for an interim period. The MCU Project Team conducted testing of the contactors, coalescers, and decanters at Wright Industries, Incorporated (WII) in Nashville, Tennessee. That testing used MCU solvent and simulated SRS dissolved salt. Because of the value of the solvent, the MCU Project wishes to recover it for use in the MCU process in the H-Tank Farm. Following testing, WII recovered approximately 62 gallons of solvent (with entrained aqueous) and shipped it to SRS. The solvent arrived in two stainless steel drums. The MCU Project requested SRNL to analyze the solvent to determine whether it is suitable for use in the MCU Process. SRNL analyzed the solvent for Isopar L by Gas Chromatrography Mass Spectroscopy (GC-MS), for Modifier and BOBCalixC6 1 by High Pressure Liquid Chromatography (HPLC), and for Isopar L -to-Modifier ratio by Fourier-Transform Infrared (FTIR) spectroscopy. They also measured the solvent density gravimetrically and used that measurement to calculate the Isopar L and Modifier2 concentration.
NTIS
Industries; Solvents; Recovery

20070021265 North Carolina Agricultural and Technical State Univ., Greensboro, NC, USA
Heat of Dissolution Measurements for CO(2) in Mixed Alkanolamine Solvents
Kabadi, V. N.; Dec. 11, 2006; 18 pp.; In English
Report No.(s): DE2007-896968; No Copyright; Avail.: National Technical Information Service (NTIS)
The main objective of this project is to measure heat of dissolution of CO2 in carefully selected mixed alkanolamine solvent systems, and provide such directly measured data that might be used for efficient design of CO2 capture processes, or for better understanding of thermodynamics of CO2- alkanolamine systems. Carbon dioxide is one of the major greenhouse gases, and the need for stabilization of its composition in earths atmosphere is vital for the future of mankind. Although technologies are available for capture and storage of CO2, these technologies are far too expensive for economical commercialization. Reduction of cost would require research for refinement of the technology. For more economical CO2 capture and regeneration, there is a need for development of more efficient solvent systems. In this project we will extend the thermodynamic database by measuring heat of solution data of CO2 in mixed solvents made of MEA (monoethanolamine), MDEA (methyldiethanolamine), piperazine, and water. Mixed solvents of different compositions will be selected and in each case data will be measured at temperatures 40 and 80C and various partial pressures of CO2. At the end of the project, observations, conclusions, and recommendations will be derived for the choice of mixed solvents for efficient CO2 capture with potential for commercialization.
NTIS
Carbon Dioxide; Dissolving; Solvents

20070021267 Lawrence Livermore National Lab., Livermore, CA USA

Nano-focused Bremstrahlung Isochromat Spectroscopy (nBIS) Determination of the Unoccupied Electronic Structure of Pu

Tobin, J. G.; Butterfield, M.; Teslich, N.; Bliss, A.; Chung, B.; Dec. 29, 2006; 19 pp.; In English

Report No.(s): DE2007-898443; UCRL-TR-227019; No Copyright; Avail.: National Technical Information Service (NTIS)

While chemically toxic and highly radioactive, Pu may be the most scientifically interesting element in the periodic table. Its properties include the following: six different phases, close to each other in energy and sensitive to variations of temperature, pressure and chemistry; the face-centered-cubic phase (delta) is the least dense; Pu expands when it solidifies from the melt; and it is clearly the nexus of the actinide binary phase diagrams of the actinides. In a sense, it is the boundary between the light (ostensibly delocalized 5f electrons) and heavy (ostensibly localized or correlated 5f electrons) actinide elements, but this is an over-simplification. The localized atomic 5f states are naturally correlated, but important regimes of correlated electron states are conceivable as extended states on the delocalized side of the possible Mott transition between conductive and insulating behavior. The proximity to this crossover may be the driving force behind all these exotic properties. Pu remains of immense scientific and technological importance and the advancement to a firm, scientific understanding of the electronic structure of Pu and its compounds, mixtures, alloys and solutions is a crucial issue. Moreover, while there are a number of ongoing experimental efforts directed at determining the occupied (valence band, below the Fermi Energy) electronic structure of Pu, there is essential no experimental data on the unoccupied (conduction band, above the Fermi Energy) electronic structure of Pu.

NTIS

Electronic Structure; Spectroscopy

20070021301 Lawrence Livermore National Lab., Livermore, CA USA

ALE3D Rolling Simulations

Riordan, T. E.; Aug. 03, 2006; 24 pp.; In English

Report No.(s): DE2007-898476; UCRL-TR-223365; No Copyright; Avail.: National Technical Information Service (NTIS)

Hot rolling is a problem involving large deformations during the process of turning an ingot into a thin sheet. As a result of the large deformations inherent in the process, significant amounts of energy are put into the ingot mechanically, most of which results in heat generation. Therefore, in order to predict the results of rolling both the mechanical and the thermal factors must accurately represent the real conditions. The factors which must be properly tuned include interface friction, mass scaling to decrease computation times, heat transfer at the interface, convective heat transfer from the ingot, and convective heat transfer from the roll. Since these parameters are generally not measurable the correct values must be derived by tuning the parameters so that solutions match some other measurable result. The interface friction will be tuned using an ALE3D input deck which has been set up to output the torque applied to the roll during the pass. The friction coefficient will be adjusted so that the computed torque matches the measured value. The various heat transfer coefficients are dependent on each other, and are tuned based on measured roll surface temperatures, ingot exit temperatures, and the energy input through the mechanical deformation of the ingot. The heat transfer coefficient at the interface has been found to be approximately 1.25x105 W/sq mK, based on estimates of how much heat can be taken from the roll surface by coolant and matching a roll surface temperature. The convection coefficient on the ingot surface has been assumed to be 100 W/sq mK, on the high end for convection to air. However, this convection coefficient is low enough that the ingot should cool uniformly through its thickness as it would with a lower convection coefficient.

NTIS

Simulation; Three Dimensional Models; Heat Transfer Coefficients; Convective Heat Transfer

20070021311 Swedish Defence Research Establishment, Linkoeping, Sweden

Improved Sample Preparation for Determination of Phosphoramidates in Water Samples Based on Na(+) Cat-ion Exchange

Astot, C.; Nygren, Y.; Fredriksson, S. A.; Hammarstrom, L. G.; Nilsson, C.; Aug. 2006; 10 pp.; In English

Report No.(s): PB2007-107534; FOI-R-1988-SE; No Copyright; Avail.: CASI: A02, Hardcopy

A new (Na(+)) cat-ion exchange method for CWA sample preparation was evaluated. The new method prevents the acidification of samples associated with the use of exchangers in H(+)-mode. The acidification may induce hydrolysis if sensitive chemicals are contained in samples of high salinity. During the 14th Official OPCW Proficiency Test this problem was observed when a phosphoramidate was hydrolysed during sample preparation according to the standard cat-ion exchange method. Use of the new method was shown to prevent this degradation.

NTIS

Ion Exchanging; Water

20070021331 Lawrence Livermore National Lab., Livermore, CA USA

Simulation Solidification in Metals at High Pressure

Streitz, F. H.; Glosli, J. N.; Patel, M. V.; Chan, B.; Yates, R. K.; Jul. 28, 2006; 16 pp.; In English

Report No.(s): DE2007-898463; UCRL-CONF-223218; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors investigate solidification in metal systems ranging in size from 64,000 to 524,288,000 atoms on the IBM BlueGene/L computer at LLNL. Using the newly developed ddcMD code, we achieve performance rates as high as 103 TFlops, with a performance of 101.7 TFlop sustained over a 7 hour run on 131,072 cpus. We demonstrate superb strong and weak scaling. Our calculations are significant as they represent the first atomic-scale model of metal solidification to proceed, without finite size effects, from spontaneous nucleation and growth of solid out of the liquid, through the coalescence phase, and into the onset of coarsening. Thus, our simulations represent the first step towards an atomistic model of nucleation and growth that can directly link atomistic to mesoscopic length scales.

NTIS

High Pressure; Metals; Simulation; Solidification

20070021338 Ohio State Univ., Columbus, OH, USA

Insecticidal Crystal Proteins with Enhanced Toxicity

Dean, D. H., Inventor; Abdullah, M. A., Inventor; 30 Aug 04; 63 pp.; In English

Contract(s)/Grant(s): NIH-RO1 AI29092

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929-754

Report No.(s): PB2007-102527; No Copyright; Avail.: CASI: A04, Hardcopy

The present invention relates generally to modified Bt insecticidal crystal proteins, also referred to as mutant toxins, with enhanced toxicity against a variety of insect genera, particularly mosquitos. The invention provides modified Bt Cry4Ba and Cry19Aa proteins, or mutant toxins, which have toxicity-enhancing sequence modifications at one or more positions within the amino acid sequence of the protein. The invention also provides polynucleotides encoding modified Cry4Ba and Cry19Aa proteins. The invention also provides insecticidal compositions comprising mutant toxins with a new or broadened insecticidal spectrum, and insecticidal compositions comprising polynucleotides encoding the modified Cry4Ba and Cry19Aa proteins.

NTIS

Crystals; Insects; Proteins; Toxicity; Toxins and Antitoxins

20070021340 Christian (Stephen R.), Idaho Falls, ID, USA

Organic/Inorganic Nanocomposites, Methods of Making, and Use as a Permeable Reactive Barrier

Harrup, M. K., Inventor; Stewart, F. F., Inventor; 9 Dec 03; 19 pp.; In English

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

Patent Info.: Filed Filed 9 Dec 03; US-Patent-Appl-SN-10-732-863

Report No.(s): PB2007-102526; No Copyright; Avail.: CASI: A03, Hardcopy

Nanocomposite materials having a composition including an inorganic constituent, a preformed organic polymer constituent, and a metal ion sequestration constituent are disclosed. The nanocomposites are characterized by being single phase, substantially homogeneous materials wherein the preformed polymer constituent and the inorganic constituent form an interpenetrating network with each other. The inorganic constituent may be an inorganic oxide, such as silicon dioxide, formed by the in situ catalyzed condensation of an inorganic precursor in the presence of the solvated polymer and metal ion sequestration constituent. The polymer constituent may be any hydrophilic polymer capable of forming a type I nanocomposite such as, polyacrylonitrile (PAN), polyethyleneoxide (PEO), polyethylene glycol (PEG), polyvinyl acetate (PVAc), polyvinyl alcohol (PVA), and combinations thereof. Nanocomposite materials of the present invention may be used as permeable reactive barriers (PRBs) to remediate contaminated groundwater. Methods for making nanocomposite materials, PRB systems, and methods of treating groundwater are also disclosed.

NTIS

Metal Ions; Nanocomposites; Reactivity

20070021587 NASA Johnson Space Center, Houston, TX, USA

Coordinated Chemical and Isotropic Studies of IDPS: Comparison of Circumstellar and Solar GEMS Grains

Keller, L. P.; Messenger, S.; August 13, 2007; 1 pp.; In English; 70th Annual Meteoritical Society Meeting, 13-17 August 2007, Tucson, AZ, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021587

Silicate stardust in IDPs and meteorites include forsterite, amorphous silicates, and GEMS grains [1]. Amorphous presolar

silicates are much less abundant than expected based on astronomical models [2], possibly destroyed by parent body alteration. A more accurate accounting of presolar silicate mineralogy may be preserved in anhydrous IDPs. Here we present results of coordinated TEM and isotopic analyses of an anhydrous IDP (L2005AL5) that is comprised of crystalline silicates and sulfides, GEMS grains, and equilibrated aggregates embedded in a carbonaceous matrix. Nanometer-scale quantitative compositional maps of all grains in two microtome thin sections were obtained with a JEOL 2500SE. These sections were then subjected to O and N isotopic imaging with the JSC NanoSIMS 50L. Coordinated high resolution chemical maps and O isotopic com-positions were obtained on 11 GEMS grains, 8 crystalline grains, and 6 equilibrated aggregates.
Derived from text
Forsterite; Meteorites; Imaging Techniques; Mineralogy; Crystallinity; Silicates

20070021754 NASA Glenn Research Center, Cleveland, OH, USA
Evaluation and Testing of Commercially-Available Carbon Nanotubes as Negative Electrodes for Lithium Ion Cells
Britton, Doris L.; May 02, 2007; 22 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2007-214809; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021754

Rechargeable lithium ion (Li-ion) battery technology offers significant performance advantages over the nickel-based technologies used for energy storage for the majority of NASA's missions. Specifically Li-ion technology offers a threefold to fourfold increase in gravimetric and volumetric energy densities and produces voltages in excess of three times the value of typical nickel-based battery systems. As part of the Advanced Battery Technology program at NASA Glenn Research Center (GRC), a program on the evaluation of anodes for Li-ion cells and batteries was conducted. This study focused on the feasibility of using carbon nanotubes as anodes in Li-Ion cells. Candidate materials from multiple sources were evaluated. Their performance was compared to a standard anode comprised of mesocarbon microbeads. In all cases, the standard MCMB electrode exhibited superior performance. The details and results of the study are presented.
Author
Carbon Nanotubes; Electrodes; Metal Ions; Flux Density; Lithium Batteries; Electrochemical Cells

24
COMPOSITE MATERIALS

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

20070021239 McLeod and Moyne, P.C., Okekmos, MI, USA
Bio-Based Epoxy, Their Nanocomposites and Methods for Making Those
Drzal, L. T., Inventor; Misra, M., Inventor; Miyagawa, H., Inventor; Mohanty, A. K., Inventor; 15 Oct 04; 51 pp.; In English
Contract(s)/Grant(s): NSF-0122108
Patent Info.: Filed Filed 15 Oct 04; US-Patent-Appl-SN-10-966-624
Report No.(s): PB2007-102487; No Copyright; Avail.: CASI: A04, Hardcopy

Precursor epoxidized vegetable oil or ester derivatives of the oil is mixed and cured with a biodegradation resistant epoxy resin precursor to provide a cured composition. The composition preferably includes a filler as a composite and/or continuous carbon fibers as a mat or strand. Novel epoxidized linseed/soybean oil compositions are described. The compositions are useful in place of the standard epoxy resin compositions making articles of manufacture.
NTIS
Epoxy Resins; Nanocomposites; Patents

20070021274 Weingarten, Shurgin, Gagnebin and Lebovici, LLP, Boston, MA, USA
Lattice Fin For Missiles or Other Fluid-Born Bodies and Method for Producing Same
Fanucci, J. P., Inventor; King, M. J., Inventor; Gorman, J. J., Inventor; 15 Sep 03; 16 pp.; In English
Contract(s)/Grant(s): SBIR-F08630-01-C-0029; SBIR-F08630-02-C-0014
Patent Info.: Filed Filed 15 Sep 03; US-Patent-Appl-SN-10-662-803
Report No.(s): PB2007-102497; No Copyright; Avail.: CASI: A03, Hardcopy

A method for the manufacture of lattice fins for fluid-born bodies is provided. In one embodiment, lattice fins having a metallic cell structure are manufactured from strips or sheets of metal. In another embodiment, composite lattice fins are manufactured from a log assembly of elongated mandrels covered with a fiber reinforced composite material. After curing,

individual fins are sliced from the log assembly. Upon removal of the mandrels, a cell structure is obtained. Combinations of the two embodiments are also provided.
NTIS
Fins; Missiles; Patents

20070021362 Whitham, Curtis and Christofferson, PC, Reston, VA, USA
Nano-Metal Composite Made By Deposition from Colloidal Suspensions
Lu, G. Q., Inventor; Shang, Z., Inventor; Calata, J. N., Inventor; Bai, G., Inventor; Liu, Y., Inventor; 15 Sep 04; 11 pp.; In English
Contract(s)/Grant(s): AFR-F33615-02-M-2298
Patent Info.: Filed Filed 15 Sep 04; US-Patent-Appl-SN-10-941 014
Report No.(s): PB2007-102550; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of attaching high-temperature electrical components to substrates are provided. The methods involve of attachment of high-temperature components to substrates via a nano-metal film.
NTIS
Colloids; Deposition

20070021454 NASA Langley Research Center, Hampton, VA, USA
Buckling and Failure of Compression-Loaded Composite Laminated Shells With Cutouts
Hilburger, Mark W.; April 23, 2007; 13 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA 2007-2227; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021454

Results from a numerical and experimental study that illustrate the effects of laminate orthotropy on the buckling and failure response of compression-loaded composite cylindrical shells with a cutout are presented. The effects of orthotropy on the overall response of compression-loaded shells is described. In general, preliminary numerical results appear to accurately predict the buckling and failure characteristics of the shell considered herein. In particular, some of the shells exhibit stable post-local-buckling behavior accompanied by interlaminar material failures near the free edges of the cutout. In contrast another shell with a different laminate stacking sequence appears to exhibit catastrophic interlaminar material failure at the onset of local buckling near the cutout and this behavior correlates well with corresponding experimental results.
Author
Buckling; Composite Structures; Cylindrical Shells; Failure; Laminates; Openings; Compression Loads; Numerical Analysis; Fabrication

20070021466 NASA Marshall Space Flight Center, Huntsville, AL, USA
Measuring Core/Facesheet Bond Toughness in Honeycomb Sandwich Structures
Nettles, A. T.; December 2006; 68 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2006-214713; M-1180; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021466

This study examines two test methods to evaluate the peel toughness of the skin to core debond of sandwich panels. The methods tested were the climbing drum (CD) peel test and the double cantilever beam (DCB) test. While the CD peel test is only intended for qualitative measurements, it is shown in this study that qualitative measurements can be performed and compare well with DCB test data. It is also shown that artificially stiffening the facesheets of a DCB specimen can cause the test to behave more like a flatwise tensile test than a peel test.
Author
Cantilever Beams; Joints (Junctions); Sandwich Structures; Toughness; Skin (Structural Member); Honeycomb Cores

20070021762 NASA Glenn Research Center, Cleveland, OH, USA
In-Plane Cracking Behavior and Ultimate Strength for 2D Woven and Braided Melt-Infiltrated SiC/SiC Composites Tensile Loaded in Off-Axis Fiber Directions
Morscher, Gregory N.; Yun, Hee Mann; DiCarlo, James A.; [2007]; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 953033.01.03.33; Copyright; Avail.: CASI: A03, Hardcopy

The tensile mechanical properties of ceramic matrix composites (CMC) in directions off the primary axes of the

reinforcing fibers are important for architectural design of CMC components that are subjected to multi-axial stress states. In this study, 2D-woven melt-infiltrated (MI) SiC/SiC composite panels with balanced fiber content in the 0 degree and 90 degree directions were tensile loaded in-plane in the 0 degree direction and at 45 degree to this direction. In addition, a 2D triaxially-braided MI composite panel with balanced fiber content in the plus or minus 67 degree bias directions and reduced fiber content in the axial direction was tensile loaded perpendicular to the axial direction tows (i.e., 23 degrees from the bias fibers). Stress-strain behavior, acoustic emission, and optical microscopy were used to quantify stress-dependent matrix cracking and ultimate strength in the panels. It was observed that both off-axis loaded panels displayed higher composite onset stresses for through-thickness matrix cracking than the 2D-woven 0/90 panels loaded in the primary 0 degree direction. These improvements for off-axis cracking strength can in part be attributed to higher effective fiber fractions in the loading direction, which in turn reduces internal stresses on critical matrix flaws for a given composite stress. Also for the 0/90 panel loaded in the 45 degree direction, an improved distribution of matrix flaws existed due to the absence of fiber tows perpendicular to the loading direction. In addition, for the +67/0/-67 braided panel, the axial tows perpendicular to the loading direction were not only low in volume fraction, but were also were well separated from one another. Both off-axis oriented panels also showed relatively good ultimate tensile strength when compared to other off-axis oriented composites in the literature, both on an absolute strength basis as well as when normalized by the average fiber strength within the composites. Initial implications are discussed for constituent and architecture design to improve the directional cracking of SiC/SiC CMC components with MI matrices.

Author

Ceramic Matrix Composites; Fiber Strength; Mechanical Properties; Tensile Properties; Silicon Carbides; Cracking (Fracturing); Fabrication; Loads (Forces); Plane Strain; Woven Composites; Braided Composites

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20070021225 NASA Johnson Space Center, Houston, TX, USA

NASA/JAXA Igniters Manufacturing Dialog--NASA STD 6001 Tests 1 and 4 (procedure published in IS0 14624-1)

Williams, Jim; Hirsch, David; Robles-Culbreth, Rosemary; [2005]; 3 pp.; In English; Copyright; Avail.: CASI: A01, Hardcopy

A dialog between JAXA and NASA scientists on igniter testing procedures is presented.

CASI

Igniters; Manufacturing; Chemical Reactions; Mixtures; Chemical Tests

20070021244 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA, California Univ., Berkeley, CA, USA

Method and/or Apparatus for Puncturing a Surface for Extraction, in Situ Analysis, and/or Substance Delivery Using Microneedles

Mukerjee, E. V., Inventor; Smith, R. L., Inventor; 22 Nov 04; 25 pp.; In English

Contract(s)/Grant(s): DOD-N66001-01-8001

Patent Info.: Filed Filed 22 Nov 04; US-Patent-Appl-SN-10-995 570

Report No.(s): PB2007-104241; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for puncturing a surface for extraction, in situ monitoring, and/or substance delivery uses microneedles with improved properties. Applications include easy to handle glucose monitoring using a group of hollow out-of-plane silicon microneedles to sample substances in interstitial fluid from the epidermal skin layer.

NTIS

Extraction; Piercing

20070021245 Armstrong Teasdale, LLP, Saint Louis, MO, USA

Biosensor and Use Thereof to Identify Therapeutic Drug Molecules and Molecules Binding Orphan Receptors

Gautam, N., Inventor; Akgoz, M., Inventor; Azpiazu, I., Inventor; 7 Aug 04; 43 pp.; In English

Contract(s)/Grant(s): NIH-GM46963; NIH-GM069027

Patent Info.: Filed Filed 7 Aug 04; US-Patent-Appl-SN-10-941 049

Report No.(s): PB2007-104236; No Copyright; Avail.: CASI: A03, Hardcopy

A G protein biosensor cell comprises G protein beta, gamma or both beta and gamma subunits tagged with a fluorescent protein(s) expressed in living intact functional cells. The subcellular location of the fluorescent protein tagged beta, gamma or both beta and gamma subunits is strongly responsive to the activation state of specific G protein coupled receptors in the biosensor cell. The biosensor cell responds reproducibly to agonist and antagonist drug molecules specific for G protein coupled receptors by demonstrating translocation of the fluorescent protein tagged beta, gamma or both beta and gamma subunits from one part of the cell to another. The biosensor cells have utility in identifying and classifying candidate therapeutic drugs as to their therapeutic value.

NTIS

Bioinstrumentation; Drugs; Molecules; Proteins

20070021246 Goodwin Procter, LLP, Boston, MA, USA

Evolving New Molecular Function

Liu, D. R., Inventor; Gartner, Z. J., Inventor; Doyon, J. B., Inventor; Calderone, C. T., Inventor; Kanan, M. W., Inventor; 24 Sep 04; 214 pp.; In English

Contract(s)/Grant(s): ONR-N00014-00-1-0596; ONR-00014-03-1-0749

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-950 367

Report No.(s): PB2007-104230; No Copyright; Avail.: CASI: A10, Hardcopy

Nature evolves biological molecules such as proteins through iterated rounds of diversification, selection, and amplification. The power of Nature and the flexibility of organic synthesis are combined in nucleic acid-templated synthesis. The present invention provides a variety of template architectures for performing nucleic acid-templated synthesis, methods for increasing the selectivity of nucleic acid-templated reactions, methods for performing stereoselective nucleic acid-templated reactions, methods of selecting for reaction products resulting from nucleic acid-templated synthesis, and methods of identifying new chemical reactions based on nucleic acid-templated synthesis.

NTIS

Nucleic Acids; Templates

20070021268 Los Alamos National Lab., NM USA

Stable Isotope, Site-Specific Mass Tagging for Protein Identification

Chen, X., Inventor; 10 Nov 04; 19 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 10 Nov 04; US-Patent-Appl-SN-10-985-268

Report No.(s): PB2007-102513; No Copyright; Avail.: CASI: A03, Hardcopy

Proteolytic peptide mass mapping as measured by mass spectrometry provides an important method for the identification of proteins, which are usually identified by matching the measured and calculated m/z values of the proteolytic peptides. A unique identification is, however, heavily dependent upon the mass accuracy and sequence coverage of the fragment ions generated by peptide ionization. The present invention describes a method for increasing the specificity, accuracy and efficiency of the assignments of particular proteolytic peptides and consequent protein identification, by the incorporation of selected amino acid residue(s) enriched with stable isotope(s) into the protein sequence without the need for ultrahigh instrumental accuracy. Selected amino acid(s) are labeled with (sup 13)C/(sup 15)N/(sup 2)H and incorporated into proteins in a sequence-specific manner during cell culturing. Each of these labeled amino acids carries a defined mass change encoded in its monoisotopic distribution pattern. Through their characteristic patterns, the peptides with mass tag(s) can then be readily distinguished from other peptides in mass spectra. The present method of identifying unique proteins can also be extended to protein complexes and will significantly increase data search specificity, efficiency and accuracy for protein identifications.

NTIS

Isotopes; Marking; Patents; Peptides; Proteins

20070021270 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Methods for the Electrochemical Detection of Target Compounds
Thorp, H. H., Inventor; Gore, M., Inventor; 5 Mar 04; 54 pp.; In English
Contract(s)/Grant(s): NIH-1 F31 HG02520-01
Patent Info.: Filed Filed 5 Mar 04; US-Patent-Appl-SN-10-795-786
Report No.(s): PB2007-102507; No Copyright; Avail.: CASI: A04, Hardcopy

The present invention concerns methods for the detection of a target nucleic acid sequence in a sample.

NTIS
Detection; Nucleic Acids; Patent Applications

20070021271 DLA Piper Rudnick Gray Cary US, LLP, Palo Alto, CA, USA
Manganese Ion Regulation of Reverse Transcriptase Activity and Methods of Modulating Same
Boeke, J. D., Inventor; Bolton, E. C., Inventor; 12 Mar 03; 25 pp.; In English
Contract(s)/Grant(s): NIH-GM 36481
Patent Info.: Filed Filed 12 Mar 03; US-Patent-Appl-SN-10-507-252
Report No.(s): PB2007-102505; No Copyright; Avail.: CASI: A03, Hardcopy

Methods of identifying agents that modulate reverse transcriptase activity in a cell by affecting manganese ion transport across a membrane of the cell are provided, as are agents identified using such methods. Also provided are methods of modulating reverse transcriptase activity by effecting manganese ion concentration. In addition, methods of reducing or inhibiting infection of cells with a retrotransposable element are provided.

NTIS
Manganese Ions; Patent Applications

20070021272 Choate Hall and Stewart, LLP, Boston, MA, USA
pH-Triggered Microparticles
Kohane, D. S., Inventor; Anderson, D. G., Inventor; Langer, R. S., Inventor; Haining, W. N., Inventor; Nadler, L. M., Inventor; 23 Sep 04; 39 pp.; In English
Contract(s)/Grant(s): NIH-GM00684-01; NIH-GM26698
Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-948-981
Report No.(s): PB2007-102504; No Copyright; Avail.: CASI: A03, Hardcopy

Microparticles that are designed to release their payload when exposed to acidic conditions are provided as a vehicle for drug delivery. Any therapeutic, diagnostic, or prophylatic agent may be encapsulated in a lipid-protein-sugar or polymeric matrix including a pH triggering agent to form pH triggerable microparticles. Preferably the diameter of the pH triggered microparticles ranges from 50 nm to 10 micrometers. The matrix of the particles may be prepared using any known lipid (e.g., DPPC), protein (e.g., albumin), or sugar (e.g., lactose). The matrix of the particles may also be prepared using any synthetic polymers such as polyesters. Methods of preparing and administering the particles are provided. Methods of immunization, transfection, and gene therapy are also provided by administering pH triggerable microparticles.

NTIS
Drugs; Microparticles; Patent Applications; pH

20070021273 O'Conner [Cozen], P. C., Philadelphia, PA, USA
Lipoparticles Comprising Proteins, Methods of Making, and Using the Same
Doranz, B. J., Inventor; Willis, S., Inventor; Ross, E., Inventor; Greene, T. A., Inventor; 28 Jul 04; 152 pp.; In English
Contract(s)/Grant(s): NIH-GM64924; NIH-GM68322
Patent Info.: Filed Filed 28 Jul 04; US-Patent-Appl-SN-10-901-399
Report No.(s): PB2007-102500; No Copyright; Avail.: CASI: A08, Hardcopy

The present invention relates to lipoparticles. The invention also relates to producing lipoparticles. The invention further relates to lipoparticles comprising a viral structural protein. The invention further relates to a lipoparticle comprising a membrane protein, and the lipoparticle can be attached to a sensor surface. The invention further relates to methods of producing and using the lipoparticle to, inter alia, assess protein binding interactions.

NTIS
Inventions; Patent Applications; Membranes; Lipoproteins

20070021287 Saliwanchik Lloyd and Saliwanchik, Gainesville, FL, USA
Variant Neuronal Nicotinic Alpha-7 Receptor and Methods of Use
Papke, R. L., Inventor; Placzek, A., Inventor; 30 Jan 04; 89 pp.; In English
Contract(s)/Grant(s): NIH-GM57481-01A2
Patent Info.: Filed Filed 30 Jan 04; US-Patent-Appl-SN-10-769 085
Report No.(s): PB2007-104229; No Copyright; Avail.: CASI: A05, Hardcopy

The present invention relates to a variant of the nicotinic acetylcholine receptor (nAChR) alpha 7 subunit having a substitution within its second transmembrane (TM2) domain. Specifically, the sixth amino acid position within the TM2 domain has the point mutation T.fwdarw.S, such that threonine-244 becomes serine-244. Advantageously, the alpha 7 variant of the present invention retains the essential drug sensitivities of the wild-type alpha 7 receptor, but does not exhibit the response-limiting form of fast desensitization. Therefore, the alpha 7 variant is a 'gain of function' mutant that is particularly useful for testing new pharmacological agents. The present invention includes the T6'S variant TM2 domain, T6'S variant alpha 7 subunit, and T6'S variant nACh receptor polypeptides, polynucleotides encoding these polypeptides, recombinant hosts expressing these polynucleotides, and assays utilizing the T6'S variant TM2 domain, T6'S variant alpha 7 subunit, and/or T6'S variant nACh receptor.

NTIS
Acetyl Compounds; Acetylcholine; Choline; Neurophysiology

20070021323 National Inst. of Standards and Technology, Gaithersburg, MD USA, Army Research Lab., Aberdeen Proving Ground, MD, USA
XPS (X-ray Photoelectron Spectroscopy) Study on the Effects of Pigment on the UV (Ultraviolet) Degradation of an Epoxy System
Scierka, S.; Forster, A.; Kosik, W.; January 2003; 7 pp.; In English
Report No.(s): PB2007-107489; No Copyright; Avail.: National Technical Information Service (NTIS)

X-ray photoelectron spectroscopy (XPS) is a powerful tool for monitoring the changes in the surface chemistry of many materials. In this study it was used to examine the chemical changes in an epoxy system formulated with and without pigment (TiO2) in an effort to gain an understanding the role that pigment plays in polymer photodegradation. Epoxy degradation as a function of surface treatment on the pigment and pigment concentration was also investigated. Epoxy and pigment will be analyzed separately in an effort to understand the changes observed for the entire system (pigmented epoxy). Preliminary XPS results show that chemical changes have occurred on the epoxy surface and that the type of pigment affects the extent of degradation. The concentration of pigment appears to have no effect on the extent of degradation.

NTIS
Chemical Reactions; Degradation; Epoxy Resins; Photodecomposition; Photoelectron Spectroscopy; Pigments; Spectroscopy; Surface Reactions; X Ray Spectroscopy

20070021328 NASA Johnson Space Center, Houston, TX, USA
Rr2004 Test1 and 4 Data Analysis
Beeson, Harold D.; Hirsch, David; April 4, 2005; 6 pp.; In English; NASA/JAXA Technical Interchange Meeting, 4-8 April 2005, Japan; Copyright; Avail.: CASI: A02, Hardcopy

Test 1 data analysis for Kydex, Royal Blue Cotton, and Silicon along with test 4 data analysis for Raychem Electrical Wire is presented.

CASI
Chemical Tests; Data Processing; Silicones; Electric Wire; Cotton; Statistical Analysis

20070021337 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Methods and Compositions for Diagnosing Musculoskeletal, Arthritic and Joint Disorders by Biomarker Dating
9 Aug 04; 25 pp.; In English
Contract(s)/Grant(s): NIH-U01 AR050898-01
Patent Info.: Filed Filed 9 Aug 04; US-Patent-Appl-SN-10-532-638
Report No.(s): PB2007-102515; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a method of determining, in a sample, the proportion of a total amount of a molecule that is derived from catabolism due to the presence of age-related molecular alterations on the molecule, comprising: (1) determining the total amount of the molecule in the sample; (2) determining the amount of the molecule in the sample that

contains D-aspartate; and (3) calculating the proportion of the amount of the molecule of step (2) relative to the total amount of the molecule as determined in step (1), thereby determining the proportion of the total amount of the molecule that is derived from catabolism due to the presence of age-related molecular alterations in the molecule. Further provided is a method of diagnosing a musculoskeletal, arthritic or joint disorder in a subject and/or identifying a subject at risk for developing such a disorder, comprising: (1) measuring an amount of D-aspartate and/or an advanced glycation end product in a sample of the subject; and (2) comparing the amount of D-aspartate and/or advanced glycation end product in the sample of (1) with an amount of D-aspartate and/or advanced glycation end product in a sample of a control subject, whereby an increased amount of D-aspartate and/or advanced glycation end product in the sample of the subject as compared to the amount of D-aspartate and/or advanced glycation end product in the sample of the control subject is diagnostic of a musculoskeletal, arthritic or joint disorder in the subject and/or identifies a subject at risk of developing such a disorder.
NTIS
Biomarkers; Catabolism; Chronology; Musculoskeletal System; Time Measurement

20070021342 Lahive and Cockfield, LLP, Boston, MA, USA
2-Amino-9-((2-hydroxymethyl) Cyclopropylidenemethyl) Purine Antiviral Agents
Zemlicka, J., Inventor; Drach, C., Inventor; Chen, X., Inventor; 15 Sep 04; 15 pp.; In English
Contract(s)/Grant(s): NIDAID-U19-AI31718; NIDAID-P01-AI46390
Patent Info.: Filed Filed 15 Sep 04; US-Patent-Appl-SN-10-942-314
Report No.(s): PB2007-102522; No Copyright; Avail.: CASI: A03, Hardcopy
No abstract available
Amines; Drugs; Purines; Viruses

20070021351 Atomic Energy Commission, Washington, DC, USA, Department of Energy, Washington, DC, USA
Hanford Chemical Vapors Worker Concerns and Exposure Evaluation
Henderson, T. J.; Dec. 20, 2006; 14 pp.; In English
Contract(s)/Grant(s): DE-AC27-99RL14047
Report No.(s): DE2007-896895; CH2M-32068-FP REV 0; No Copyright; Avail.: Department of Energy Information Bridge
Chemical vapor emissions from underground hazardous waste storage tanks on the Hanford site in eastern Washington State are a potential concern because workers enter the tank farms on a regular basis for waste retrievals, equipment maintenance, and surveillance. Tank farm contractors are in the process of retrieving all remaining waste from aging single-shell tanks, some of which date to World War II, and transferring it to newer double-shell tanks. During the waste retrieval process, tank farm workers are potentially exposed to fugitive chemical vapors that can escape from tank headspaces and other emission points. The tanks are known to hold more than 1,500 different species of chemicals, in addition to radionuclides. Exposure assessments have fully characterized the hazards from chemical vapors in half of the tank farms. Extensive sampling and analysis has been done to characterize the chemical properties of hazardous waste and to evaluate potential health hazards of vapors at the ground surface, where workers perform maintenance and waste transfer activities. Worker concerns. risk communication, and exposure assessment are discussed, including evaluation of the potential hazards of complex mixtures of chemical vapors. Concentrations of vapors above occupational exposure limits-(OEL) were detected only at exhaust stacks and passive breather filter outlets. Beyond five feet from the sources, vapors disperse rapidly. No vapors have been measured above 50% of their OELs more than five feet from the source. Vapor controls are focused on limited hazard zones around sources. Further evaluations of vapors include analysis of routes of exposure and thorough analysis of nuisance odors.
NTIS
Exposure; Hazards; Health; Radioactive Wastes; Vapors; Physical Work

20070021366 Stanford Linear Accelerator Center, CA, USA, Argonne National Lab., IL USA, Illinois Univ., Urbana-Champaign, IL, USA, Wisconsin Univ., Madison, WI, USA
MM-Wave Cavity/Klystron Developments Using Deep X-Ray Lithography at the Advanced Photon Source
Song, J. J.; Kang, Y. W.; Kustom, R. L.; Mancini, D. C.; Nassin, A.; Oct. 25, 2006; 3 pp.; In English
Contract(s)/Grant(s): AC02-76SF00515
Report No.(s): DE2007-894157; SLAC-PUB-12177; No Copyright; Avail.: Department of Energy Information Bridge
Recent microfabrication technologies based on LIGA (German acronym for Lithographe, Galvanoformung, und

Abformung) have been applied to build high-aspect-ratio, metallic or dielectric, planar structures suitable for high-frequency rf cavity structures. The cavity structures would be used as parts of linear accelerators, microwave undulators, and mm-wave amplifiers. The microfabrication process includes manufacturing of precision x-ray masks, exposure of positive resist by x-rays through the mask, resist development, and electroforming of the final microstructure. Prototypes of a 32-cell, 108-GHz constant impedance cavity and a 66-cell, 94-GHz constant-gradient cavity were fabricated using the synchrotron radiation sources at APS. Preliminary design parameters for a 91-GHz modulator klystron along with an overview of the new technology are discussed.
NTIS
Cavities; Klystrons; Lithography; Micromachining; Millimeter Waves; Photons; Planar Structures; X Rays

20070021451 NASA Johnson Space Center, Houston, TX, USA
Colorimetric-Solid Phase Extraction Technology for Water Quality Monitoring: Evaluation of C-SPE and Debubbling Methods in Microgravity
Hazen-Bosveld, April; Lipert, Robert J.; Nordling, John; Shih, Chien-Ju; Siperko, Lorraine; Porter, Marc D.; Gazda, Daniel B.; Rutz, Jeff A.; Straub, John E.; Schultz, John R.; McCoy, J. Torin; July 12, 2007; 8 pp.; In English; 37th International Conference on Environmental Systems (ICES), 9-12 Jul. 2007, Chicago, IL, USA; Original contains color illustrations
Report No.(s): Rept-2007-01-3217; Copyright; Avail.: Other Sources

Colorimetric-solid phase extraction (C-SPE) is being developed as a method for in-flight monitoring of spacecraft water quality. C-SPE is based on measuring the change in the diffuse reflectance spectrum of indicator disks following exposure to a water sample. Previous microgravity testing has shown that air bubbles suspended in water samples can cause uncertainty in the volume of liquid passed through the disks, leading to errors in the determination of water quality parameter concentrations. We report here the results of a recent series of C-9 microgravity experiments designed to evaluate manual manipulation as a means to collect bubble-free water samples of specified volumes from water sample bags containing up to 47% air. The effectiveness of manual manipulation was verified by comparing the results from C-SPE analyses of silver(I) and iodine performed in-flight using samples collected and debubbled in microgravity to those performed on-ground using bubble-free samples. The ground and flight results showed excellent agreement, demonstrating that manual manipulation is an effective means for collecting bubble-free water samples in microgravity.
Author
Bubbles; Colorimetry; In-Flight Monitoring; Microgravity; Solid Phases; Water Quality; Extraction

20070021782 NASA Johnson Space Center, Houston, TX, USA
The ISS Water Processor Catalytic Reactor as a Post Processor for Advanced Water Reclamation Systems
Nalette, Tim; Snowdon, Doug; Pickering, Karen D.; Callahan, Michael; 9 Jul. 2007; 10 pp.; In English; International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 516572.04.02.02
Report No.(s): 07ICES-39; Copyright; Avail.: CASI: A02, Hardcopy

Advanced water processors being developed for NASA s Exploration Initiative rely on phase change technologies and/or biological processes as the primary means of water reclamation. As a result of the phase change, volatile compounds will also be transported into the distillate product stream. The catalytic reactor assembly used in the International Space Station (ISS) water processor assembly, referred to as Volatile Removal Assembly (VRA), has demonstrated high efficiency oxidation of many of these volatile contaminants, such as low molecular weight alcohols and acetic acid, and is considered a viable post treatment system for all advanced water processors. To support this investigation, two ersatz solutions were defined to be used for further evaluation of the VRA. The first solution was developed as part of an internal research and development project at Hamilton Sundstrand (HS) and is based primarily on ISS experience related to the development of the VRA. The second ersatz solution was defined by NASA in support of a study contract to Hamilton Sundstrand to evaluate the VRA as a potential post processor for the Cascade Distillation system being developed by Honeywell. This second ersatz solution contains several low molecular weight alcohols, organic acids, and several inorganic species. A range of residence times, oxygen concentrations and operating temperatures have been studied with both ersatz solutions to provide addition performance capability of the VRA catalyst.
Author
Catalysts; International Space Station; Water Reclamation; Potable Water; Reactors

26
METALS AND METALLIC MATERIALS

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

20070021356 UT-Battelle, LLC, Oak Ridge, TN, USA
Ir-Based Alloys for Ultra-High Temperature Applications
Liu, C. T., Inventor; George, E. P., Inventor; Bloom, E. E., Inventor; 15 Dec 03; 10 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 15 Dec 03; US-Patent-Appl-SN-10-737 649
Report No.(s): PB2007-102582; No Copyright; Avail.: CASI: A02, Hardcopy

An alloy composition includes, in atomic percent: about 1 to about 10% of at least one element selected from the group consisting of Zr and Hf, balance Ir.
NTIS
Heat Resistant Alloys; Iridium; High Temperature

20070021367 Los Alamos National Lab., NM USA
Method for Preparing Ultrafine-Grained Metallic Foil
Zhu, Y. T., Inventor; Valiev, R. Z., Inventor; Kolobov, Y. R., Inventor; Grabovetskaya, G. P., Inventor; Girsova, N. V., Inventor; 15 Dec 03; 12 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 15 Dec 03; US-Patent-Appl-SN-10-737 096
Report No.(s): PB2007-102544; No Copyright; Avail.: CASI: A03, Hardcopy

Coarse-grained titanium and ultrafine-grained (UFG) titanium billets were processed into titanium foil cold rolling and intermediate annealing. The foil produced from the UFG titanium billet exhibits a homogeneous nanostructure. By contrast, foil produced by cold rolling the coarse-grained titanium billet exhibits a heterogeneous structure with both nanostructured and coarser-grained regions. The foil produced from UFG billets has higher strength, higher ductility, and exhibits uniform deformation over a larger strain range at room temperature than foil produced from coarse-grained billets.
NTIS
Billets; Coarseness; Foils (Materials); Grain Size; Metal Foils; Titanium

20070021449 United Space Alliance, Houston, TX, USA
Space Shuttle Program Tin Whisker Mitigation
Nishimi, Keith; April 24, 2007; 17 pp.; In English; International Symposium on Tin Whiskers, 24-25 April 2007, College Park, MD, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021449

The discovery of tin whiskers (TW) on space shuttle hardware led to a program to investigate and removal and mitigation of the source of the tin whiskers. A Flight Control System (FCS) avionics box failed during vehicle testing, and was routed to the NASA Shuttle Logistics Depot for testing and disassembly. The internal inspection of the box revealed TW growth visible without magnification. The results of the Tiger Team that was assembled to investigate and develop recommendations are reviewed in this viewgraph presentation.
CASI
Tin; Whiskers (Crystals); Metal Fibers; Removal; Recommendations; Structural Members

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*.

20070021237 Clark and Elbing, LLP, Boston, MA, USA
Polyurethane-Sealed Biocompatible Device and Method for Its Preparation
Phaneuf, M. D., Inventor; Dempsey, D. J., Inventor; Quist, W. C., Inventor; Logerfo, F. W., Inventor; 1 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): NHLBI-1R41HL63511-01A1

Patent Info.: Filed Filed 1 Jun 04; US-Patent-Appl-SN-10-858-495
Report No.(s): PB2007-102491; No Copyright; Avail.: CASI: A03, Hardcopy

Provided is a biocompatible device which has been coated or sealed with a polyether or polyether/carbonate based urethane polymer that contains functional groups (e.g. carboxylic acid groups) which are capable of serving as anchor sites for protein binding.

NTIS

Patent Applications; Polyurethane Resins

20070021284 California Univ., Santa Barbara, Goleta, CA, USA

Embedded Optical Sensors for Thermal Barrier Coatings. Annual Report for Period August 1, 2005 to July 31, 2006

Clarke, D. R.; Jul. 31, 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT41794
Report No.(s): DE2007-898969; No Copyright; Avail.: National Technical Information Service (NTIS)

The third year of this program on developing embedded optical sensors for thermal barrier coatings has been devoted to two principal topics: (1) continuing the assessment of the long-term, thermal cycle stability of the Eu3+ doped 8YSZ temperature sensor coatings, and (2) improving the fiber-optic based luminescence detector system. Following the earlier, preliminary findings, it has been found that not only is the luminescence from the sensors not affected by prolonged thermal cycling, even after 195 hours at 1425 degrees C, but the variation in luminescence lifetime with temperature remains unchanged. As the temperature of 1425 degrees C is much higher than present engines attain or even planned in the foreseeable future, our findings indicate that the Eu3+ doped thermal barrier coating sensors are very robust and have the potential of being stable throughout the life of coatings. Investigation of Eu3+ doped coatings prepared by plasma-spraying exhibited the same luminescence characteristics as those prepared by electron-beam evaporation. This is of major significance since thermal barrier coatings can be prepared by both process technologies. A fiber-optic based luminescence system has been constructed in which the hottest section of fiber operates to at least 1250 degrees C.

NTIS

Embedding; Optical Measuring Instruments; Thermal Control Coatings

20070021345 California Univ., Berkeley, CA, USA

Composition and Method for Removing Photoresist Materials from Electronic Components

Davenahll, L. B., Inventor; Rubin, J. B., Inventor; Taylor, C. M. V., Inventor; 11 Jan 05; 11 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 11 Jan 05; US-Patent-Appl-SN-11-034-519
Report No.(s): PB2007-102519; No Copyright; Avail.: CASI: A03, Hardcopy

Composition and method for removing photoresist materials from electronic components. The composition is a mixture of at least one dense phase fluid and at least one dense phase fluid modifier. The method includes exposing a substrate to at least one pulse of the composition in a supercritical state to remove photoresist materials from the substrate.

NTIS

Photoresists; Electronics

20070021384 VanDeuren (Richard) Boerner, SC, WI, USA, Northwestern Univ., Chicago, IL, USA

Vapor Deposited Electro-Optic Films Self-Assembled Through Hydrogen Bonding

Marks, T. J., Inventor; Zhu, P., Inventor; 27 Feb 04; 15 pp.; In English
Contract(s)/Grant(s): ONR-N000-14-00-C
Patent Info.: Filed Filed 27 Feb 04; US-Patent-Appl-SN-10-788 928
Report No.(s): PB2007-102554; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention introduces a novel route toward microstructural orientation into organic films, using multiple hydrogen-bonding to self-assemble chromophore molecules into electro-optic films in a net polar orientation. High-quality, thick films (up to micrometers) with molecular net dipole orientations can be fabricated under vacuum in hours. The film microstructure is intrinsically acentric; and the orientation is robust.

NTIS

Electro-Optics; Hydrogen Bonds; Vapor Deposition

20070021467 NASA Marshall Space Flight Center, Huntsville, AL, USA

Degradation of the Adhesive Properties of MD-944 Diode Tape by Simulated Low Earth Orbit Environmental Factors

Albyn, K.; Finckenor, M.; December 2006; 64 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2006-214712; M-1179; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021467

The International Space Station (ISS) solar arrays utilize MD-944 diode tape with silicone pressure-sensitive adhesive to protect the underlying diodes and also provide a high-emittance surface. On-orbit, the silicone adhesive will be exposed and ultimately convert to a glass-like silicate due to atomic oxygen (AO). The current operational plan is to retract ISS solar array P6 and leave it stored under load for a long duration (6 mo or more). The exposed silicone adhesive must not cause the solar array to stick to itself or cause the solar array to fail during redeployment. The Environmental Effects Branch at Marshall Space Flight Center, under direction from the ISS Program Office Environments Team, performed simulated space environment exposures with 5-eV AO, near ultraviolet radiation and ionizing radiation. The exposed diode tape samples were put under preload and then the resulting blocking force was measured using a tensile test machine. Test results indicate that high-energy AO, ultraviolet radiation, and electron ionizing radiation exposure all reduce the blocking force for a silicone-to-silicone bond. AO exposure produces the most significant reduction in blocking force

Author

Solar Arrays; Ultraviolet Radiation; Ionizing Radiation; Oxygen Atoms; Silicones; Adhesives; Low Earth Orbits

20070021679 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Progress Status of Skutterudite-Based Segmented Thermoelectric Technology Development

Caillat, T.; Sakamoto, J.; Lara, L.; Jewell, A.; Kisor, A.; July 25, 2004; 34 pp.; In English; 23rd International Conference on Thermoelectrics, 25-29 Jul. 2004, Adelaide, Australia; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39958

Young's modulus, bulk density, fracture strength, and fracture toughness of alpha silicon carbide manufactured by extrusion and by isopressing were measured at room and elevated temperature in order to determine material feasibility as augers for the Tile Overlay Repair attachment. The measured properties of extruded and isopressed materials differ significantly, with the extruded material exhibiting marked strength anisotropy and lower density. The measurements were made between July and September 2006 at Glenn Research Center (GRC), in order to obtain design data for use in structural and thermal mathematical models.

Author

Mathematical Models; Segments; Thermoelectricity; Microstructure; Mechanical Properties; Technology Utilization

28
PROPELLANTS AND FUELS

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

20070021785 NASA Johnson Space Center, Houston, TX, USA

The Development of Fuel Cell Technology for NASA's Human Spaceflight Program

Scott, John H.; June 20, 2007; 25 pp.; In English; 5th International Fuel Cell Science, Engineering and Technology, 18-20 June 2007, New York, NY, USA; Original contains color illustrations

Contract(s)/Grant(s): 305311.01.05.01; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021785

My task this morning is to review the history and current direction of fuel cell technology development for NASA's human spaceflight program and to compare it to the directions being taken in that field for The Hydrogen Economy. The concept of 'The Hydrogen Economy' involves many applications for fuel cells, but for today's discussion, I'll focus on automobiles.

Author

Manned Space Flight; Technology Utilization; Automobile Fuels; Hydrogen Oxygen Fuel Cells; NASA Space Programs

31
ENGINEERING (GENERAL)

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

20070021742 Jacobs Engineering Group, Inc., Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA

Lunar Habitat Optimization Using Genetic Algorithms

SanScoucie, M. P.; Hull, P. V.; Tinker, M. L.; Dozier, G. V.; March 2007; 32 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TP-2007-214852; Copyright; Avail.: CASI: A03, Hardcopy

Long-duration surface missions to the Moon and Mars will require bases to accommodate habitats for the astronauts. Transporting the materials and equipment required to build the necessary habitats is costly and difficult. The materials chosen for the habitat walls play a direct role in protection against each of the mentioned hazards. Choosing the best materials, their configuration, and the amount required is extremely difficult due to the immense size of the design region. Clearly, an optimization method is warranted for habitat wall design. Standard optimization techniques are not suitable for problems with such large search spaces; therefore, a habitat wall design tool utilizing genetic algorithms (GAs) has been developed. GAs use a 'survival of the fittest' philosophy where the most fit individuals are more likely to survive and reproduce. This habitat design optimization tool is a multiobjective formulation of up-mass, heat loss, structural analysis, meteoroid impact protection, and radiation protection. This Technical Publication presents the research and development of this tool as well as a technique for finding the optimal GA search parameters.

Author

Design Optimization; Genetic Algorithms; Structural Analysis; Walls; Space Habitats; Habitats; Structural Design; Design Analysis

20070021790 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

Journal of The Chinese Institute of Engineers, Volume 29, No. 6

Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Chern, Ming-Jyh, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Chen, Jean-Lien, Editor; Shieh, Ce-Kuen, Editor; Chao, Hui-Yu, Editor; Chang, Kai, Editor, et al.; October 2006; ISSN 0253-3839; 184 pp.; In English; See also 20070021791 - 20070021803; Original contains color illustrations; Copyright; Avail.: Other Sources

The Journal of the Chinese Institute of Engineers is presented. The topics include: 1) An Algorithm to Build Convex Hulls for 3-D Objects; 2) A Cell Subdivision Strategy for R-Nearest Neighbors Computation; 3) Extreme Reaches and Maximal Reachable Workspace for Rotary Tools Mounted on a Stewart Platform Manipulator; 4) Indirect T-Trefftz and F-Trefftz Methods for Solving Boundary Value Problem of Poisson Equation; 5) The Chloride Ponding Test and Its Correlation to the Accelerated Chloride Migration Test for Concrete; 6) Coloured Petri Net-Based Modeling for Distributed Relational Database Queries; 7) A Novel Automatic Color Transfer Algorithm Between Images; 8) A Fast-Built Flux-Linkage Model for Switched-Reluctance Motors; 9) A Numerical Study of Piled Raft Foundations; 10) A Preliminary Study of RPC for Repair and Retrofitting Materials; 11) Design and Analysis for a Delay-Bounded Fair Queuing Algorithm; 12) Performance Comparisons of Index-Based Communication-Induced Checkpointing Protocols; 13) A Leakage Reduction Via Balanced Circuit and Masking Noise Design against the Differential Power Analysis

CASI

China; Mechanical Engineering; Chemical Engineering; Electrical Engineering

20070021791 National Taiwan Univ., Taipei, Taiwan, Province of China

An Algorithm to Build Convex Hulls for 3-D Objects

Chen, Han-Ming; Lin, Tzung-Han; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 945-952; In English; See also 20070021790

Contract(s)/Grant(s): NSC 93-2212-E-002-061; Copyright; Avail.: Other Sources

In this paper, a new algorithm based on the Quickhull algorithm is proposed to find convex hulls for 3-D objects using neighbor trees. The neighbor tree is the data structure by which all visible facets to the selected furthest outer point can be

found. The neighboring sequence of ridges on the outer boundary of all visible facets also can be found directly from the neighbor tree. This new algorithm is twice as efficient as Barber's algorithm.
Author
Algorithms; Computational Geometry; Three Dimensional Models; Trees (Mathematics); Convexity

20070021792 National Taiwan Ocean Univ., Keelung, Taiwan, Province of China
The Chloride Ponding Test and Its Correlation to the Accelerated Chloride Migration Test for Concrete
Yang, Chung-Chia; Chiang Shih-Che; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1007-1015; In English; See also 20070021790
Contract(s)/Grant(s): NSC 94-2211-E-019-018; Copyright; Avail.: Other Sources

In this study, the total chloride content and penetration depth of concretes were measured by the 90-day salt ponding test, and the flux of chloride ions passing through the concrete was measured by the accelerated chloride migration test (ACMT; the electrochemical technique is applied to accelerate chloride ion migration). Fick's second law was fitted to the data from the ponding test to determine the diffusion coefficient. The steady-state and the non-steady-state migration coefficients were determined from the modified Fick's first and second laws, respectively. The steady-state migration coefficient, the non-steady-state migration coefficient, and the diffusion coefficient were compared. The non-steady-state migration coefficient, steady-state migration coefficient, and diffusion coefficient were linearly correlated. The non-steady-state migration coefficient gave the highest value, being about 1.5 times higher than the steady-state migration coefficient, and up to about 4 times higher than the diffusion coefficient. Since the 90-day ponding test is time-consuming, the ACMT provides a time saving method to obtain the transport property of concrete.
Author
Chlorides; Concretes; Correlation; Diffusion Coefficient; Migration; Electrochemistry

20070021795 National Taiwan Ocean Univ., Keelung, Taiwan, Province of China
Indirect T-Trefftz and F-Trefftz Methods for Solving Boundary Value Problem of Poisson Equation
Liu, Ru-Feng; Kuo, Shy-Rhong; Chen, Yung-Wei; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 989-1006; In English; See also 20070021790; Copyright; Avail.: Other Sources

The Poisson equation can be solved by first finding a particular solution and then solving the resulting Laplace equation. In this paper, a computational procedure based on the Trefftz method is developed to solve the Poisson equation for two-dimensional domains. The radial basis function approach is used to find an approximate particular solution for the Poisson equation. Then, two kinds of Trefftz methods, the T-Trefftz method and F-Trefftz method, are adopted to solve the resulting Laplace equation. In order to deal with the possible ill-posed behaviors existing in the Trefftz methods, the truncated singular value decomposition method and L-curve concept are both employed. The Poisson equation of the type, del squared u = f(x, u), in which x is the position and u is the dependent variable, is solved by the iterative procedure. Numerical examples are provided to show the validity of the proposed numerical methods and some interesting phenomena are carefully discussed while solving the Helmholtz equation as a Poisson equation. It is concluded that the F-Trefftz method can deal with a multiply connected domain with genus p(p greater than 1) while the T-Trefftz method can only deal with a multiply connected domain with genus 1 if the domain partition technique is not adopted.
Author
Boundary Value Problems; Iteration; Numerical Analysis; Poisson Equation; Trefftz Method

20070021796 Nan-Jeon Inst. of Technology, Tainan, Taiwan
A Fast-Built Flux-Linkage Model for Switched-Reluctance Motors
Chi, Hsiao-Ping; Lin, Ray-Lee; Chen, Jiann-Fuh; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1071-1080; In English; See also 20070021790; Copyright; Avail.: Other Sources

This paper presents a simplified and fast-built model for the analytical representation of the flux linkage of a switched-reluctance motor (SRM). Presently, most conventional methods require numerous flux-linkage-current-position data to build a model; however, this is time-ineffective. In the proposed model, the flux linkage is represented by a limited number of Fourier series terms. The coefficients of the Fourier series are determined by the valued of the flux linkage at the aligned position, unaligned position and a midway position. At either the aligned or the midway position, the non-linear relationship between the flux linkage and the phase current is represented by a simplified function, which is derived from a linear relationship--the product of flux linkage and phase current versus phase current--in the saturated region. The proposed model can be built with only five data points of static characteristics, which are simply obtained through finite-element analysis

(FEA); this allows for easy implementation and high computational efficiency. The accuracy of the proposed model is verified via comparison to measurements of the steady-state voltage and phase current waveforms of the machine as well as several characteristic curves. The proposed model is shown to have a good degree of accuracy.
Author
Fourier Series; Linkages; Reluctance; Mathematical Models; Motors

20070021797 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Coloured Petri Net-Based Modeling for Distributed Relational Database Queries
Chen, Pe-Te; Chen, Yu-Tsai; Yang, Chen-Chau; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1029-1039; In English; See also 20070021790; Copyright; Avail.: Other Sources

In this paper, a new application of colour timed Petri net (CTPN) based methodology for distributed relational database queries modeling and corresponding simulation is addressed. This work, first based on parsed query definitions, converts logical query plans into designed CTPN models. Later, the improved cost-based functions are then established and appended to CTPN with a general purpose CPN simulator-Design/CPN to observe the thresholds of query operations. The proposed CTPN can be used in the design phase as an experimental prototype to automatically simulate distributed database query processing which, in turn, may considerably reduce the load of developing the actual query processing software in the logical design phase of a distributed database system. Also, since all the essential details of query processing in CTPN have been simulated, the results of this study can be closely related to real world applications.
Author
Petri Nets; Relational Data Bases; Mathematical Models; Distributed Processing; Query Languages

20070021798 National Chung Hsing Univ., Taichung, Taiwan, Province of China
A Novel Automatic Color Transfer Algorithm Between Images
Wang, Chung-Ming; Huang, Yao-Hsien; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1051-1060; In English; See also 20070021790; Copyright; Avail.: Other Sources

A color transfer algorithm between images intends to modify the colors in the source image by borrowing the color characteristics from the target image. In this paper, we present a novel automatic color transfer algorithm between images. This algorithm is able to proceed on color transfer with no user intervention, and produce visually plausible resultant images. To the best of our knowledge, our algorithm is the first to achieve this kind of automation. Our technique consists of an image segmentation algorithm, a swatch merging algorithm, and a pattern recognition algorithm. The image segmentation algorithm generates a number of swatches with different features in the source and target images. The swatch merging algorithm merges a particular swatch with its neighbors in the source image when it fails to pass the normality test. The pattern recognition algorithm then automatically matches these swatches for color transfer. We develop a boundary transition algorithm to make possible a consistent transition between two boundaries of patches. Experimental results demonstrate that, without any user intervention, our technique performs color transfer results with good visual realism. The technique is superior to the original user-intervention color transfer algorithm.
Author
Algorithms; Imaging Techniques; Automatic Control; Color

20070021799 National Central Univ., Jung-Li, Taiwan, Province of China
A Cell Subdivision Strategy for R-Nearest Neighbors Computation
Chen, Han-Ming; Lin, Tzung-Han; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 953-965; In English; See also 20070021790; Copyright; Avail.: Other Sources

Due to the popularity of optical digitizing devices which can digitize an object easily and densely, the processing of a huge amount of data points has become important. Searching is one of the fundamental computational tasks in data analysis algorithms as it often dominates the computational efficiency significantly. The purpose of this study is to provide algorithms based on cell subdivision to search for the nearest neighbors adjacent to a given entity, where the given entity can be a point, a line segment or a triangle. The nearest-points search is used to find a set of points closest to a given point; the nearest-edges search is to find the edges that intersect the given edge; the nearest-triangles search is to find the mapping triangles of a given point or a given triangle. A detailed discussion for each of the above algorithms is described. Several examples are provided also to demonstrate the feasibility of the proposed algorithms.
Author
Algorithms; Cellular Automata; Analysis (Mathematics); Computation; Points (Mathematics)

20070021801 National Chung Hsing Univ., Taichung, Taiwan, Province of China

A Numerical Study of Piled Raft Foundations

Lin, Der-Guey; Feng, Zheng-Yi; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1091-1097; In English; See also 20070021790; Copyright; Avail.: Other Sources

This paper presents raft-pile-soil interaction for a vertically loaded flexible piled raft on layered subsoil using a two-dimensional finite difference numerical tool. The subsoil is modeled as a linear elastic material and the raft is modeled as a beam structure under plane strain. In addition, the piles are simulated by a series of pile elements considering the pile/soil interface behavior. In the simulations, the required input parameters of soil, pile and interface are determined by back analyses of pile loading tests. Settlement, bending moment, both in pile and raft, as well as effects of raft flexibility for vertical uniform loading in the subsoil were examined. It is found that even though for vertical uniform loading, a relatively high bending moment may be induced in the piles due to lateral displacement of the stressed subsoil. For the case of a piled raft placed over a soft clay layer at ground surface the contact pressure at the raft-soil interface is merely 4 - 6% of that developed in the unpiled raft. Nevertheless, the contact pressure may reach 15 - 25% of that of the unpiled raft if the piled raft is resting on a sand layer at the ground surface. This implies that the loading carried by the pile group could be reduced by almost 114 of the design load and it could eventually reduce the cost of pile group construction to a certain extent.

Author

Soils; Plane Strain; Simulation; Pressure; Displacement; Construction

20070021802 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

Extreme Reaches and Maximal Reachable Workspace for Rotary Tools Mounted on a Stewart Platform Manipulator

Oen, Ka-Tjun; Wang, Li-Chun T.; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 967-974; In English; See also 20070021790; Copyright; Avail.: Other Sources

A new type of problem associated with the extreme reaches of the Stewart platform manipulator is dealt with in this paper. Given a specified orientation of the tool axis, the problem involves finding the extreme distance that the tool bit mounted on the mobile platform can reach from its home position along any specified direction. During the motion, the mobile platform is allowed to be rotated about the tool axis to adjust the configuration of the driving mechanism to prevent premature activation of the kinematic constraints. A numerical optimization algorithm based on the concept of the cyclic coordinate descent method is developed for solving this problem, in which all three types of kinematic constraints, namely the actuator stroke constraint, the passive joint limitations, and the link interference conditions, have been taken into account. In addition, a numerical example is presented to demonstrate the ability of the proposed method to find the optimal reachable workspace of the robot.

Author

Manipulators; Mechanical Drives; Numerical Analysis; Kinematics; Tools; Supports

20070021803 Chaoyang Univ. of Technology, Taichung, Taiwan, Province of China

A Preliminary Study of RPC for Repair and Retrofitting Materials

Lee, Ming-Gin; Kan, Yu-Cheng; Chen, Kuei-Ching; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1099-1103; In English; See also 20070021790

Contract(s)/Grant(s): NSC 91-NU-7-324-001; NSC 92-2211-E324-022; Copyright; Avail.: Other Sources

This study aims to assess the performances of reactive powder concrete, RPC, as a new repair and retrofitting material and evaluate its durability in concrete members. One accelerated aging environment, namely a freeze-thaw cycle acceleration deterioration test, was selected for the durability study of the repair materials. Before and after aging, the samples were evaluated by the bond strength (slant shear test), rebar pull out strength, and relative dynamic modulus NDT tests. The test results show that the RPC displayed excellent repair and retrofit potentials, as it possessed high strengthening effect, bond strength, dynamic modulus and durability, as compared with other concretes. Using RPC or CFRP (carbon fiber reinforced plates) for strengthening concrete members one can obtain specific retrofit effects but the costs are extremely different for these two materials.

Author

Concretes; Durability; Powder (Particles); Reactivity; Retrofitting; Mechanical Properties; Aging (Materials)

32
COMMUNICATIONS AND RADAR

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

20070021290 Nevada Univ. System, Reno, NV, USA

Community Environmental Monitoring Program in the 21st Century: The Evolution of a Monitoring Network

Hartwell, W. T.; Tappen, J.; Karr, L.; McCurdy, G.; Jan. 19, 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-AC52-06NA26383

Report No.(s): DE2007-898974; CONF-2007-1; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper focuses on the evolution of the various operational aspects of the Community Environmental Monitoring Program (CEMP) network following the transfer of program administration from the U.S. Environmental Protection Agency (EPA) to the Desert Research Institute (DRI) of the Nevada System of Higher Education in 1999-2000. The CEMP consists of a network of 29 fixed radiation and weather monitoring stations located in Nevada, Utah, and California. Its mission is to involve stakeholders directly in monitoring for airborne radiological releases to the offsite environment as a result of past or ongoing activities on the Nevada Test Site (NTS) and to make data as transparent and accessible to the general public as feasible.

NTIS

Environmental Monitoring; Communities

20070021307 Government Accountability Office, Washington, DC, USA

Telecommunications: GSA Has Accumulated Adequate Funding for Transition to New Contracts but Needs Cost Estimation Policy

Feb. 2007; 28 pp.; In English

Report No.(s): PB2007-107731; GAO-07-268; No Copyright; Avail.: CASI: A03, Hardcopy

GSA did not use sound analysis when estimating the amount of funding needed to meet its transition-related commitments. Specifically, its analysis was not sufficiently accurate, comprehensive, documented, or validated. A primary weakness is that the estimate is largely based an assumption--known as the transition traffic factor--that 76 percent of the services provided under the current contracts would be moved to a different provider under the Networx contracts. However, according to program officials, this assumption is intentionally conservative and represents a worst-case scenario that is unlikely to occur. Additionally, GSA may have double-counted a cost and did not update its analysis to reflect a nearly 2-year delay. Finally, GSA did not document significant assumptions and data sources used in its analysis, or validate it. These weaknesses can be attributed in part to the lack of a cost estimation policy that reflects best practices. While GSA's intentionally conservative approach minimizes the risk that it would have inadequate funds to pay for committed transition costs, it increases the risk that GSA will retain excess funds that could be used for other purposes. GSA has accumulated adequate funding to support its anticipated transition costs. As of fiscal year-end 2006, GSA had approximately $142 million in a transition reserve. GAO analysis of the estimate indicates it is unlikely that GSA will need more than it has already accumulated to fund the transition. Specifically, the $142 million already retained will be adequate to cover anticipated costs 96 percent of the time. The recent merger of two GSA funds gives the agency additional flexibility that reduces its need to accumulate the entire $151.5 million it estimated would be needed. With Networx contracts scheduled to be awarded starting in March 2007, GSA will soon have the information necessary to reassess the main assumption underlying its estimate--the transition traffic factor--and address the weaknesses GAO identified. Once this has been accomplished, GSA can reevaluate the funding needed to meet anticipated commitments.

NTIS

Accumulations; Cost Estimates; Policies; Telecommunication

20070021327 Massachusetts Inst. of Tech., Cambridge, MA, USA
Lincoln Distributed Optical Receiver Array
Bondurant, R. S., Inventor; Boroson, D. M., Inventor; Murphy, D. V., Inventor; 4 Aug. 2005; 18 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0002
Patent Info.: Filed Filed 30 Jan. 2004; US-Patent-Appl-SN-10-768395
Report No.(s): PB2007-102959; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021327

An array of spatially-separated optical detectors is configured to receive a free-space optical communication signal from a remote source. Each optical detector of the array includes an optical system and an array of light sensors. The optical system collects a portion of light received from the remote source and directs it toward the array of light sensors. The array of light sensors, in turn, converts the collected portion of light to one or more electrical, detected signals corresponding to the collected portion of light. A processor is coupled to the array of spatially-separated optical detectors, receiving the detected signals and combining the received signals to obtain information borne by the received optical communication signal.
Author
Receivers; Free-Space Optical Communication; Space Communication; Satellite Communication

20070021341 Government Accountability Office, Washington, DC, USA
Emergency Preparedness: Current Emergency Alert System Has Limitations, and Development of a New Integrated System Will Be Challenging
Mar. 2007; 46 pp.; In English
Report No.(s): PB2007-107717; GAO-07-411; No Copyright; Avail.: CASI: A03, Hardcopy

During emergencies, the public needs accurate and timely information. Through the Emergency Alert System (EAS), the media play a pivotal role, assisting emergency management personnel in communicating to the public. GAO reviewed (1) the media's ability to meet federal requirements for participating in EAS, (2) stakeholder views on the challenges facing EAS and potential changes to it, and (3) the progress made toward developing an integrated alert system. GAO reviewed the Federal Communications Commission's (FCC) proposed rulemaking on EAS and interviewed media outlets, state emergency management officials, and federal agencies responsible for EAS, including FCC and the Federal Emergency Management Agency (FEMA), within the Department of Homeland Security (DHS).
NTIS
Cosmic Ray Showers; Emergencies; Management Methods; Systems Integration; Warning Systems

20070021344 Government Accountability Office, Washington, DC, USA
First Responders: Much Work Remains to Improve Communications Interoperability
Apr. 2007; 75 pp.; In English
Report No.(s): PB2007-107712; GAO-07-301; No Copyright; Avail.: CASI: A04, Hardcopy

As the first to respond to natural disasters, domestic terrorism, and other emergencies, public safety agencies rely on timely communications across multiple disciplines and jurisdictions. It is vital to the safety and effectiveness of first responders that their electronic communications systems enable them to communicate with whomever they need to, when they need to, and when they are authorized to do so. GAO was asked to determine, among other things, (1) the extent to which Department of Homeland Security (DHS) funding and technical assistance has helped to improve interoperable communications in selected states and (2) the progress that has been made in the development and implementation of interoperable communications standards. To address these objectives, GAO reviewed grant information, documentation of selected states' and localities' interoperability projects, and standards documents.
NTIS
Communication Networks; Emergencies; Interoperability; Management Methods; Transponders

20070021365 Los Alamos National Lab., NM USA
Radiofrequency Attenuator and Method
Warner, B. P., Inventor; McCleskey, T. M., Inventor; Burrell, A. K., Inventor; Agrawal, A., Inventor; Hall, S. B., Inventor; 16 Nov 04; 7 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 16 Nov 04; US-Patent-Appl-SN-10-990 881
Report No.(s): PB2007-102547; 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 moltensalt. 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)SO(sub 3)(sup -)), bis(trifluoromethylsulfonyl)imide ((CF(sub 3)SO(sub 2))(sub 2)N(sup -)),bis(perfluoroet hylsulfonyl)imide ((CF(sub 3)CF(sub 2)SO(sub 2))(sub 2)N(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

20070021393 NASA Goddard Space Flight Center, Greenbelt, MD, USA
BAE Systems Radiation Hardened SpaceWire ASIC and Roadmap
Berger, Richard; Milliser, Myrna; Kapcio, Paul; Stanley, Dan; Moser, David; Koehler, Jennifer; Rakow, Glenn; Schnurr, Richard; September 26, 2006; 6 pp.; In English; 9th Annual International MAPLD Conference, 26-28 September 2006, Washington, DC, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

An Application Specific Integrated Circuit (ASIC) that implements the SpaceWire protocol has been developed in a radiation hardened 0.25 micron CMOS, technology. This effort began in March 2003 as a joint development between the NASA Goddard Space Flight Center (GSFC) and BAE Systems. The BAE Systems SpaceWire ASlC is comprised entirely of reusable core elements, many of which are already flight-proven. It incorporates a 4-port SpaceWire router with two local ports, dual PC1 bus interfaces, a microcontroller, 32KB of internal memory, -and a memory controller for additional external memory use. The SpaceWire ASlC is planned for use on both the Geostationary Operational Environmental Satellites (GOES)-R and the Lunar Reconnaissance Orbiter (LRO). Engineering parts have already been delivered to both programs. This paper discusses the SpaceWire protocol and those elements of it that have been built into the current SpaceWire reusable core. There are features within the core that go beyond the current standard that can be enabled or disabled by the user and these will be described. The adaptation of SpaceWire to BAE Systems' On Chip Bus (OCB) for compatibility with the other reusable cores will be discussed. Optional configurations within user systems will be shown. The physical imp!ementation of the design will be described and test results from the hardware will be discussed. Finally, the BAE Systems roadmap for SpaceWire developments will be discussed, including some products already in design as well as longer term plans.
Author
Application Specific Integrated Circuits; Controllers; Radiation Hardening; Electronic Equipment; Spacecraft Communication

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ELECTRONICS AND ELECTRICAL ENGINEERING

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

20070021230 NASA Johnson Space Center, Houston, TX, USA
Hazards, Safety and Design Considerations for Commercial Lithium-ion Cells and Batteries
Jeevarajan, Judith; May 2007; 23 pp.; In English; 2nd IAASS Conference: Space Safety in a Global World, 14-17 May 2007, Chicago, IL, USA; Original contains color illustrations
Contract(s)/Grant(s): 667560.05.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021230

This viewgraph presentation reviews the features of the Lithium-ion batteries, particularly in reference to the hazards and safety of the battery. Some of the characteristics of the Lithium-ion cell are: Highest Energy Density of Rechargeable Battery Chemistries, No metallic lithium, Leading edge technology, Contains flammable electrolyte, Charge cut-off voltage is critical (overcharge can result in fire), Open circuit voltage higher than metallic lithium anode types with similar organic electrolytes. Intercalation is a process that places small ions in crystal lattice. Small ions (such as lithium, sodium, and the other alkali metals) can fit in the interstitial spaces in a graphite lattice. These metallic ions can go farther and force the graphitic planes apart to fit two, three, or more layers of metallic ions between the carbon sheets. Other features of the battery/cell are: The

graphite is conductive, Very high energy density compared to NiMH or NiCd, Corrosion of aluminum occurs very quickly in the presence of air and electrolyte due to the formation of HF from LiPF6 and HF is highly corrosive. Slides showing the Intercalation/Deintercalation and the chemical reactions are shown along with the typical charge/discharge for a cylindrical cell. There are several graphs that review the hazards of the cells.
CASI
Hazards; Lithium; Metal Ions; Safety; Lithium Batteries; Electrolytic Cells; Electric Batteries

20070021292 Vanderbilt Univ., Nashville, TN, USA
Experimental Analysis of Proton-Induced Displacement and Ionization Damage Using Gate-Controlled Lateral PNP Bipolar Transistors
Ball, D. R.; Schrimpf, R. D.; Barnaby, H. J.; [2006]; 4 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The electrical characteristics of proton-irradiated bipolar transistors are affected by ionization damage to the insulating oxide and displacement damage to the semiconductor bulk. While both types of damage degrade the transistor, it is important to understand the mechanisms individually and to be able to analyze them separately. In this paper, a method for analyzing the effects of ionization and displacement damage using gate-controlled lateral PNP bipolar junction transistors is described. This technique allows the effects of oxide charge, surface recombination velocity, and bulk traps to be measured independently.
Author
Bipolar Transistors; Junction Transistors; Protons; Irradiation; Semiconductors (Materials)

20070021304 Lawrence Livermore National Lab., Livermore, CA USA
Methods for Calibration of Prout-Tompkins Kinetics Parameters Using EZM Iteration and GLO
Wemhoff, A. P.; Burnham, A. K.; Nov. 08, 2006; 32 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898464; UCRL-TR-225940; No Copyright; Avail.: Department of Energy Information Bridge

This document contains information regarding the standard procedures used to calibrate chemical kinetics parameters for the extended Prout-Tompkins model to match experimental data. Two methods for calibration are mentioned: EZM calibration and GLO calibration. EZM calibration matches kinetics parameters to three data points, while GLO calibration slightly adjusts kinetic parameters to match multiple points. Information is provided regarding the theoretical approach and application procedure for both of these calibration algorithms. It is recommended that for the calibration process, the user begin with EZM calibration to provide a good estimate, and then fine-tune the parameters using GLO. Two examples have been provided to guide the reader through a general calibrating process.
NTIS
Calibrating; Iteration; Adjusting; Reaction Kinetics

20070021321 Newcastle-upon-Tyne Univ., Newcastle, UK
Efficient Automatic Resolution of Encoding Conflicts Using STG (Signal Transition Graphs) Unfoldings
Khomenko, V.; Jan. 2007; 16 pp.; In English
Report No.(s): PB2007-107502; CS-TR-995; Copyright; Avail.: National Technical Information Service (NTIS)

Synthesis of asynchronous circuits from Signal Transition Graphs (STGs) involves resolution of state encoding conflicts by means of refining the STG specification. In this paper, a technique for resolving such conflicts by means of insertion of new signals is proposed. It is based on conflict cores, i.e. sets of transitions causing encoding conflicts, which are represented at the level of finite and complete prefixes of STG unfoldings. The experimental results show significant improvements over the state space based approach in terms of runtime and memory consumption, as well as some improvements in the quality of the resulting circuit.
NTIS
Circuits; Synchronism; Graphs (Charts); Transition; Automatic Control; Signal Encoding

20070021322 Newcastle-upon-Tyne Univ., Newcastle, UK
Mobile Devices in Crossmodal Interfaces
Cao, H.; Olivier, P.; Jackson, D.; Armstrong, A.; Feb. 2007; 14 pp.; In English
Report No.(s): PB2007-107501; CS-TR-1004; Copyright; Avail.: National Technical Information Service (NTIS)

Synthesis of asynchronous circuits from Signal Transition Graphs (STGs) involves resolution of state encoding conflicts

by means of refining the STG specification. In this paper, a technique for resolving such conflicts by means of insertion of new signals is proposed. It is based on conflict cores, i.e. sets of transitions causing encoding conflicts, which are represented at the level of finite and complete prefixes of STG unfoldings. The experimental results show significant improvements over the state space based approach in terms of runtime and memory consumption, as well as some improvements in the quality of the resulting circuit.
NTIS
Circuits; Synchronism; Mobile Communication Systems

20070021333 Lawrence Livermore National Lab., Livermore, CA USA
Frequency Content of Current Pulses in Slapper Detonator Bridges
Carpenter, K. H.; Dec. 21, 2006; 13 pp.; In English
Report No.(s): DE2007-898461; UCRL-TR-226959; No Copyright; Avail.: Department of Energy Information Bridge
DFT amplitudes are obtained for digital current pulse files. The frequency content of slapper detonator bridge current pulses is obtained. The frequencies are confined well within the passband of the CVR used to sample them.
NTIS
Detonators; Frequencies

20070021334 Summma and Allan, P.A., Charlotte, NC, USA
One Hundred Millimeter High Purity Semi-Insulating Single Crystal Silicon Carbide Wafer
Jenny, J. R., Inventor; Malta, D. P., Inventor; McDonald, H., Inventor; Brady, S. M., Inventor; Mueller, S. G., Inventor; 25 Jun 04; 29 pp.; In English
Contract(s)/Grant(s): DARPA-N00014-02-C-0306
Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-876 963
Report No.(s): PB2007-102541; No Copyright; Avail.: CASI: A03, Hardcopy
A single polytype single crystal silicon carbide wafer is disclosed having a diameter greater than three inches and less than five inches, resistivity greater than 10,000 ohm-cm, a micropipe density less than 200 cm(sup -2), and a combined concentration of shallow level dopants less than 5E16 cm(sup -3).
NTIS
Insulation; Millimeter Waves; Purity; Silicon Carbides; Single Crystals; Wafers

20070021336 Bartunek and Bhattacharyya Ltd., Columbia, MD, USA
Device and Method for Determining and Detecting the Onset of Structural Collapse
Duron, Z., Inventor; Pranger, L. A., Inventor; von Gerdorff, N., Inventor; Flynn, E., Inventor; Cho, A., Inventor; 16 Sep 04; 43 pp.; In English
Patent Info.: Filed Filed 16 Sep 04; US-Patent-Appl-SN-10-942-626
Report No.(s): PB2007-102532; No Copyright; Avail.: CASI: A03, Hardcopy
A significant number of rescue workers are killed or injured each year as they conduct searches within damaged or burning structures, unaware that the structure is in imminent danger of collapse. The present invention provides a system and method for detecting and monitoring structural damages which are irreversible and which lead to inevitable collapse of a building or structure. The system includes at least one accelerometer that is housed in a device that is mounted on an exterior surface outside the burn area, and within the reach of the rescue worker. The device communicates with a remote display that provides visual and/or audible signals to indicate imminent collapse of the structure. Additionally, the system includes collapse detecting analysis processes for determining the likelihood of collapse.
NTIS
Collapse; Detection

20070021346 Johns Hopkins Univ., Baltimore, MD, USA
Planetary-Harmonic Motor
Stolanovici, D., Inventor; Kavoussi, L. R., Inventor; 18 Sep 03; 20 pp.; In English
Contract(s)/Grant(s): NIH-1 R21 CA88232-01A1
Patent Info.: Filed Filed 18 Sep 03; US-Patent-Appl-SN-10-666-213
Report No.(s): PB2007-102518; No Copyright; Avail.: CASI: A03, Hardcopy
A motor suitable for use in a medical imaging environment has (1) a centrally located means for actuating a radial wave,

(2) a deformable flexspline having an inner surface and a toothed outer surface, with the flexspline coaxially aligned with the central axis of the radial wave actuating means and oriented such that the flexspline inner surface is proximate the outer boundary surface of the actuation means, and with the flexspline toothed outer surface having a first specified number of teeth, and (3) a circular spline having a toothed inner surface, this spline having an outer boundary surface and being coaxially aligned with the central axis and oriented such that the spline toothed inner surface is proximate the flexspline's toothed outer surface, with the spline inner surface having a second specified number of teeth which is different than the first specified number of teeth in the flexspline, wherein the actuation means is operable so that the action of its radial wave causes at least one of the flexspline teeth to engage at a point the toothed side of the circular spline in such a manner that an engagement point passes as a wave around the inner perimeter of the circular spine, with the movement of this engagement point causing the flexspline to rotate around its central axis.
NTIS
Deformation; Imaging Techniques

20070021348 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Growth and Integration of Epitaxial Gallium Nitride Films with Silicon-Based Devices
Rawdanowicz, T. A., Inventor; Narayan, J., Inventor; 21 Oct 04; 13 pp.; In English
Contract(s)/Grant(s): NSF-5-39207
Patent Info.: Filed Filed 21 Oct 04; US-Patent-Appl-SN-10-970-773
Report No.(s): PB2007-102517; No Copyright; Avail.: CASI: A03, Hardcopy

Epitaxial gallium nitride is grown on a silicon substrate while reducing or suppressing the formation of a buffer layer. The gallium nitride may be grown directly on the silicon substrate, for example using domain epitaxy. Alternatively, less than one complete monolayer of silicon nitride may be formed between the silicon and the gallium nitride. Subsequent to formation of the gallium nitride, an interfacial layer of silicon nitride may be formed between the silicon and the gallium nitride.
NTIS
Epitaxy; Gallium Nitrides; Silicon; Substrates

20070021354 Fulbright and Jaworski, LLP, Austin, TX, USA
Electrophoretic Ratchets and Cyclic Electrophoresis
Serwer, P., Inventor; Griess, G. A., Inventor; Valvano, J. W., Inventor; Basu, A., Inventor; 22 Jan 03; 29 pp.; In English
Contract(s)/Grant(s): NIH-HG02233; NIH-GM24365
Patent Info.: Filed Filed 22 Jan 03; US-Patent-Appl-SN-10-502 250
Report No.(s): PB2007-102583; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods for improving the resolution of macromolecules during electrophoresis. A method of creating an electrical field-rectifying fractionation-ratchet includes obtaining a fractionated particle that has an electrophoretic mobility that varies when an electric field varies, applying a pulsed electrical field to the fractionated particle, and varying a plurality of pulses of the electrical field repeatedly. Another method includes preparative gel electrophoresis that utilizes a continuous fractionation method made possible by an electrophoretic ratchet-generating field. Another method includes implementing cyclic electrophoresis including analyzing a sample by constant field electrophoresis; and enhancing the sample by an electrophoretic ratchet. Another method includes error checking during cyclic electrophoresis comprising: analyzing a sample by constant field electrophoresis; checking for errors in the sample; and enhancing the sample by an electrophoretic ratchet.
NTIS
Electrophoresis; Macromolecules

20070021358 Stockton (Kilpatrick), LLP, Atlanta, GA, USA, Oklahoma Univ., Norman, OK, USA, Arkansas Univ., Fayetteville, AR, USA
Monodisperse Core/Shell and Other Complex Structured Nanocrystals and Methods of Preparing the Same
Peng, X., Inventor; Li, J., Inventor; Battaglia, D., Inventor; Yang, Y. A., Inventor; Wang, Y., Inventor; 22 Jan 04; 51 pp.; In English
Contract(s)/Grant(s): NSF-CHE0101178
Patent Info.: Filed Filed 22 Jan 04; US-Patent-Appl-SN-10-763 068
Report No.(s): PB2007-102581; No Copyright; Avail.: CASI: A04, Hardcopy

The present invention provides new compositions containing naearly monodisperse colloidal core/shell semiconductor nanocrystals with high photoluminescence quantum yields (PL QY), as well as other complex structured semiconductor

nanocrystals. This invention also provides new synthetic methods for preparing these nanocrystals, and new devices comprising these compositions. In addition to core/shell semiconductor nanocrystals, this patent application also provides complex semiconductor nanostructures, quantum shells, quantum wells, doped nanocrystals, and other multiple-shelled semiconductor nanocrystals.
NTIS
Nanocrystals; Photoluminescence; Semiconductors (Materials); Doped Crystals

20070021368 Nelson Scientific Exploration, LLC, MountLake Terrace, WA, USA, Department of Energy, Washington, DC, USA
ICC Experiment Performance Improvement through Advanced Feedback Controllers for High-Power Low-Cost Switching Power Amplifiers
Nelson, B. A.; Oct. 20, 2006; 32 pp.; In English
Contract(s)/Grant(s): FG02-05ER84190
Report No.(s): DE2007-893760; DOE/ER/84190-1; No Copyright; Avail.: National Technical Information Service (NTIS)
Limited resources force most smaller fusion energy research experiments to have little or no feedback control of their operational parameters, preventing achievement of their full operational potential. Recent breakthroughs in high-power switching technologies have greatly reduced feedback-controlled power supply costs, primarily those classified as switching power amplifiers. However, inexpensive and flexible controllers for these power supplies have not been developed. A Clinux-based micro-controller (Analog Devices Blackfin BF537) was identified as having the capabilities to form the base of a digital control system for switching power amplifiers. A control algorithm was created, and a Linux character device driver was written to realize the algorithm. The software and algorithm were successfully tested on a switching power amplifier and magnetic field coil using University of Washington (subcontractor) resources.
NTIS
Controllers; Feedback; Low Cost; Plasma Physics; Power Amplifiers; Switching

20070021370 National Renewable Energy Lab., Golden, CO USA
Ultra-High Current Density Thin-Film Si Diode
Wang, Q., Inventor; 29 Apr 03; 12 pp.; In English
Contract(s)/Grant(s): DE-AC3699GO10337
Patent Info.: Filed Filed 29 Apr 03; US-Patent-Appl-SN-10-488 902
Report No.(s): PB2007-102580; No Copyright; Avail.: CASI: A03, Hardcopy
A combination of a thin-film mu c--Si and a--Si:H containing diode structure characterized by an ultra-high current density that exceeds 1000 A/cm(sup 2), comprising: a substrate; a bottom metal layer disposed on the substrate; an n-layer of mu c--Si deposited the bottom metal layer; an i-layer of mu c--Si deposited on the n-layer; a buffer layer of a--Si:H deposited on the i-layer, a p-layer of mu c--Si deposited on the buffer layer; and a top metal layer deposited on the p-layer.
NTIS
Current Density; Diodes; Electron Tubes; Field Emission; Silicon; Thin Films

20070021382 Ortiz and Lopez, PLLC, Albuquerque, NM, USA
Redundant Single Event Upset Supression System
Hoff, J. R., Inventor; 12 Dec 03; 20 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Patent Info.: Filed Filed 12 Dec 03; US-Patent-Appl-SN-10-735 489
Report No.(s): PB2007-102559; No Copyright; Avail.: CASI: A03, Hardcopy
CMOS transistors are configured to operate as either a redundant, SEU-tolerant, positive-logic, cross-coupled Nor Gate SR-flip flop or a redundant, SEU-tolerant, negative-logic, cross-coupled Nand Gate SR-flip flop. The register can operate as a memory, and further as a memory that can overcome the effects of radiation. As an SR-flip flop, the invention can be altered into any known type of latch or flip-flop by the application of external logic, thereby extending radiation tolerance to devices previously incapable of radiation tolerance. Numerous registers can be logically connected and replicated thereby being electronically configured to operate as a redundant circuit.
NTIS
Computer Storage Devices; Integrated Circuits; Memory (Computers); Radiation Effects; Single Event Upsets

20070021383 Nutter, McClennen and Fish, Boston, MA, USA
Silicon-Based Visible and Near-Infrared Optoelectric Devices
Mazur, E., Inventor; Carey, J. E., Inventor; 24 Sep 04; 30 pp.; In English
Contract(s)/Grant(s): DE-FC36-016011051
Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-950 230
Report No.(s): PB2007-102555; No Copyright; Avail.: CASI: A03, Hardcopy

In one aspect, the present invention provides a silicon photodetector having a surface layer that is doped with sulfur inclusions with an average concentration in a range of about 0.5 atom percent to about 1.5 atom percent. The surface layer forms a diode junction with an underlying portion of the substrate. A plurality of electrical contacts allow application of a reverse bias voltage to the junction in order to facilitate generation of an electrical signal, e.g., a photocurrent, in response to irradiation of the surface layer. The photodetector exhibits a responsivity greater than about 1 A/W for incident wavelengths in a range of about 250 nm to about 1050 nm, and a responsivity greater than about 0.1 A/W for longer wavelengths, e.g., up to about 3.5 microns.
NTIS
Electro-Optics; Photometers; Silicon

20070021387 Quarles and Brandy, LLP., Milwaukee, WI, USA
Multi-Level DC Bus Inverter for Providing Sinusoidal and PWM Electrical Machine Voltages
Su, G. J., Inventor; 12 Dec 03; 22 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 12 Dec 03; US-Patent-Appl-SN-10-734 940
Report No.(s): PB2007-102556; No Copyright; Avail.: CASI: A03, Hardcopy

A circuit for controlling an ac machine comprises a full bridge network of commutation switches which are connected to supply current for a corresponding voltage phase to the stator windings, a plurality of diodes, each in parallel connection to a respective one of the commutation switches, a plurality of dc source connections providing a multi-level dc bus for the full bridge network of commutation switches to produce sinusoidal voltages or PWM signals, and a controller connected for control of said dc source connections and said full bridge network of commutation switches to output substantially sinusoidal voltages to the stator windings. With the invention, the number of semiconductor switches is reduced to m+3 for a multi-level dc bus having m levels. A method of machine control is also disclosed.
NTIS
Electric Potential; Inverters; Sine Waves

20070021392 Gopdward (Cooley), LLP, Reston, VA, USA
Haptic Feedback Device with Button Forces
Shahoian, E. J., Inventor; Hasser, C. J., Inventor; Rosenberg, L. B., Inventor; 23 Feb 04; 29 pp.; In English
Contract(s)/Grant(s): N00014-98-C-0220
Patent Info.: Filed Filed 23 Feb 04; US-Patent-Appl-SN-10-782 939
Report No.(s): PB2007-102562; No Copyright; Avail.: CASI: A03, Hardcopy

A haptic feedback control device, such as a handheld remote control or handheld game controller, for controlling a graphical object within a graphical display and for outputting forces to a user. A housing includes a button, wherein the user engages the button with a finger. The button is depressible along a degree of freedom by the user. An actuator applies forces to the user through the button along the degree of freedom. A sensor detects displacement of the button along the degree of freedom when the button is depressed by the user. A process, local to the device, controls the actuator to generate the forces upon the button in the degree of freedom to provide a tactile sensation to the user contacting the button.
NTIS
Control Equipment; Feedback; Touch

20070021412 NASA Goddard Space Flight Center, Greenbelt, MD, USA

4x4 Individually Addressable InGaAs APD Arrays Optimized for Photon Counting Applications

Gu, Y.; Wu, X.; Wu, S.; Choa, F. S.; Yan, F.; Shu, P.; Krainak, M.; [2007]; 1 pp.; In English; IEEE Infrared Dectors, 17-19 Jul. 2006, Quebec City, Canada; Copyright; Avail.: Other Sources; Abstract Only

InGaAs APDs with improved photon counting characteristics were designed and fabricated and their performance improvements were observed. Following the results, a 4x4 individually addressable APD array was designed, fabricated, and results are reported.

Author

Indium Gallium Arsenides; Fabrication; Counting; Photons

20070021417 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Comparison of Measured Leakage Current Distributions with Calculated Damage Energy Distributions in HgCdTe

Marshall, C. J.; Ladbury, R.; Marshall, P. W.; Reed, R. A.; Howe, C.; Weller, B.; Mendenhall, M.; Waczynski, A.; Jordan, T. M.; Fodness, B.; [2006]; 4 pp.; In English; Radiation and Its Effects on Components and Systems (RADECS) Workshop, 27-29 Sep. 2006, Athens, Greece; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

This paper presents a combined Monte Carlo and analytic approach to the calculation of the pixel-to-pixel distribution of proton-induced damage in a HgCdTe sensor array and compares the results to measured dark current distributions after damage by 63 MeV protons. The moments of the Coulombic, nuclear elastic and nuclear inelastic damage distribution were extracted from Monte Carlo simulations and combined to form a damage distribution using the analytic techniques first described in [I]. The calculations show that the high energy recoils from the nuclear inelastic reactions (calculated using the Monte Car10 code MCNPX [2]) produce a pronounced skewing of the damage energy distribution. The nuclear elastic component (also calculated using the MCNPX) has a negligible effect on the shape of the damage distribution. The Coulombic contribution was calculated using MRED [3,4], a Geant4 [4,5] application. The comparison with the dark current distribution strongly suggests that mechanisms which are not linearly correlated with nonionizing damage produced according to collision kinematics are responsible for the observed dark current increases. This has important implications for the process of predicting the on-orbit dark current response of the HgCdTe sensor array.

Author

Current Distribution; Leakage; Mercury Cadmium Tellurides; Damage; Dark Current

20070021455 NASA Langley Research Center, Hampton, VA, USA

Paired Pulse Basis Functions for the Method of Moments EFIE Solution of Electromagnetic Problems Involving Arbitrarily-shaped, Three-dimensional Dielectric Scatterers

MacKenzie, Anne I.; Rao, Sadasiva M.; Baginski, Michael E.; May 8, 2007; 6 pp.; In English; 2007 Electromagnetic Code Consortium (EMCC) Annual Meeting, 8-10 May 2007, San Diego, CA, USA; Original contains color and black and white illustrations

Report No.(s): Paper No. 1176736464; Copyright; Avail.: CASI: A02, Hardcopy

A pair of basis functions is presented for the surface integral, method of moment solution of scattering by arbitrarily-shaped, three-dimensional dielectric bodies. Equivalent surface currents are represented by orthogonal unit pulse vectors in conjunction with triangular patch modeling. The electric field integral equation is employed with closed geometries for dielectric bodies; the method may also be applied to conductors. Radar cross section results are shown for dielectric bodies having canonical spherical, cylindrical, and cubic shapes. Pulse basis function results are compared to results by other methods.

Author

Method of Moments; Radar Cross Sections; Electric Fields; Dielectrics; Three Dimensional Bodies; Conductors

20070021680 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Model of a Hollow Cathode Insert Plasma

Mikellides, Ioannis G.; Katz, Ira; Goebel, Dan M.; Polk, James E.; July 12, 2004; 18 pp.; In English; 2004 Joint Propulsion Conference, 12-14 Jul. 2006, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright;

Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39946

A 2-D axisymmetric fluid model of the plasma in the insert region of a hollow cathode is presented. The level of sophistication included in the model is motivated in part by the need to determine quantitatively plasma fluxes to the emitter

surface. The ultimate goal is to assess whether plasma effects can degrade the life of impregnated inserts beyond those documented throughout the 30-50 year history of vacuum cathode technologies. Results from simulations of a 1.2-cm diameter cathode operating at a discharge current of 25 A, and a gas flow rate of 5 sccm, suggest that approximately 10 A of electron current, and 3.5 A of ion current return to the emitter surface. The total emitted electron current computed by the model is about 35 A. Comparisons with plasma measurements suggest that anomalous heating of the plasma due to two-stream instabilities is possible near the orifice region. Solution to the heavy species energy equation, with classical transport and no viscous effects, predicts heavy species temperatures as high as 2640 K.
Author
Hollow Cathodes; Plasmas (Physics); Two Dimensional Models; Viscous Flow; Inserts; Electron Energy; Emittance; Ion Currents

20070021786 Houston Univ., TX, USA
Adaptive Modeling of the International Space Station Electrical Power System
Thomas, Justin Ray; August 2007; 96 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS9-20000; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021786

Software simulations provide NASA engineers the ability to experiment with spacecraft systems in a computer-imitated environment. Engineers currently develop software models that encapsulate spacecraft system behavior. These models can be inaccurate due to invalid assumptions, erroneous operation, or system evolution. Increasing accuracy requires manual calibration and domain-specific knowledge. This thesis presents a method for automatically learning system models without any assumptions regarding system behavior. Data stream mining techniques are applied to learn models for critical portions of the International Space Station (ISS) Electrical Power System (EPS). We also explore a knowledge fusion approach that uses traditional engineered EPS models to supplement the learned models. We observed that these engineered EPS models provide useful background knowledge to reduce predictive error spikes when confronted with making predictions in situations that are quite different from the training scenarios used when learning the model. Evaluations using ISS sensor data and existing EPS models demonstrate the success of the adaptive approach. Our experimental results show that adaptive modeling provides reductions in model error anywhere from 80% to 96% over these existing models. Final discussions include impending use of adaptive modeling technology for ISS mission operations and the need for adaptive modeling in future NASA lunar and Martian exploration.
Author
International Space Station; Electric Power; Mathematical Models; Adaptive Control; Systems Engineering; Computerized Simulation

20070021824 ISRO Satellite Centre, Peenya, Bangalore, India
Simulation and Implementation of a Tunable C-Band Dielectric Resonator Oscillator
Chandrasekharam, K.; Rao, G. Srinivasa; Prasad, A. P. Shiva; Vedavathy,T. S.; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 1-13; In English; See also 20070021821; Copyright; Avail.: Other Sources

Microwave sources used in present day applications are either multiplied source derived from basic quartz crystals, or frequency synthesizers. The frequency multiplication method increases FM noise power considerably, and has very low efficiency in addition to being very complex and expensive. The complexity and cost involved demands a simple, compact and tunable microwave source. A tunable dielectric resonator oscillator(DR0) is an ideal choice for such applications. In this paper, the simulation, design and realization of a tunable DRO with a center frequency of 6250 MHz is presented. Simulation has been carried out on HP-Ees of CAD software. Mechanical and electronic tuning features are provided. The DRO operates over a frequency range of 6235 MHz to 6375 MHz. The output power is +5.33dBm at centre frequency. The performance of the DRO is as per design with respect to phase noise, harmonic levels and tunability. and hence, can conveniently be used for the intended applications.
Author
Microwave Oscillators; Quartz Crystals; Frequency Synthesizers; Resonators; Dielectrics; Simulation; C Band

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*.

20070021332 Finnegan, Henderson, Farabow, Garrett, Dunner, LLP, Washington, DC, USA, Caterpillar, Inc., Peoria, IL, USA

Fuel Pumping System and Method

Shafer, S. F., Inventor; Wang, L., Inventor; 12 Dec 03; 10 pp.; In English

Contract(s)/Grant(s): DE-FC05-00OR22806

Patent Info.: Filed Filed 12 Dec 03; US-Patent-Appl-SN-10-733 444

Report No.(s): PB2007-102542; No Copyright; Avail.: CASI: A02, Hardcopy

A fuel pumping system that includes a pump drive is provided. A first pumping element is operatively connected to the pump drive and is operable to generate a first flow of pressurized fuel. A second pumping element is operatively connected to the pump drive and is operable to generate a second flow of pressurized fuel. A first solenoid is operatively connected to the first pumping element and is operable to vary at least one of a fuel pressure and a fuel flow rate of the first flow of pressurized fuel. A second solenoid is operatively connected to the second pumping element and is operable to vary at least one of a fuel pressure and a fuel flow rate of the second flow of pressurized fuel.

NTIS

Fuel Systems; Fuel Pumps

20070021456 NASA Langley Research Center, Hampton, VA, USA

Apparent-Strain Correction for Combined Thermal and Mechanical Testing

Johnson, Theodore F.; O'Neil, Teresa L.; Apri 23, 2007; 16 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 136905.08.05.04.05.04

Report No.(s): AIAA 2007-2410; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021456

Combined thermal and mechanical testing requires that the total strain be corrected for the coefficient of thermal expansion mismatch between the strain gage and the specimen or apparent strain when the temperature varies while a mechanical load is being applied. Collecting data for an apparent strain test becomes problematic as the specimen size increases. If the test specimen cannot be placed in a variable temperature test chamber to generate apparent strain data with no mechanical loads, coupons can be used to generate the required data. The coupons, however, must have the same strain gage type, coefficient of thermal expansion, and constraints as the specimen to be useful. Obtaining apparent-strain data at temperatures lower than -320 F is challenging due to the difficulty to maintain steady-state and uniform temperatures on a given specimen. Equations to correct for apparent strain in a real-time fashion and data from apparent-strain tests for composite and metallic specimens over a temperature range from -450 F to +250 F are presented in this paper. Three approaches to extrapolate apparent-strain data from -320 F to -430 F are presented and compared to the measured apparent-strain data. The first two approaches use a subset of the apparent-strain curves between -320 F and 100 F to extrapolate to -430 F, while the third approach extrapolates the apparent-strain curve over the temperature range of -320 F to +250 F to -430 F. The first two approaches are superior to the third approach but the use of either of the first two approaches is contingent upon the degree of non-linearity of the apparent-strain curve.

Author

Thermal Expansion; Strain Gages; Real Time Operation; Extrapolation; Data Acquisition

20070021684 NASA Dryden Flight Research Center, Edwards, CA, USA

Reentry Thermal Analysis of a Generic Crew Exploration Vehicle Structure

Ko, William L.; Gong, Leslie; Quinn, Robert D.; May 2007; 53 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TM-2007-214607; H-2674; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021684

Comparative studies were performed on the heat-shielding characteristics of honeycomb-core sandwich panels fabricated with different materials for possible use as wall panels for the proposed crew exploration vehicle. Graphite/epoxy sandwich panel was found to outperform aluminum sandwich panel under the same geometry due to superior heat-shielding qualities

and lower material density. Also, representative reentry heat-transfer analysis was performed on the windward wall structures of a generic crew exploration vehicle. The Apollo low Earth orbit reentry trajectory was used to calculate the reentry heating rates. The generic crew exploration vehicle has a graphite/epoxy composite honeycomb sandwich exterior wall and an aluminum honeycomb sandwich interior wall, and is protected with the Apollo thermal protection system ablative material. In the thermal analysis computer program used, the TPS ablation effect was not yet included; however, the results from the nonablation heat-transfer analyses were used to develop a 'virtual ablation' method to estimate the ablation heat loads and the thermal protection system recession thicknesses. Depending on the severity of the heating-rate time history, the virtual ablation period was found to last for 87 to 107 seconds and the ablation heat load was estimated to be in the range of 86 to 88 percent of the total heat load for the ablation time period. The thermal protection system recession thickness was estimated to be in the range of 0.08 to 0.11 inches. For the crew exploration vehicle zero-tilt and 18-degree-tilt stagnation points, thermal protection system thicknesses of h = {0.717, 0.733} inches were found to be adequate to keep the substructural composite sandwich temperature below the limit of 300 F.
Author
Honeycomb Structures; Thermal Analysis; Reentry Effects; Heat Transfer; Ablative Materials; Composite Structures; Heat Shielding

20070021695 NASA Langley Research Center, Hampton, VA, USA
Impact of Fluidic Chevrons on Supersonic Jet Noise
Henderson, Brenda; Norum, Thomas; May 21, 2007; 12 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07
Report No.(s): AIAA 2007-3595; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021695

The impact of fluidic chevrons on broadband shock noise and mixing noise for single stream and coannular jets was investigated. Air was injected into the core flow of a bypass ratio 5 nozzle system using a core fluidic chevron nozzle. For the single stream experiments, the fan stream was operated at the wind tunnel conditions and the core stream was operated at supersonic speeds. For the dual stream experiments, the fan stream was operated at supersonic speeds and the core stream was varied between subsonic and supersonic conditions. For the single stream jet at nozzle pressure ratio (NPR) below 2.0, increasing the injection pressure of the fluidic chevron increased high frequency noise at observation angles upstream of the nozzle exit and decreased mixing noise near the peak jet noise angle. When the NPR increased to a point where broadband shock noise dominated the acoustic spectra at upstream observation angles, the fluidic chevrons significantly decreased this noise. For dual stream jets, the fluidic chevrons reduced broadband shock noise levels when the fan NPR was below 2.3, but had little or no impact on shock noise with further increases in fan pressure. For all fan stream conditions investigated, the fluidic chevron became more effective at reducing mixing noise near the peak jet noise angle as the core pressure increased.
Author
Fluidics; Jet Aircraft Noise; Supersonic Jet Flow; Supersonic Speed; Wind Tunnels; Nozzle Design

20070021736 NASA Langley Research Center, Hampton, VA, USA
Investigation of Liner Characteristics in the NASA Langley Curved Duct Test Rig
Gerhold, Carl H.; Brown, Martha C.; Watson, Willie R.; Jones, Michael G.; May 21, 2007; 22 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2007-3532; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021736

The Curved Duct Test Rig (CDTR), which is designed to investigate propagation of sound in a duct with flow, has been developed at NASA Langley Research Center. The duct incorporates an adaptive control system to generate a tone in the duct at a specific frequency with a target Sound Pressure Level and a target mode shape. The size of the duct, the ability to isolate higher order modes, and the ability to modify the duct configuration make this rig unique among experimental duct acoustics facilities. An experiment is described in which the facility performance is evaluated by measuring the sound attenuation by a sample duct liner. The liner sample comprises one wall of the liner test section. Sound in tones from 500 to 2400 Hz, with modes that are parallel to the liner surface of order 0 to 5, and that are normal to the liner surface of order 0 to 2, can be generated incident on the liner test section. Tests are performed in which sound is generated without axial flow in the duct and with flow at a Mach number of 0.275. The attenuation of the liner is determined by comparing the sound power in a hard wall section downstream of the liner test section to the sound power in a hard wall section upstream of the liner test section. These

experimentally determined attenuations are compared to numerically determined attenuations calculated by means of a finite element analysis code. The code incorporates liner impedance values educed from measured data from the NASA Langley Grazing Incidence Tube, a test rig that is used for investigating liner performance with flow and with (0,0) mode incident grazing. The analytical and experimental results compare favorably, indicating the validity of the finite element method and demonstrating that finite element prediction tools can be used together with experiment to characterize the liner attenuation. Author

Linings; Curvature; Mathematical Models; Walls; Test Chambers; Aeroacoustics; Ducted Flow; Sound Propagation

20070021761 NASA Glenn Research Center, Cleveland, OH, USA

Development of a Rayleigh Scattering Diagnostic for Time-Resolved Gas Flow Velocity, Temperature, and Density Measurements in Aerodynamic Test Facilities

Mielke, Amy F.; Elam, Kristie A.; Sung, Chih-Jen; June 10, 2007; 15 pp.; In English; 22nd International Congress on Instrumentation in Aerospace Simulation Facilities, 10-14 Jun. 2007, Pacific Grove, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.14.02; Copyright; Avail.: CASI: A03, Hardcopy

A molecular Rayleigh scattering technique is developed to measure time-resolved gas velocity, temperature, and density in unseeded turbulent flows at sampling rates up to 32 kHz. A high power continuous-wave laser beam is focused at a point in an air flow field and Rayleigh scattered light is collected and fiber-optically transmitted to the spectral analysis and detection equipment. The spectrum of the light, which contains information about the temperature and velocity of the flow, is analyzed using a Fabry-Perot interferometer. Photomultiplier tubes operated in the photon counting mode allow high frequency sampling of the circular interference pattern to provide time-resolved flow property measurements. An acoustically driven nozzle flow is studied to validate velocity fluctuation measurements, and an asymmetric oscillating counterflow with unequal enthalpies is studied to validate the measurement of temperature fluctuations. Velocity fluctuations are compared with constant temperature anemometry measurements and temperature fluctuations are compared with constant current anemometry measurements at the same locations. Time-series and power spectra of the temperature and velocity measurements are presented. A numerical simulation of the light scattering and detection process was developed and compared with experimental data for future use as an experiment design tool.

Author

Density Measurement; Flow Velocity; Gas Flow; Rayleigh Scattering; Temperature Measurement; Test Facilities; Aerodynamics

20070021764 NASA Glenn Research Center, Cleveland, OH, USA

Optical Measurements in a Combustor Using a 9-Point Swirl-Venturi Fuel Injector

Hicks, Yolanda R.; Anderson, Robert C.; Locke, Randy J.; September 02, 2007; 9 pp.; In English; XVIII ISABE, 2-7 Sep. 2007, Beijing, China; Original contains color illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.19.03

Report No.(s): ISABE 2007-1280; Copyright; Avail.: CASI: A02, Hardcopy

This paper highlights the use of two-dimensional data to characterize a multipoint swirl-venturi injector. The injector is based on a NASA-conceived lean direct injection concept. Using a variety of advanced optical diagnostic techniques, we examine the flows resultant from multipoint, lean-direct injectors that have nine injection sites arranged in a 3 x 3 grid. The measurements are made within an optically-accessible, jet-A-fueled, 76-mm by 76-mm flame tube combustor. Combustion species mapping and velocity measurements are obtained using planar laser-induced fluorescence of OH and fuel, planar laser scatter of liquid fuel, chemiluminescence from CH*, NO*, and OH*, and particle image velocimetry of seeded air (non-fueled). These measurements are used to study fuel injection, mixedness, and combustion processes and are part of a database of measurements that will be used for validating computational combustion models.

Author

Fuel Injection; Injectors; Optical Measurement; Combustion Chambers; Laser Induced Fluorescence; Particle Image Velocimetry; Chemiluminescence

20070021776 NASA Glenn Research Center, Cleveland, OH, USA

ISS Destiny Laboratory Smoke Detection Model

Brooker, John E.; Urban, David L.; Ruff, Gary A.; July 09, 2007; 7 pp.; In English; 37th International Conference on Environmental Systems, 9 Jul. 2007, Chicago, IL, USA; Original contains color illustrations

Contract(s)/Grant(s): 567524.04.02.02

Report No.(s): 2007-01-3076; Copyright; Avail.: Other Sources

Smoke transport and detection were modeled numerically in the ISS Destiny module using the NIST, Fire Dynamics Simulator code. The airflows in Destiny were modeled using the existing flow conditions and the module geometry included obstructions that simulate the currently installed hardware on orbit. The smoke source was modeled as a 0.152 by 0.152 m region that emitted smoke particulate ranging from 1.46 to 8.47 mg/s. In the module domain, the smoke source was placed in the center of each Destiny rack location and the model was run to determine the time required for the two smoke detectors to alarm. Overall the detection times were dominated by the circumferential flow, the axial flow from the intermodule ventilation and the smoke source strength.

Author

Destiny Laboratory Module; International Space Station; Smoke Detectors; Mathematical Models; Fires

20070021831 ISRO Satellite Centre, Peenya, Bangalore, India

Performance of Single Stage Split Stirling Cryocooler Development Model

Ramasamy, A.; Padmanabhan; Gurudath, C. S.; Gupta, P. P.; Bhandari, D. R.; Narayanamurthy, H. Narayana; Journal of Spacecraft Technology Vol. 17, No. 1; January 2007, pp. 49-54; In English; See also 20070021821; Copyright; Avail.: Other Sources

Development of split Stirling cycle cryocooler for spacecraft application has been carried out at Indian Space Research Organization (ISRO) and its thermal performance demonstrated. The efficiency of the cooler at 80K with 1W load is 11 % at ambient heat rejection temperature of 300K, which is higher than that reported in literature. This development model meets the specified performance and provides 1W of cooling power at 80, 70 and 60K for the compressor input power of 25, 32 and 43 W respectively.

Author

Stirling Cycle; Cryogenic Cooling; Temperature Effects; Ambient Temperature; Loads (Forces)

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*.

20070021469 NASA Marshall Space Flight Center, Huntsville, AL, USA

Analysis Results for Lunar Soil Simulant Using a Portable X-Ray Fluorescence Analyzer

Boothe, R. E.; November 2006; 20 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM-2006-214709; M-1176; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021469

Lunar soil will potentially be used for oxygen generation, water generation, and as filler for building blocks during habitation missions on the Moon. NASA s in situ fabrication and repair program is evaluating portable technologies that can assess the chemistry of lunar soil and lunar soil simulants. This Technical Memorandum summarizes the results of the JSC 1 lunar soil simulant analysis using the TRACeR III IV handheld x-ray fluorescence analyzer, manufactured by KeyMaster Technologies, Inc. The focus of the evaluation was to determine how well the current instrument configuration would detect and quantify the components of JSC-1.

Author

Fabrication; Lunar Soil; X Ray Fluorescence; Portable Equipment; Analyzers

20070021745 NASA Langley Research Center, Hampton, VA, USA

Experimental Methods Using Photogrammetric Techniques for Parachute Canopy Shape Measurements

Jones, Thomas W.; Downey, James M.; Lunsford, Charles B.; Desabrais, Kenneth J.; Noetscher, Gregory; May 21, 2007; 10 pp.; In English; 19th AIAA Aerodynamic Decelerator Systems Technology Conference and Seminar, 21-24 May 2007, Williamsburg, VA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021745

NASA Langley Research Center in partnership with the U.S. Army Natick Soldier Center has collaborated on the development of a payload instrumentation package to record the physical parameters observed during parachute air drop tests. The instrumentation package records a variety of parameters including canopy shape, suspension line loads, payload 3-axis acceleration, and payload velocity. This report discusses the instrumentation design and development process, as well as the photogrammetric measurement technique used to provide shape measurements. The scaled model tests were conducted in the NASA Glenn Plum Brook Space Propulsion Facility, OH.

Author

Airdrops; Drop Tests; Parachutes; Photogrammetry

20070021783 Engineering Research and Consulting, Inc., Houston, TX, USA

Strain Dependence of Photoluminescense of Individual Carbon Nanotubes

Nikolaev, Pavel N.; Leeuw, Tonya K.; Tsyboulski, Dmitri A.; Bachilo, Sergei M.; Weisman, Bruce; Arepalli, Sivaram; June 29, 2007; 2 pp.; In English; Nanotube 07, 24-29 Jun. 2007, Ouro Preto, Brazil

Contract(s)/Grant(s): NNJ05HI05C; Copyright; Avail.: CASI: A01, Hardcopy

We have investigated strain dependence of photoluminescense (PL) spectra of single wall carbon nanotubes (SWNT). Nanotubes were sparsely dispersed in a thin PMMA film applied to acrylic bar, and strained in both compression and extension by bending this bar in either direction in a homebuilt four-point bending rig. The average surface strain was measured with high accuracy by a resistive strain gage applied on top of the film. The near infrared imaging and spectroscopy were performed on the inverted microscope equipped with high numerical aperture reflective objective lens and InGaAs CCD cameras. PL was excited with a diode laser at either 658, 730 or 785 nm, linearly polarized in the direction of the strain. We were able to measure (n,m) types and orientation of individual nanotubes with respect to strain direction and strain dependence of their PL maxima. It was found that PL peak shifts with respect to the values measured in SDS micelles are a sum of three components. First, a small environmental shift due to difference in the dielectric constant of the surrounding media, that is constant and independent of the nanotube type. Second, shift due to isotropic compression of the film during drying. Third, shifts produced by the uniaxial loading of the film in the experiment. Second and third shifts follow expression based on the first-order expansion of the TB hamiltonian. Their magnitude is proportional to the nanotube chiral angle and strain, and direction is determined by the nanotube quantum number. PL strain dependence measured for a number of various nanotube types allows to estimate TB carbon-carbon transfer integral.

Author

Carbon Nanotubes; Strain Gages; Photoluminescence; Strain Distribution

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*.

20070021291 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Qualification and Issues with Space Flight Laser Systems and Components

Ott, Melanie N.; Coyle, D. Barry; Canham, John S.; Leidecker, Henning W.; [2006]; 15 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

The art of flight quality solid-state laser development is still relatively young, and much is still unknown regarding the best procedures, components, and packaging required for achieving the maximum possible lifetime and reliability when deployed in the harsh space environment. One of the most important issues is the limited and unstable supply of quality, high power diode arrays with significant technological heritage and market lifetime. Since Spectra Diode Labs Inc. ended their involvement in the pulsed array business in the late 199O's, there has been a flurry of activity from other manufacturers, but little effort focused on flight quality production. This forces NASA, inevitably, to examine the use of commercial parts to

enable space flight laser designs. System-level issues such as power cycling, operational derating, duty cycle, and contamination risks to other laser components are some of the more significant unknown, if unquantifiable, parameters that directly effect transmitter reliability. Designs and processes can be formulated for the system and the components (including thorough modeling) to mitigate risk based on the known failures modes as well as lessons learned that GSFC has collected over the past ten years of space flight operation of lasers. In addition, knowledge of the potential failure modes related to the system and the components themselves can allow the qualification testing to be done in an efficient yet, effective manner. Careful test plan development coupled with physics of failure knowledge will enable cost effect qualification of commercial technology. Presented here will be lessons learned from space flight experience, brief synopsis of known potential failure modes, mitigation techniques, and options for testing from the system level to the component level.
Author
Performance Tests; Aerospace Environments; Failure Modes; Lasers; Diodes; Solid State Lasers; Flight Operations

20070021407 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Power Laser Diode Array Qualification and Guidelines for Space Flight Environments
Ott, Melanie N.; Eegholm, Niels; Stephen, Mark; Leidecker, Henning; Plante, Jeannette; Meadows, Byron; Amzajerdian, Farzin; Jamison, Tracee; LaRocca, Frank; January 2006; 44 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021407

High-power laser diode arrays (LDAs) are used for a variety of space-based remote sensor laser programs as an energy source for diode-pumped solid-state lasers. LDAs have been flown on NASA missions including MOLA, GLAS and MLA and have continued to be viewed as an important part of the laser-based instrument component suite. There are currently no military or NASA-grade, -specified, or - qualified LDAs available for 'off-the-shelf' use by NASA programs. There has also been no prior attempt to define a standard screening and qualification test flow for LDAs for space applications. Initial reliability studies have also produced good results from an optical performance and stability standpoint. Usage experience has shown, howeve that the current designs being offered may be susceptible to catastrophic failures due to their physical construction (packaging) combined with the electro-optical operational modes and the environmental factors of space application. design combined with operational mode was at the root of the failures which have greatly reduced the functionality of the GLAS instrument. The continued need for LDAs for laser-based science instruments and past catastrophic failures of this part type demand examination of LDAs in a manner which enables NASA to select, buy, validate and apply them in a manner which poses as little risk to the success of the mission as possible.
Derived from text
Performance Tests; Qualifications; Reliability; Semiconductor Lasers; Arrays; Aerospace Environments

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*.

20070021226 NASA Langley Research Center, Hampton, VA, USA
Quasi-Static Analysis of Round LaRC THUNDER Actuators
Campbell, Joel F.; May 2007; 23 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2007-214876; L-19357; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021226

An analytic approach is developed to predict the shape and displacement with voltage in the quasi-static limit of round LaRC Thunder Actuators. The problem is treated with classical lamination theory and Von Karman non-linear analysis. In the case of classical lamination theory exact analytic solutions are found. It is shown that classical lamination theory is insufficient to describe the physical situation for large actuators but is sufficient for very small actuators. Numerical results are presented for the non-linear analysis and compared with experimental measurements. Snap-through behavior, bifurcation, and stability are presented and discussed.
Author
Actuators; Electric Potential; Laminates; Nonlinearity; Analysis (Mathematics)

38
QUALITY ASSURANCE AND RELIABILITY

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

20070021523 NASA White Sands Test Facility, NM, USA
Final Cleaning and Cleanliness Verification of Hardware
McLeod, Ken; January 03, 2007; 17 pp.; In English
Report No.(s): WJI-SVC-CSS-0032.E; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021523

This White Sands Test Facility Job Instruction (WJI) provides procedures for final cleaning and cleanliness verification of parts in general compliance with NASA SN-C-0005, Contamination Control Requirements for the Space Shuttle Program; JPR 5322.1, Contamination Control Requirements Manual; and WSP 09-0012, WSTF Hardware Surface Cleanliness Requirements.
Derived from text
Cleaning; Cleanliness; Hardware; Procedures; Sanitation; Hygiene

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*.

20070021481 NASA Langley Research Center, Hampton, VA, USA
Nonlinear Structural Analysis Methodology and Dynamics Scaling of Inflatable Parabolic Reflector Antenna Concepts
Sreekantamurthy, Tham; Gaspar, James L.; Mann, Troy; Behun, Vaughn; Pearson, James C., Jr.; Scarborough, Stephen; [2007]; 15 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 Apr. 2007, Waikiki, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 439432.07.02.07
Report No.(s): AIAA 2007-1834; Copyright; Avail.: CASI: A03, Hardcopy

Ultra-light weight and ultra-thin membrane inflatable antenna concepts are fast evolving to become the state-of-the-art antenna concepts for deep-space applications. NASA Langley Research Center has been involved in the structural dynamics research on antenna structures. One of the goals of the research is to develop structural analysis methodology for prediction of the static and dynamic response characteristics of the inflatable antenna concepts. This research is focused on the computational studies to use nonlinear large deformation finite element analysis to characterize the ultra-thin membrane responses of the antennas. Recently, structural analyses have been performed on a few parabolic reflector antennas of varying size and shape, which are referred in the paper as 0.3 meters subscale, 2 meters half-scale, and 4 meters full-scale antenna. The various aspects studied included nonlinear analysis methodology and solution techniques, ways to speed convergence in iterative methods, the sensitivities of responses with respect to structural loads, such as inflation pressure, gravity, and pretension loads in the ground and in-space conditions, and the ultra-thin membrane wrinkling characteristics. Several such intrinsic aspects studied have provided valuable insight into evaluation of structural characteristics of such antennas. While analyzing these structural characteristics, a quick study was also made to assess the applicability of dynamics scaling of the half-scale antenna. This paper presents the details of the nonlinear structural analysis results, and discusses the insight gained from the studies on the various intrinsic aspects of the analysis methodology. The predicted reflector surface characteristics of the three inflatable ultra-thin membrane parabolic reflector antenna concepts are presented as easily observable displacement fringe patterns with associated maximum values, and normal mode shapes and associated frequencies. Wrinkling patterns are presented to show how surface wrinkle progress with increasing tension loads. Antenna reflector surface accuracies were found to be very much dependent on the type and size of the antenna, the reflector surface curvature, reflector membrane supports in terms of spacing of catenaries, as well as the amount of applied load.
Author
Antenna Arrays; Antenna Components; Finite Element Method; Nonlinearity; Parabolic Reflectors; Antenna Design; Dynamic Structural Analysis

20070021749 NASA Glenn Research Center, Cleveland, OH, USA

Compatibility Condition in Theory of Solid Mechanics (Elasticity, Structures, and Design Optimization)

Patnaik, Surya N.; Pai, Shantaram S.; Hopkins, Dale A.; May 2007; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2915; WBS 599489.02.07.03.06

Report No.(s): NASA/TP-2007-214480; E-15772; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021749

The strain formulation in elasticity and the compatibility condition in structural mechanics have neither been understood nor have they been utilized. This shortcoming prevented the formulation of a direct method to calculate stress. We have researched and understood the compatibility condition for linear problems in elasticity and in finite element analysis. This has lead to the completion of the method of force with stress (or stress resultant) as the primary unknown. The method in elasticity is referred to as the completed Beltrami-Michell formulation (CBMF), and it is the integrated force method (IFM) in structures. The dual integrated force method (IFMD) with displacement as the primary unknown has been formulated. IFM and IFMD produce identical responses. The variational derivation of the CBMF yielded the new boundary compatibility conditions. The CBMF can be used to solve stress, displacement, and mixed boundary value problems. The IFM in structures produced high-fidelity response even with a modest finite element model. The IFM has influenced structural design considerably. A fully utilized design method for strength and stiffness limitation has been developed. The singularity condition in optimization has been identified. The CBMF and IFM tensorial approaches are robust formulations because of simultaneous emphasis on the equilibrium equation and the compatibility condition.

Author

Compatibility; Design Optimization; Elastic Properties; Mathematical Models; Solid Mechanics; Structural Strain; Mechanical Properties

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*.

20070021400 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spatial Variability of Barrow-Area Shore-Fast Sea Ice and Its Relationships to Passive Microwave Emissivity

Maslanik, J. A.; Rivas, M. Belmonte; Holmgren, J.; Gasiewski, A. J.; Heinrichs, J. F.; Stroeve, J. C.; Klein, M.; Markus, T.; Perovich, D. K.; Sonntag, J. G.; Tape, K.; IEEE Transactions on Geoscience and Remote Sensing; November 2006; ISSN 0196-2892; Volume 44, No. 11, pp. 3021-3033; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GH68G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1109/TGRS.2006.879557

Aircraft-acquired passive microwave data, laser radar height observations, RADARSAT synthetic aperture radar imagery, and in situ measurements obtained during the AMSR-Ice03 experiment are used to investigate relationships between microwave emission and ice characteristics over several space scales. The data fusion allows delineation of the shore-fast ice and pack ice in the Barrow area, AK, into several ice classes. Results show good agreement between observed and Polarimetric Scanning Radiometer (PSR)-derived snow depths over relatively smooth ice, with larger differences over ridged and rubbled ice. The PSR results are consistent with the effects on snow depth of the spatial distribution and nature of ice roughness, ridging, and other factors such as ice age. Apparent relationships exist between ice roughness and the degree of depolarization of emission at 10,19, and 37 GHz. This depolarization .would yield overestimates of total ice concentration using polarization-based algorithms, with indications of this seen when the NT-2 algorithm is applied to the PSR data. Other characteristics of the microwave data, such as effects of grounding of sea ice and large contrast between sea ice and adjacent land, are also apparent in the PSR data. Overall, the results further demonstrate the importance of macroscale ice roughness conditions such as ridging and rubbling on snow depth and microwave emissivity.

Author

Microwave Emission; Sea Ice; In Situ Measurement; Optical Radar; Multisensor Fusion; Surface Roughness; Synthetic Aperture Radar; RADARSAT; Snow

20070021522 Alfred-Wegener-Inst. for Polar and Marine Research, Bremerhaven, Germany

A Model-based Interpretation of Low-frequency Changes in the Carbon Cycle during the Last 120,000 years and its Implications for the Reconstruction of Atmospheric (delta) 14-C

Koehler, Peter; Muscheler, Raimund; Fischer, Hubertus; Geochemistry Geophysics Geosystems (G3); November 03, 2006; Volume 7; 22 pp.; In English; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2005GC001228

A main caveat in the interpretation of observed changes in atmospheric (Delta)C-l4 during the last 50,000 years is the unknown variability of the carbon cycle, which together with changes in the C-14 production rates determines the C-14 dynamics. A plausible scenario explaining glacial/interglacial dynamics seen in atmospheric CO2 and (delta)C-13 was proposed recently (Kohler et al., 2005a). A similar approach that expands its interpretation to the C-14 cycle is an important step toward a deeper understanding of (Delta)C-14 variability. This approach is based on an ocean/atmosphere/biosphere box model of the global carbon cycle (BICYCLE) to reproduce low-frequency changes in atmospheric CO2 as seen in Antarctic ice cores. The model is forced forward in time by various paleoclimatic records derived from ice and sediment cores. The simulation results of our proposed scenario match a compiled CO2 record from various ice cores during the last 120,000 years with high accuracy (r(sup 2) = 0.89). We analyze scenarios with different C-14 production rates, which are either constant or based on Be-10 measured in Greenland ice cores or the recent high-resolution geomagnetic field reconstruction GLOPIS-75 and compare them with the available (Delta)C-14 data covering the last 50,000 years. Our results suggest that during the last glacial cycle in general less than 110%0o f the increased atmospheric (Delta)C-14 is based on variations in the carbon cycle, while the largest part (5/6) of the variations has to be explained by other factors. Glacial atmospheric (Delta)C-14 larger than 700% cannot not be explained within our framework, neither through carbon cycle-based changes nor through variable C-14 production. Superimposed on these general trends might lie positive anomalies in atmospheric (Delta)C-14 of approx. 50% caused by millennial-scale variability of the northern deep water production during Heinrich events and Dansgaard/Oeschger climate fluctuations. According to our model, the dominant processes that increase glacial (Delta)C-14 are a reduced glacial ocean circulation (+ approx.40%0), a restricted glacial gas exchange between the atmosphere and the surface ocean through sea ice coverage (+ approx. 20%), and the enrichment of dissolved inorganic carbon with C-14 in the surface waters through isotopic fractionation during higher glacial marine export production caused by iron fertilization (+ approx.10%).

Author

Carbon Cycle; Carbon 14; Atmospheric Composition; Carbon Dioxide Concentration; Gas Exchange; Low Frequencies; Beryllium Isotopes; Air Water Interactions

20070021626 NASA Johnson Space Center, Houston, TX, USA

Petrology and Geochemistry of New Ureilites and Ureilite Genesis

Mittlefehldt, David W.; Herrin, J. S.; Downes, H.; [2007]; 1 pp.; In English; 70th Annual Meeting of the Meteoritical Society, 13017 Aug. 2007, Tucson, AZ, USA; Copyright; Avail.: CASI: A01, Hardcopy

Ureilites are C-bearing, basalt-depleted olivine+pyroxene achondrites from a differentiated asteroid. The group is heterogeneous, exhibiting ranges in O isotopic composition, Fe/Mg, Fe/Mn, pyx/ol, siderophile and lithophile trace element content, and C content and isotopic composition [1]. Some of these characteristics are nebular in origin; others were strongly overprinted by asteroidal igneous processes. The consensus view is that most ureilites are melt-residues, but some are partial cumulates or have interacted with a melt [1,2]. An 'unroofing' event occurred while the parent asteroid was hot that froze in mineral core com-positions and resulted in FeO reduction at olivine grain margins. We have studied several new ureilites, but will focus here on two anomalous stones; LAR 04315 and NWA 1241. LAR 04315 is texturally unusual. It contains olivine with angular subdomains, and low-Ca pyroxene riddled with wormy inclusions of metal+troilite, graphite, and possibly other phases, and irregular inclusions of high-Ca pyroxene. Reduction occurred along olivine grain margins and internal fractures, but not along subdomain boundaries. Although texturally odd, LAR 04351 is a typical ureilite in mineral and bulk composition. The olivine is Fo80.8 and falls on the ureilite Fe/Mn-Fe/Mg trend. Its olivine composition falls within the range of the majority of ureilites, and it is typical of these ureilites in bulk rock lithophile and siderophile element contents.

Author

Ureilites; Petrology; Geochemistry; Achondrites; Trace Elements; Pyroxenes; Graphite; Iron Oxides; Olivine

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*.

20070021381 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Influence of Antenna Pattern on Faraday Rotation in Remote Sensing at L-band

LeVine, David M.; Jacob, S. Daniel; [2007]; 29 pp.; In English; IGARSS 2007, 23-27 Jul. 2007, Barcelona, Spain; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Faraday rotation is a change in the polarization vector of electromagnetic radiation that occurs as the waves propagate from the Earth surface through the ionosphere to a spaceborne sensor. This change can cause errors in monitoring parameters at the surface such as soil moisture and sea surface salinity and it is an important consideration for radiometers on future missions in space such as NASA's Aquarius mission and ESA's SMOS mission. Two prominent strategies for compensating for Faraday rotation are using a sum of the signal at two polarizations and using the correlation between the signals at the two polarizations. These strategies work for an idealized antenna. This paper evaluates the strategies in the context of realistic antennas such as will be built for the Aquarius radiometer. Realistic antennas will make small differences that need to be included in planning for retrieval algorithms in future missions.

Author

Antenna Radiation Patterns; Electromagnetic Radiation; Faraday Effect; Radiometers; Remote Sensing; Ultrahigh Frequencies

20070021390 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Snow Depth and Ice Thickness Measurements From the Beaufort and Chukchi Seas Collected During the AMSR-Ice03 Campaign

Sturm, M.; Holmgren, J.; Maslanik, J. A.; Perovich, D. K.; Richter-Menge, J.; Stroeve, J. C.; Markus, T.; Heinrichs, J. F.; Tape, K.; IEEE Transactions on Geoscience and Remote Sensing; November 2006; ISSN 0196-2892; Volume 44, No. 11, pp. 3009-3020; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1109/TGRS.2006.878236

In March 2003, a field validation campaign was conducted on the sea ice near Barrow, AK. The goal of this campaign was to produce an extensive dataset of sea ice thickness and snow properties (depth and stratigraphy) against which remote sensing products collected by aircraft and satellite could be compared. Chief among these were products from the Polarimetric Scanning Radiometer (PSR) flown aboard a NASA P-3B aircraft and the Aqua Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E). The data were collected in four field areas: three on the coastal sea ice near Barrow, AK, and the fourth out on the open ice pack 175 km northeast of Barrow. The snow depth ranged from 9.4-20.8 cm in coastal areas (n = 9881 for three areas) with the thinnest snow on ice that had formed late in the winter. Out in the main pack ice, the snow was 20.6 cm deep (n = 1906). The ice in all four areas ranged from 138-219 cm thick (n = 1952), with the lower value again where the ice had formed late in the winter. Snow layer and grain characteristics observed in 118 snow pits indicated that 44% of observed snow layers were depth hoar; 46% were wind slab. Snow and ice measurements were keyed to photomosaics produced from low-altitude vertical aerial photographs. Using these, and a distinctive three-way relationship between ice roughness, snow surface characteristics, and snow depth, strip maps of snow depth, each about 2 km wide, were produced bracketing the traverse lines. These maps contain an unprecedented level of snow depth detail against which to compare remote sensing products. The maps are used in other papers in this special issue to examine the retrieval of snow properties from the PSR and AMSR-E sensors.

Author

Beaufort Sea (North America); Chukchi Sea; Sea Ice; Snow; Remote Sensing; Microwave Radiometers; Scanners; Thickness

20070021395 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A-Train Data Depot: Integrating, Visualizing, and Extracting Cloudsat, CALIPSO, MODIS, and AIRS Atmospheric Measurements Along the A-Train Tracks

Kempler, Steven; Stephens, Graeme; Winkler, Dave; Leptoukh, Greg; Reinke, Don; Smith, Peter; [2006]; 2 pp.; In English; American Geophysical Union meeting, 11-15 Dec. 2006, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The succession of US and international Earth observing satellites that follow each other, seconds to minutes apart, across

the local afternoon equator crossing is called the ATrain. The A-Train consists of the following satellites, in order of equator crossing: OCO, EOS Aqua, CloudSat, CALIPSO, PARASOL, and EOS Aura. Flying in such formation increases the number of observations, validates observations, and enables coordination between science observations, resulting in a more complete virtual science platform (Kelly, 2000). The goal of this project is to create the first ever A-Train virtual data portal/center, the A-Train Data Depot (ATDD), to process, archive, access, visualize, analyze and correlate distributed atmosphere measurements from various A-Train instruments along A-Train tracks. The ATDD will enable the free movement of remotely located A-Train data so that they are combined to create a consolidated vertical view of the Earth's Atmosphere along the A-Train tracks. Once the infrastructure of the ATDD is in place, it will be easily evolved to serve data from all A-Train data measurements: one stop shopping. The innovative approach of analyzing and visualizing atmospheric profiles along the platforms track (i.e., time) will be accommodated by reusing the GSFC Atmospheric Composition Data and Information Services Center (ACDISC) visualization and analysis tool, GIOVANNI, existing data reduction tools, on-line archiving for fast data access, access to remote data without unnecessary data transfers, and data retrieval by users finding data desirable for further study. Initial measurements utilized include CALIPSO lidar backscatter, CloudSat radar reflectivity, clear air relative humidity, water vapor and temperature from AIRS, and cloud properties and aerosols from both MODIS. This will be foilowed by associated measurements from TVILS, =MI, HIRDLS, sad TES. Given the independent nature of instrumentlplatform development, the ATDD project has been met with many interesting challenges that, once resolved, will provide a much greater understanding of the relative flight dynamics and data co-registration of the suite of A-Train instruments, thus greatly increasing the accuracy of A-Train data analysis. Some of these challenges will be illustrated and discussed. The project's early visualizations and analysis efforts illustrate the importance of managing data so that measurements from various missions can be combined to enhance the understanding of the atmosphere. A-Train data management coordination, as performed here, is extremely significant in facilitating the A-Train science of clouds, precipitation, aerosol and chemistry.
Author
MODIS (Radiometry); Scientific Visualization; CALIPSO (Pathfinder Satellite); Aqua Spacecraft; Atmospheric Composition; Data Acquisition; Remote Sensing

20070021414 Colorado Univ., Boulder, CO, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact of Surface Roughness on AMSR-E Sea Ice Products
Stroeve, Julienne C.; Markus, Thorsten; Maslanik, James A.; Cavalieri, Donald J.; Gasiewski, Albin J.; Heinrichs, John F.; Holmgren, Jon; Perovich, Donald K.; Sturm, Matthew; IEEE Transactions on Geoscience and Remote Sensing; November 2006; Volume 44, No. 11, pp. 3103-3117; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GH68G; NAG5-11369; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/TGRS.2006.880619

This paper examines the sensitivity of Advanced Microwave Scanning Radiometer (AMSR-E) brightness temperatures (Tbs) to surface roughness by a using radiative transfer model to simulate AMSR-E Tbs as a function of incidence angle at which the surface is viewed. The simulated Tbs are then used to examine the influence that surface roughness has on two operational sea ice algorithms, namely: 1) the National Aeronautics and Space Administration Team (NT) algorithm and 2) the enhanced NT algorithm, as well as the impact of roughness on the AMSR-E snow depth algorithm. Surface snow and ice data collected during the AMSR-Ice03 field campaign held in March 2003 near Barrow, AK, were used to force the radiative transfer model, and resultant modeled Tbs are compared with airborne passive microwave observations from the Polarimetric Scanning Radiometer. Results indicate that passive microwave Tbs are very sensitive even to small variations in incidence angle, which can cause either an over or underestimation of the true amount of sea ice in the pixel area viewed. For example, this paper showed that if the sea ice areas modeled in this paper mere assumed to be completely smooth, sea ice concentrations were underestimated by nearly 14% using the NT sea ice algorithm and by 7% using the enhanced NT algorithm. A comparison of polarization ratios (PRs) at 10.7,18.7, and 37 GHz indicates that each channel responds to different degrees of surface roughness and suggests that the PR at 10.7 GHz can be useful for identifying locations of heavily ridged or rubbled ice. Using the PR at 10.7 GHz to derive an 'effective' viewing angle, which is used as a proxy for surface roughness, resulted in more accurate retrievals of sea ice concentration for both algorithms. The AMSR-E snow depth algorithm was found to be extremely sensitive to instrument calibration and sensor viewing angle, and it is concluded that more work is needed to investigate the sensitivity of the gradient ratio at 37 and 18.7 GHz to these factors to improve snow depth retrievals from spaceborne passive microwave sensors.
Author
Microwave Radiometers; Surface Roughness; Satellite-Borne Instruments; Sea Ice; Scanners; Remote Sensing; Atmospheric Models

44
ENERGY PRODUCTION AND CONVERSION

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

20070021281 Colorado School of Mines, Golden, CO USA, National Renewable Energy Lab., Golden, CO USA
Studies of Basic Electronic Properties of CdTe-Based Solar Cells and Their Evolution during Processing and Stress. Annual Technical Report. November 1, 2005 through October 31, 2006
Beach, J.; Seymour, F. H.; Kaydanov, V. I.; Ohno, T. R.; Jan. 01, 2007; 63 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-898922; NREL/SR-520-41097; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors describe the results of our continuing study of deep electronic states controlling open-circuit voltage in CdTe/CdS thin-film solar cells. The study includes: (1) analysis of factors affecting trap signatures derived from admittance spectroscopy and capacitance transients measurements, such as activation-energy capture cross-sections and trap-density estimates, and (2) comparative studies of cells received from four different sources and prepared with significant variations in cell structure and processing procedures.
NTIS
Cadmium Tellurides; Electrical Properties; Solar Cells

20070021363 Orrick, Herrington and Sutcliffe, LLP, Irvine, CA, USA, California Univ., Berkeley, CA, USA
Systems and Methods for Making and Using Nanoelectrodes
Burke, P. J., Inventor; Li, S., Inventor; Zheng, L., Inventor; 27 Feb 04; 20 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0387
Patent Info.: Filed Filed 27 Feb 04; US-Patent-Appl-SN-10-789 779
Report No.(s): PB2007-102549; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods are provided for the manipulation of a polarizable object with a pair of elongated nanoelectrodes using dielectrophoresis. The nanoelectrodes can be carbon nanotubes and are coupled with one or more time-varying voltage sources to create an electric field gradient in a gap between the nanotubes. The gradient induces the movement of a polarizable object in proximity with the field. The nanotube pair can be used to trap a single polarizable object in the gap. A method of fabricating a nanoelectrode dielectrophoretic system is also provided. Applications extend to self-fabricating nanoelectronics, nanomachines, nanochemistry and nanobiochemistry. A nanoelectrode dielectrophoretic system having an extended nanoelectrode for use in applications including the self-fabrication of a nanowire, as well as methods for fabricating the same, are also provided.
NTIS
Electrophoresis; Nanotechnology; Biochemistry

20070021369 Quine, Intellectual Property Law Group, P.C., Alameda, CA, USA, NanoSystems, Inc., Palo Alto, CA, USA
Nanostructure and Nanocomposite Based Compositions and Photovoltaic Devices
Scher, E. C., Inventor; Buretea, M. A., Inventor; Chow, C., Inventor; Empedocles, S., Inventor; Parce, J. W., Inventor; 11 Feb 04; 52 pp.; In English
Contract(s)/Grant(s): NRO-03-C-0042
Patent Info.: Filed Filed 11 Feb 04; US-Patent-Appl-SN-10-778 009
Report No.(s): PB2007-102543; No Copyright; Avail.: CASI: A04, Hardcopy

Nanocomposite photovoltaic devices are provided that generally include semiconductor nanocrystals as at least a portion of a photoactive layer. Photovoltaic devices and other layered devices that comprise core-shell nanostructures and/or two populations of nanostructures, where the nanostructures are not necessarily part of a nanocomposite, are also provided, as are devices including a recombination material and/or multiple electrodes. Varied architectures for such devices are also provided, including flexible and rigid architectures, planar and non-planar architectures, and the like, as are systems incorporating such devices, and methods and systems for fabricating such devices. Compositions comprising two populations of nanostructures

of different materials or nanostructures and a small molecule are also described, as are doped polymer nanocomposites. Compositions useful for making nanocomposites are also described.
NTIS
Nanocomposites; Nanocrystals; Nanostructure (Characteristics); Nanostructures (Devices); Semiconductors (Materials)

45
ENVIRONMENT POLLUTION

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

20070021247 California Univ., Berkeley, CA, USA, Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover, Germany
Sequestration of CO2 in the Altmark Natural Gas Field, Germany: Mobility Control to Extend Enhanced Gas Recovery
Rebscher, D.; May, F.; Oldenburg, C. M.; Apr. 21, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898955; LBNL--60157; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors are investigating the technical feasibility of injecting CO2 for carbon sequestration with enhanced gas recovery (CSEGR) in the depleted Altmark natural gas reservoir, Germany. Our approach is numerical simulation using TOUGH2/EOS7C. Our earlier simulation studies have shown early CO2 breakthrough due to fast-flow through the high-permeability sand layers. In order to extend the period of enhanced CH4 recovery, we propose the pre-injection of gelling fluids for the purpose of limiting the mobility of injected CO2 and thereby improving CO2 sweep and delaying CO2 breakthrough. We have implemented a simple gel model into EOS7C and simulated gel injection followed by CSEGR. Preliminary simulations to date show minimal improvements in CSEGR with breakthrough times delayed by only a few months to a year. While mobility control using pre-injected gelling fluids appears to be a promising strategy in controlling early breakthrough, more work is needed to design and simulate an effective procedure.
NTIS
Carbon Dioxide; Gas Recovery; Mobility; Natural Gas

20070021264 Stanford Linear Accelerator Center, Stanford, CA, USA, Pennsylvania Univ., Philadelphia, PA, USA, Texas Univ., Austin, TX, USA
Inversion of Airborne Contaminants in a Regional Model
Akcelik, V.; Giros, G.; Droganescu, A.; Ghatta, O.; Hill, J.; Jan. 2007; 8 pp.; In English
Report No.(s): DE2007-897455; SLAC-PUB-12288; No Copyright; Avail.: National Technical Information Service (NTIS)

We are interested in a DDDAS problem of localization of airborne contaminant releases in regional atmospheric transport models from sparse observations. Given measurements of the contaminant over an observation window at a small number of points in space, and a velocity field as predicted for example by a mesoscopic weather model, we seek an estimate of the state of the contaminant at the beginning of the observation interval that minimizes the least squares misfit between measured and predicted contaminant field, subject to the convection-diffusion equation for the contaminant. Once the 'initial' conditions are estimated by solution of the inverse problem, we issue predictions of the evolution of the contaminant, the observation window is advanced in time, and the process repeated to issue a new prediction, in the style of 4D-Var. We design an appropriate numerical strategy that exploits the spectral structure of the inverse operator, and leads to efficient and accurate resolution of the inverse problem. Numerical experiments verify that high resolution inversion can be carried out rapidly for a well-resolved terrain model of the greater Los Angeles area.
NTIS
Atmospheric Circulation; Contaminants; Inversions; Position (Location)

20070021285 California Univ., Berkeley, CA, USA
Sorbent-Based Gas Phase Air Cleaning for VOCs in Commercial Buildings
Fisk, W. J.; May 01, 2006; 24 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898957; LBNL-60162; No Copyright; Avail.: Department of Energy Information Bridge

This paper provides a review of current knowledge about the suitability of sorbent-based air cleaning for removing volatile organic compounds (VOCs) from the air in commercial buildings as needed to enable reductions in ventilation rates

and associated energy savings. The fundamental principles of sorbent air cleaning are introduced, criteria are suggested for sorbent systems that can counteract indoor VOC concentration increases from reduced ventilation, major findings from research on sorbent performance for this application are summarized, novel sorbent technologies are described, and related priority research needs are identified. Major conclusions include: sorbent systems can remove a broad range of VOCs with moderate to high efficiency, sorbent technologies perform effectively when challenged with VOCs at the low concentrations present indoors, and there is a large uncertainty about the lifetime and associated costs of sorbent air cleaning systems when used in commercial buildings for indoor VOC control. Suggested priority research includes: experiments to determine sorbent system VOC removal efficiencies and lifetimes considering the broad range and low concentration of VOCs indoors; evaluations of in-situ regeneration of sorbents; and an updated analysis of the cost of sorbent air cleaning relative to the cost of ventilation.
NTIS
Absorbers (Materials); Air Filters; Air Pollution; Air Purification; Air Sampling; Buildings; Sorbents; Vapor Phases; Volatile Organic Compounds

20070021286 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Joule-Thomson Cooling Due to CO2 Injection into Natural Gas Reservoirs
Oldenburg, C. M.; Apr. 21, 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898956; LBNL-60158; No Copyright; Avail.: Department of Energy Information Bridge

Depleted natural gas reservoirs are a promising target for Carbon Sequestration with Enhanced Gas Recovery (CSEGR). The focus of this study is on evaluating the importance of Joule-Thomson cooling during CO2 injection into depleted natural gas reservoirs. Joule-Thomson cooling is the adiabatic cooling that accompanies the expansion of a real gas. If Joule-Thomson cooling were extreme, injectivity and formation permeability could be altered by the freezing of residual water, formation of hydrates, and fracturing due to thermal stresses. The TOUGH2/EOS7C module for CO2-CH4-H2O mixtures is used as the simulation analysis tool. For verification of EOS7C, the classic Joule-Thomson expansion experiment is modeled for pure CO2 resulting in Joule-Thomson coefficients in agreement with standard references to within 5-7 percent. For demonstration purposes, CO2 injection at constant pressure and with a large pressure drop (approximately 50 bars) is presented in order to show that cooling by more than 20 degrees C can occur by this effect. Two more-realistic constant-rate injection cases show that for typical systems in the Sacramento Valley, California, the Joule-Thomson cooling effect is minimal. This simulation study shows that for constant-rate injections into high-permeability reservoirs, the Joule-Thomson cooling effect is not expected to create significant problems for CSEGR.
NTIS
Carbon Dioxide; Cooling; Cryogenic Cooling; Injection; Joule-Thomson Effect; Natural Gas; Reservoirs

20070021306 Eastern Research Group, Inc., Morrisville, NC USA
Source Sampling Fine Particulate Matter: Institutional Oil-Fired Boiler, Appendix A thru D
Bursey, J. T.; Dayton, D. P.; Feb. 2007; 30 pp.; In English
Contract(s)/Grant(s): 68-D-00-264
Report No.(s): PB2007-107709; No Copyright; Avail.: CASI: A03, Hardcopy

This test report describes the measurement and characterization of fine particulate matter (fine PM) emissions and volatile organic compound (VOC) emissions from an institutional scale no. 2 distillate oil-fired boiler with a rated capacity of 60,000 lbs/h (18.7 MW, 67.3 GJ/h)1. This category of boilers was responsible for an estimated 1245.4 kJ (ca. 45.6%) of distillate oil consumption in the U.S. in 1990. The boiler tested in this study was one of three boilers in a university power plant that provided space and water heating to a number of buildings on the university campus. Sampling was conducted in the exhaust duct of one boiler prior to the point at which all three boiler exhausts were combined into a single exhaust stream to the power plant stack. The boiler employed low-NOx burners for control of NOx emissions, but no devices for control of particulate matter were utilized. The report presents results of the test efforts in two ways: As mass emission factors (i.e., mass of emitted species per unit mass of fuel consumed), and Mass fraction composition of the particle and gas phase emissions.This test report describes the measurement and characterization of fine particulate matter (fine PM) emissions and volatile organic compound (VOC) emissions from an institutional scale no. 2 distillate oil-fired boiler with a rated capacity of 60,000 lbs/h (18.7 MW, 67.3 GJ/h)1. This category of boilers was responsible for an estimated 1245.4 kJ (ca. 45.6%) of distillate oil consumption in the U.S. in 1990. The boiler tested in this study was one of three boilers in a university power plant that provided space and

water heating to a number of buildings on the university campus. Sampling was conducted in the exhaust duct of one boiler prior to the point at which all three boiler exhausts were combined into a single exhaust stream to the power plant stack. The boiler employed low-NOx burners for control of NOx emissions, but no devices for control of particulate matter were utilized. The report presents results of the test efforts in two ways: As mass emission factors (i.e., mass of emitted species per unit mass of fuel consumed), and mass fraction composition of the particle and gas phase emissions.
NTIS
Air Pollution; Boilers; Combustion Products; Oils; Particulates; Sampling

20070021308 Eastern Research Group, Inc., Morrisville, NC USA
Source Sampling Fine Particulate Matter: Institutional Oil-Fired Boiler
Bursey, J. T.; Dayton, D. P.; Feb. 2007; 182 pp.; In English
Contract(s)/Grant(s): 68-D-00-264
Report No.(s): PB2007-107707; No Copyright; Avail.: National Technical Information Service (NTIS)

This test report describes the measurement and characterization of fine particulate matter (fine PM) emissions and volatile organic compound (VOC) emissions from an institutional scale no. 2 distillate oil-fired boiler with a rated capacity of 60,000 lbs/h (18.7 MW, 67.3 GJ/h)1. This category of boilers was responsible for an estimated 1245.4 kJ (ca. 45.6%) of distillate oil consumption in the U.S. in 1990. The boiler tested in this study was one of three boilers in a university power plant that provided space and water heating to a number of buildings on the university campus. Sampling was conducted in the exhaust duct of one boiler prior to the point at which all three boiler exhausts were combined into a single exhaust stream to the power plant stack. The boiler employed low-NOx burners for control of NOx emissions, but no devices for control of particulate matter were utilized. The report presents results of the test efforts in two ways: As mass emission factors (i.e., mass of emitted species per unit mass of fuel consumed), and mass fraction composition of the particle and gas phase emissions.
NTIS
Air Pollution; Boilers; Combustion Products; Oils; Particulates; Sampling

20070021310 National Toxicology Program, Research Triangle Park, NC, USA
NTP Technical Report on the Toxicology and Carcinogenesis Studies of Methyl Isobutyl Ketone (CAS No. 108-10-1) in F344/N Rats and B6C3F1 Mice (Inhalation Studies)
Feb. 2007; 242 pp.; In English
Report No.(s): PB2007-107706; NIH/PUB-07-4476; NTP-TR-538; No Copyright; Avail.: CASI: A11, Hardcopy

Methyl isobutyl ketone is used as a denaturant for rubbing alcohol; as a solvent for paints, varnishes, nitrocellulose, lacquers, and protective coatings; in industrial extraction processes; in dry-cleaning preparations; and in the synthesis of methyl isobutyl carbinol. Methyl isobutyl ketone was nominated for study by the National Cancer Institute and the USA Environmental Protection Agency because of its widespread use, the high potential for worker exposure due to its many industrial applications, and its high production volume. Male and female F344/N rats and B6C3F1 mice were exposed to methyl isobutyl ketone (greater than 99% pure) by inhalation for 2 years. Genetic toxicology studies were conducted in Salmonella typhimurium.
NTIS
Carcinogens; Hazardous Wastes; Ketones; Methyl Compounds; Mice; Rats; Respiration; Toxicity; Toxicology

20070021316 Istituto Superiore di Sanita, Rome, Italy
Stili di Vita e Comportamenti delle Popolazioni di Taranto, Massafra, Crispiano Lifestyles and Behaviour of Taranto, Massafra, Crispiano and Statte Populations for Inhalation Exposure Assessment to Atmospheric Pollution
Bastone, A.; Soggiu, M. E.; Vollono, C.; Viviano, G.; Masciocchi, M.; January 2006; 45 pp.; In Italian
Report No.(s): PB2007-107510; ISTISAN-06/36; Copyright; Avail.: National Technical Information Service (NTIS)

Population exposure studies in urban areas, where industrial plants are located, require surveys able to include variability in human behaviour and lifestyles with the aim to describe personal pattern related to higher health risks. This approach requires knowledge of variables influencing personal exposure. Population studies, carried out using specifically predisposed questionnaires, can provide a valid support in acquiring information on individual variability in order to perform the exposure evaluation. A population survey, specifically designed in order to acquire information on individual exposure variability, was performed in the Taranto area. Information analysis, carried out in 2005, referred to 1066 individuals residing in Taranto,

Statte, Crispiano and Massafra, showed differences in behaviour among age-sex population groups and permitted to reconstruct inhalation rates for each age-sex group, suggesting risk profiles which characterize the population under study. Finally, the results of this study are compared with those obtained from a similar one carried out in a city of Northern Italy.
NTIS
Air Pollution; Exposure; Populations; Respiration

20070021353 Hampton Univ., VA, USA
Development Of A Novel Catalyst For No Decomposition Semi-Annual
Akyurtlu, A.; Akyutlu, J. F.; Sep. 14, 2006; 11 pp.; In English
Contract(s)/Grant(s): FG26-03NT41911
Report No.(s): DE2007-896871; No Copyright; Avail.: Department of Energy Information Bridge

Air pollution arising from the emission of nitrogen oxides as a result of combustion taking place in boilers, furnaces and engines, has increasingly been recognized as a problem. New methods to remove NOx emissions significantly and economically must be developed. The current technology for post-combustion removal of NO is the selective catalytic reduction (SCR) of NO by ammonia or possibly by a hydrocarbon such as methane. The catalytic decomposition of NO to give N2 will be preferable to the SCR process because it will eliminate the costs and operating problems associated with the use of an external reducing species. The most promising decomposition catalysts are transition metal (especially copper)-exchanged zeolites, perovskites, and noble metals supported on metal oxides such as alumina, silica, and ceria. The main shortcoming of the noble metal reducible oxide (NMRO) catalysts is that they are prone to deactivation by oxygen. It has been reported that catalysts containing tin oxide show oxygen adsorption behavior that may involve hydroxyl groups attached to the tin oxide. This is different than that observed with other noble metal-metal oxide combinations, which have the oxygen adsorbing on the noble metal and subsequently spilling over to the metal oxide. This observation leads one to believe that the Pt/SnO2 catalysts may have a potential as NO decomposition catalysts in the presence of oxygen. This prediction is also supported by some preliminary data obtained for NO decomposition on a Pt/SnO2 catalyst in the PIs laboratory. The main objective of the research that is being undertaken is the evaluation of the Pt/SnO2 catalysts for the decomposition of NO in simulated power plant stack gases with particular attention to the resistance to deactivation by O2, CO2, and elevated temperatures. Temperature programmed desorption (TPD) and temperature programmed reaction (TPRx) studies on Pt/SnO2 catalysts having different noble metal concentrations and pretreated under different conditions were done. It is also planned to perform NO decomposition tests in a laboratory-size packed-bed reactor to obtain longterm deactivation data. In the previous reporting periods, runs were made with catalysts containing 15% Pt and 10% Pt on SnO2 were done. Catalysts containing 10% Pt resulted in significantly lower actgivities than 15% PT catalysts. Therefore, in the following tests 15% Pt/SnO2 catalysts were used. In the current reporting period runs to elucidate the effects of temperature, oxygen, water vapor, pretreatment temperature, and space velocity on NO dissociation were completed. It was found that the presence of oxygen and water vapor did not affect the activation energy of the NO dissociation reaction indicating the presence of the same rate controlling step for all feed compositions. Activation energy was higher for higher gas velocities suggesting the presence of mass transfer limitations at lower velocities. Presence of oxygen in the feed inhibited the NO decomposition. Having water vapor in the feed did not significantly affect the catalyst activity for catalysts pretreated at 373 K, but significantly reduced catalyst activity for catalysts pretreated at 900 K.
NTIS
Air Pollution; Catalysts; Decomposition; Nitrous Oxides; Pollution Control

20070021465 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Application of Satellite-Derived, High-Resolution Land Use/Land Cover Data to Improve Urban Air Quality Model Forecasts
Quattrochi, D. A.; Lapenta, W. M.; Crosson, W. L.; Estes, M. G., Jr.; Limaye, A.; Kahn, M.; November 2006; 64 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2006-214710; M-1177; Copyright; Avail.: CASI: A04, Hardcopy

Local and state agencies are responsible for developing state implementation plans to meet National Ambient Air Quality Standards. Numerical models used for this purpose simulate the transport and transformation of criteria pollutants and their precursors. The specification of land use/land cover (LULC) plays an important role in controlling modeled surface meteorology and emissions. NASA researchers have worked with partners and Atlanta stakeholders to incorporate an improved high-resolution LULC dataset for the Atlanta area within their modeling system and to assess meteorological and air quality impacts of Urban Heat Island (UHI) mitigation strategies. The new LULC dataset provides a more accurate representation of land use, has the potential to improve model accuracy, and facilitates prediction of LULC changes. Use of

the new LULC dataset for two summertime episodes improved meteorological forecasts, with an existing daytime cold bias of approx. equal to 3 C reduced by 30%. Model performance for ozone prediction did not show improvement. In addition, LULC changes due to Atlanta area urbanization were predicted through 2030, for which model simulations predict higher urban air temperatures. The incorporation of UHI mitigation strategies partially offset this warming trend. The data and modeling methods used are generally applicable to other U.S. cities.
Author
Air Quality; Cities; Land Use; Mathematical Models; Weather Forecasting; Satellite Observation; Remote Sensing; High Resolution

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GEOPHYSICS

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

20070021589 NASA Johnson Space Center, Houston, TX, USA, Portland State Univ., OR, USA
The Case against Mercury as the Angrite Parent Body (APB)
Hutson, M. L.; Ruzicka, A. M.; Mittlefehldt, D. W.; August 13, 2007; 1 pp.; In English; 70th Annual Meeting of the Meteoritical Society, 13-17 August 2007, Tucson, AZ, USA; Copyright; Avail.: CASI: A01, Hardcopy

Angrites are not plausibly from Mercury based on their high FeO contents and ancient ages (e.g., [1]). Rather, the early crystallization ages of angrites argues for a small asteroidal-sized parent body for these meteorites (e.g., [2]). Despite this, recently it has been proposed that Mercury is the APB [3, 4, 5, 6]. Preserved corona and symplectite textures and the presence of 120 triple junctions in NWA 2999 have been cited as requiring a planetary origin [3, 4], with the symplectites in NWA 2999 resulting from rapid decompression during uplift via thrust faults on Mercury [4], and the coronas during subsequent cooling at low pressure. Glasses along grain boundaries and exsolution lamellae possibly indicative of rapid melting and cooling in NWA 4950 are cited as evidence of rapid decompression [6]. To explain the discrepancy between spectral observations of the Mercurian surface and the high FeO contents in angrites, an early (~4.5 Ga), collisionally-stripped FeO-rich basaltic surface has been suggested for Mercury [5, 6].
Derived from text
Iron Oxides; Asteroids; Meteoritic Composition; Basalt; Pressure Reduction; Meteorites; Grain Boundaries; Coronas

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070020527 Scripps Institution of Oceanography, La Jolla, CA, USA
Multidecadal Changes in Near-Global Cloud Cover and Estimated Cloud Cover Radiative Forcing
Norris, Joel; Journal of Geophysical Research; April 30, 2005; Volume 110, No. D8206; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2004JD005600

The first paper was Multidecadal changes in near-global cloud cover and estimated cloud cover radiative forcing, by J. R. Norris (2005, J. Geophys. Res. - Atmos., 110, D08206, doi: lO.l029/2004JD005600). This study examined variability in zonal mean surface-observed upper-level (combined midlevel and high-level) and low-level cloud cover over land during 1971-1 996 and over ocean during 1952-1997. These data were averaged from individual synoptic reports in the Extended Edited Cloud Report Archive (EECRA). Although substantial interdecadal variability is present in the time series, long-term decreases in upper-level cloud cover occur over land and ocean at low and middle latitudes in both hemispheres. Near-global upper-level cloud cover declined by 1.5%-sky-cover over land between 1971 and 1996 and by 1.3%-sky-cover over ocean between 1952 and 1997. Consistency between EECRA upper-level cloud cover anomalies and those from the International Satellite Cloud Climatology Project (ISCCP) during 1984-1 997 suggests the surface-observed trends are real. The reduction in surface-observed upper-level cloud cover between the 1980s and 1990s is also consistent with the decadal increase in all-sky outgoing longwave radiation reported by the Earth Radiation Budget Satellite (EMS). Discrepancies occur between time series of EECRA and ISCCP low-level cloud cover due to identified and probable artifacts in satellite and surface cloud data. Radiative effects of surface-observed cloud cover anomalies, called ‘cloud cover radiative forcing (CCRF) anomalies,’

are estimated based on a linear relationship to climatological cloud radiative forcing per unit cloud cover. Zonal mean estimated longwave CCRF has decreased over most of the globe. Estimated shortwave CCRF has become slightly stronger over northern midlatitude oceans and slightly weaker over northern midlatitude land areas. A long-term decline in the magnitude of estimated shortwave CCRF occurs over low-latitude land and ocean, but comparison with EMS all-sky reflected shortwave radiation during 1985-1997 suggests this decrease may be underestimated.
Author
Cloud Cover; Periodic Variations; Estimating; Long Wave Radiation; Clouds (Meteorology); Climatology; Time Series Analysis

20070020528 Scripps Institution of Oceanography, La Jolla, CA, USA
Trends in Upper-Level Cloud Cover and Surface Divergence Over the Tropical Indo-Pacific Ocean Between 1952 And 1997
Norris, Joel R.; Journal of Geophysical Research; November 12, 2005; Volume 110, No. D21110; 2 pp.; In English
Contract(s)/Grant(s): NAG5-11731; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2005JD006183

This study investigated the spatial pattern of linear trends in surface-observed upper-level (combined mid-level and High-level) cloud cover, precipitation, and surface divergence over the tropical Indo-Pacific Ocean during 1952-1957. Cloud values were obtained from the Extended Edited Cloud Report Archive (EECRA), precipitation values were obtained from the Hulme/Climate Research Unit Data Set, and surface divergence was alternatively calculated from wind reported Comprehensive Ocean-Atmosphere Data Set and from Smith and Reynolds Extended Reconstructed sea level pressure data.
Author
Cloud Cover; Climate; Sea Level; Air Water Interactions; Divergence

20070020529 Scripps Institution of Oceanography, La Jolla, CA, USA
North Pacific Cloud Feedbacks Inferred from Synoptic-Scale Dynamic and Thermodynamic Relationships
Norris, Joel R.; Iacobellis, Sam F.; Journal of Climate; November 2005; Volume 18, Issue 22, pp. 4862-4878; In English
Contract(s)/Grant(s): NAG5-11731; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1175/JCLI3558.1

This study analyzed daily satellite cloud observations and reanalysis dynamical parameters to determine how mid-tropospheric vertical velocity and advection over the sea surface temperature gradient control midlatitude North Pacific cloud properties. Optically thick clouds with high tops are generated by synoptic ascent, but two different cloud regimes occur under synoptic descent. When vertical motion is downward during summer, extensive stratocumulus cloudiness is associated with near surface northerly wind, while frequent cloudless pixels occur with southerly wind. Examinations of ship-reported cloud types indicates that midlatitude stratocumulus breaks up as the the boundary level decouples when it is advected equatorward over warmer water. Cumulus is prevalent under conditions of synoptic descent and cold advection during winter. Poleward advection of subtropical air over colder water causes stratification of the near-surface layer that inhibits upward mixing of moisture and suppresses cloudiness until a fog eventually forms. Averaging of cloud and radiation data into intervals of 500-hPa vertical velocity and advection over the SST gradient enables the cloud response to changes in temperature and the stratification of the lower troposphere to be investigated independent of the dynamics.
Author
Clouds (Meteorology); Air Water Interactions; Stratocumulus Clouds; Troposphere; Sea Surface Temperature; Cloud Physics; Cloud Cover; Temperature Gradients; Descent; Ascent

20070021221 Scripps Institution of Oceanography, La Jolla, CA, USA
Low-Level Cloud Variability over the Equatorial Cold Tongue in Observations and Models
Mansbach, David K.; Norris, Joel R.; Journal of Climate; April 2007; Volume 20, Issue 8, pp. 1555-1570; In English
Contract(s)/Grant(s): NAG5-11731; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1175/JCLI4073.1

A fourth paper now in press is, Low-level cloud variability over the equatorial cold tongue in observations and models, by D. K. Mansbach and J. R. Norris (2007, J. Climate). This study examined cloud and meteorological observations from satellite, surface, and reanalysis datasets and fount that monthly anomalies in low-level cloud amount and near-surface temperature advection are strongly negatively correlated on the southern side of the equatorial Pacific cold tongue. This inverse correlation occurs independently of relationships between cloud amount and sea surface temperature (SST) or lower

tropospheric static stability (LTS) and the combination of advection plus SST or LTS explains significantly more interannual cloud variability in a multilinear regression than does SST or LTS alone. Warm anomalous advection occurs when the equatorial cold tongue is well defined and the southeastern Pacific trade winds bring relatively warm air over colder water. Ship meteorological reports and soundings show that the atmospheric surface layer becomes stratified under these conditions, thus inhibiting the upward mixing of moisture needed to sustain cloudiness against subsidence and entrainment drying. Cold anomalous advection primarily occurs when the equatorial cold tongue is weak or absent and the air-sea temperature difference is substantially negative. These conditions favor a more convective atmospheric boundary layer, greater cloud amount, and less frequent occurrence of clear sky. Examination of output from global climate models developed by the Geophysical Fluid Dynamics Laboratory (GFDL) and the National Center for Atmospheric Research (NCAR) indicates that both models generally fail to simulate the cloud-advection relationships observed on the northern and southern sides of the equatorial cold tongue. Although the GFDL atmosphere model does reproduce the expected signs of cloud-advection correlations when forced with prescribed historical SST variations, it does not consistently do so when coupled to an ocean model. The NCAR model has difficulty reproducing the observed correlations in both atmosphere-only and coupled versions. This suggests that boundary layer cloud parameterizations could be improved through better representation of the effects of advection over varying SST.
Author
Cloud Cover; Clouds (Meteorology); Variability; Equatorial Atmosphere; Cold Weather; Atmospheric Models

20070021298 Lawrence Livermore National Lab., Livermore, CA USA
Simulations of High Yield Air Bursts Using Gray and Multigroup Diffusion: Comparison of Raptor and Lasnex
Shestakov, A. I.; Nilsen, V.; Dec. 28, 2006; 14 pp.; In English
Report No.(s): DE2007-898467; UCRL-PROC-227008; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors describe a realistic test problem which simulates a strong explosion in air at STP. They consider two yields, Y-11kT and Y=1MT. The authors compare results obtained using gray with those using multigroup diffusion. For low Y, the two models give nearly identical results. In the early-time radiation-dominated regime, the low Y simulation resembles a classical spherically expanding thermal wave with strongly coupled (T=T(r)) temperatures. For large Y, the gray and multigroup runs differ considerably. The large yield, gray diffusion simulation, after proper scaling, is nearly identical to the low yield result. However, for large Y, the multigroup temperatures are equal only for T larger than 5-10keV. Beyond, T(r) decouples from T and an energetic pulse of radiation, populated by 100 keV photons, streams out from the fireball. Our large Y result contradicts established theory. However, two LNL codes, Raptor and Lasnex, show excellent agreement for large Y.
NTIS
Diffusion; Simulation

20070021300 Lawrence Livermore National Lab., Livermore, CA USA
Experiment on Mass-Stripping of Interstellar Cloud Following Shock Passage
Hansen, J. F.; Robey, H. F.; Klein, R. I.; Miles, A. R.; Nov. 01, 2006; 26 pp.; In English
Report No.(s): DE2007-898466; UCRL-CONF-225774; No Copyright; Avail.: Department of Energy Information Bridge

The interaction of supernova shocks and interstellar clouds is an important astrophysical phenomenon which can lead to mass-stripping (transfer of material from cloud to surrounding mass-loading the flow) and possibly increase the compression in the cloud to high enough densities to trigger star formation. Our experiments attempt to simulate and quantify the mass-stripping as it occurs when a shock passes through interstellar clouds. We drive a strong shock using 5 kJ of the 30 kJ Omega laser into a cylinder filled with low-density foam with an embedded 120 mu m Al sphere simulating an interstellar cloud. The density ratio between Al and foam is approximately 9. Time-resolved x-ray radiographs show the cloud getting compressed by the shock (t 5 ns), undergoing a classical Kelvin-Helmholtz roll-up (12 ns) followed by a Widnall instability (30 ns), an inherently 3d eect that breaks the 2d symmetry of the experiment. Material is continuously being stripped from the cloud at a rate which is shown to be in- consistent with laminar models for mass-stripping (the cloud is fully stripped by 80 ns-100 ns, ten times faster than the laminar model). We present a new model for turbulent mass-stripping that agrees with the observed rate and which should scale to astrophysical conditions, which occur at even higher Reynolds numbers than the current experiment. The new model combines the integral momentum equations, potential flow past a sphere, flat plate skin friction coefficients, and Spalding's law of the wall for turbulent boundary layers.
NTIS
Interstellar Matter; Molecular Clouds

20070021329 NASA Kennedy Space Center, Cocoa Beach, FL, USA

Anvil Tool in the Advanced Weather Interactive Processing System

Barrett, Joe, III; Bauman, William, III; Keen, Jeremy; April 2007; 26 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNK06MA70C

Report No.(s): NASA/CR-2007-214729; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021329

Meteorologists from the 45th Weather Squadron (45 WS) and Spaceflight Meteorology Group (SMG) have identified anvil forecasting as one of their most challenging tasks when predicting the probability of violations of the lightning Launch Commit Criteria and Space Shuttle Flight Rules. As a result, the Applied Meteorology Unit (AMU) created a graphical overlay tool for the Meteorological Interactive Data Display Systems (MIDDS) to indicate the threat of thunderstorm anvil clouds, using either observed or model forecast winds as input. In order for the Anvil Tool to remain available to the meteorologists, the AMU was tasked to transition the tool to the Advanced Weather interactive Processing System (AWIPS). This report describes the work done by the AMU to develop the Anvil Tool for AWIPS to create a graphical overlay depicting the threat from thunderstorm anvil clouds. The AWIPS Anvil Tool is based on the previously deployed AMU MIDDS Anvil Tool. SMG and 45 WS forecasters have used the MIDDS Anvil Tool during launch and landing operations. SMG's primary weather analysis and display system is now AWIPS and the 45 WS has plans to replace MIDDS with AWIPS. The Anvil Tool creates a graphic that users can overlay on satellite or radar imagery to depict the potential location of thunderstorm anvils one, two, and three hours into the future. The locations are based on an average of the upper-level observed or forecasted winds. The graphic includes 10 and 20 nm standoff circles centered at the location of interest, in addition to one-, two-, and three-hour arcs in the upwind direction. The arcs extend outward across a 30 degree sector width based on a previous AMU study which determined thunderstorm anvils move in a direction plus or minus 15 degrees of the upper-level (300- to 150-mb) wind direction. This report briefly describes the history of the MIDDS Anvil Tool and then explains how the initial development of the AWIPS Anvil Tool was carried out. After testing was performed by SMG, 45 WS, and AMU, a number of needed improvements were identified. A bug report document was created that showed the status of each bug and desired improvement. This report lists the improvements that were made to increase the accuracy and user-friendliness of the tool. Final testing was carried out and documented and then the final version of the software and Users Guide was provided to SMG and the 45 WS. Several possible future improvements to the tool are identified that would increase the flexibility of the tool. This report contains a brief history of the development of the Anvil Tool in MIDDS, and then describes the transition and development of software to AWIPS.

Derived from text

Anvil Clouds; Lightning; Meteorology; Thunderstorms; Weather; Climate Models; Weather Forecasting; Applications Programs (Computers)

20070021399 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Using Multi-scale Modeling System to Study the Interactions between Clouds, Precipitation, Aerosols, Radiation and Land Surface

Tao, Wei-Kuo; [2006]; 1 pp.; In English; State Key Laboratory of Sever Weather, Chinese Academy of Meteorological Services, July 31, 2006 and Physics and Severe Storms, Institute of Atmospheric Physics. Chinese Academy of Sciences, August 2, 2006; No Copyright; Avail.: Other Sources; Abstract Only

Numerical cloud models, which are based the non-hydrostatic equations of motion, have been extensively applied to cloud-scale and mesoscale processes during the past four decades. Because cloud-scale dynamics are treated explicitly, uncertainties stemming from convection that have to be parameterized in (hydrostatic) large-scale models are obviated, or at least mitigated, in cloud models. Global models will use the non-hydrostatic framework when their horizontal resolution becomes about 10 kilometers, the theoretical limit for the hydrostatic approximation. This juncture will be reached one to two decades from now. Over the past generation, voluminous datasets on atmospheric convection have been accumulated from radar, instrumented aircraft, satellites, and rawinsonde measurements in field campaigns, enabling the detailed evaluation of models. Improved numerical methods have resulted in more accurate and efficient dynamical cores in models. Improvements have been made in the parameterizations of microphysical processes, radiation, boundary-layer effects, and turbulence; however, microphysical parameterizations remain a major source of uncertainty in all classes of atmospheric models. In recent years, exponentially increasing computer power has extended cloud-resolving-model integrations from hours to months, the number of computational grid points from less than a thousand to close to ten million. Three-dimensional models are now more prevalent. Much attention is devoted to precipitating cloud systems where the crucial-lkm scales are resolved in horizontal domains as large as 10,000 kilometers in two-dimensions, and 1,000 x 1,000 square kilometers in three-dimensions.

Cloud models now provide statistical information useful for developing more realistic physically based parameterizations for climate models and numerical weather prediction models. It is also expected that NWP and mesoscale model can be run in grid size similar to cloud resolving model through nesting technique. A review of developments, improvements and applications of cloud models (GCE and WRF) at Goddard wlll be is presented in this talk. In particular, a new approach to using multi-scale modeling system to study the interactions between clouds, precipitation, aerosols and land will be presented. Author

Aerosols; Clouds (Meteorology); Mathematical Models; Multiscale Models; Parameterization; Land; Precipitation (Meteorology); Earth Surface

20070021406 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Microwave Signatures of Snow on Sea Ice: Modeling

Powell, D. C.; Markus, T.; Cavalieri, D. J.; Gasiewski, A. J.; Klein, M.; Maslanik, J. A.; Stroeve, J. C.; Sturm, M.; IEEE Transactions on Geoscience and Remote Sensing; November 2006; ISSN 0196-2892; Volume 44, No. 11, pp. 3091-3104; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 291-07-66; 622-82-75; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1109/TGRS.2006.882139

Accurate knowledge of snow-depth distribution over sea ice is critical for polar climate studies. Current snow-depth-over-sea-ice retrieval algorithms do not sufficiently account for variations in snow and ice physical properties that can affect the accuracy of retrievals. For this reason, airborne microwave observations were coordinated with ground-based measurements of snow depth and snow properties in the vicinity of Barrow, AK, in March 2003. In this paper, the effects of snowpack properties and ice conditions on microwave signatures are examined using detailed surface-based measurements and airborne observations in conjunction with a thermal microwave-emission model. A comparison of the Microwave Emission Model of Layered Snowpacks (MEMLS) simulations with detailed snowpack and ice data from stakes along the Elson Lagoon and the Beaufort Sea and ra- ‘diometer data taken from low-level flights using a Polarimetric Scanning Radiometer (PSR-A) shows that MEMLS can be used to simulate snow on sea ice and is a useful tool for understanding the limitations of the snow-depth algorithm. Analysis of radiance data taken over the Elson Lagoon and the Beaufort Sea using MEMLS suggests that the radiometric differences between the two locations are due to the differences in sea-ice emissivity. Furthermore, measured brightness temperatures suggest that the current snow-depth retrieval algorithm is sufficient for areas of smooth first-year sea ice, whereas new algorithm coefficients are needed for rough first-year sea ice. Snowpack grain size and density remain an unresolved issue for snow-depth retrievals using passive-microwave radiances.
Author

Snow Cover; Sea Ice; Microwave Signatures; Microwave Emission; Climate; Emissivity; Polarimetry; Thermal Emission

20070021435 NASA Goddard Space Flight Center, Greenbelt, MD, USA

What Does Reflection from Cloud Sides Tell Us About Vertical Distribution of Cloud Droplet Sizes?

Marshak, Alexander; Martins, J. Vanderlei; Zubko, Victor; Kaufman, Yoram, J.; [2005]; 28 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Cloud development, the onset of precipitation and the effect of aerosol on clouds depend on the structure of the cloud profiles of droplet size and phase. Aircraft measurements of cloud profiles are limited in their temporal and spatial extent. Satellites were used to observe cloud tops not cloud profiles with vertical profiles of precipitation-sized droplets anticipated from Cloudsat. The recently proposed CLAIM-3D satellite mission (cloud aerosol interaction mission in 3D) suggests to measure profiles of cloud microphysical properties by retrieving them from the solar and infrared radiation reflected or emitted from cloud sides. Inversion of measurements from the cloud sides requires rigorous understanding of the 3-dimensional (3D) properties of clouds. Here we discuss the reflected sunlight from the cloud sides and top at two wavelengths: one nonabsorbing to solar radiation (0.67 micrometers) and one with liquid water efficient absorption of solar radiation (2.1 micrometers). In contrast to the plane-parallel approximation, a conventional approach to all current operational retrievals, 3D radiative transfer is used for interpreting the observed reflectances. General properties of the radiation reflected from the sides of an isolated cloud are discussed. As a proof of concept, the paper shows a few examples of radiation reflected from cloud fields generated by a simple stochastic cloud model with the prescribed vertically resolved microphysics. To retrieve the information about droplet sizes, we propose to use the probability density function of the droplet size distribution and its first two moments instead of the assumption about fixed values of the droplet effective radius. The retrieval algorithm is based on the Bayesian theorem that combines prior information about cloud structure and microphysics with radiative transfer calculations.
Author

Cloud Physics; Drop Size; Vertical Distribution; Reflection; Atmospheric Models; Geophysics; CloudSat

20070021437 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spatial and Temporal Distribution of Clouds as Observed by MODIS Onboard the Terra and Aqua Satellites

King, Michael D.; Platnick, Steven; Menzel, Paul; Ackerman, Steven A.; Aug. 4, 2006; 2 pp.; In English; 2006 IGARSS Symposium, 31 Jul. - 4 Aug. 2006, Denver, CO, USA; Copyright; Avail.: CASI: A01, Hardcopy

The Moderate Resolution Imaging Spectroradiometer (MODIS) was developed by NASA and launched onboard the Terra spacecraft on December 18,1999 and Aqua spacecraft on May 4, 2002. It achieved its final orbit and began Earth observations on February 24,2000 for Terra and June 24,2002 for Aqua. A comprehensive set of remote sensing algorithms for cloud masking and the retrieval of cloud physical and optical properties has been developed by members of the MODIS atmosphere science team. The archived products from these algorithms have applications in climate change studies, climate modeling, numerical weather prediction, and fundamental atmospheric research. In addition to an extensive cloud mask, products include cloud-top properties (temperature, pressure, effective emissivity), cloud thermodynamic phase, cloud optical and microphysical parameters (optical thickness, effective particle radius, water path), as well as derived statistics. Over the last year, extensive improvements and enhancements in the global cloud products have been implemented, and reprocessing of all MODIS data on Terra has commenced since first light in February 2000. In the cloud mask algorithm, the most extensive improvements were in distinguishing clouds at nighttime, including the challenging polar darkness regions of the world. Additional improvements have been made to properly distinguish sunglint from clouds in the tropical ocean regions, and to improve the identification of clouds from snow during daytime in Polar Regions. We will show global monthly mean cloud fraction for both Terra and Aqua, and show how similar the global daytime cloud fraction is from these morning and afternoon orbits, respectively. We will also show the zonal distribution of cloud fraction over land and ocean regions for both Terra and Aqua, and show the time series of global cloud fraction from July 2002 through June 2006.

Author

MODIS (Radiometry); Cloud Physics; Remote Sensing; Temporal Distribution; Terra Spacecraft; Aqua Spacecraft; Climate Models; Emissivity; Numerical Weather Forecasting

20070021462 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Influence of Aerosols on the Shortwave Cloud Radiative Forcing from North Pacific Oceanic Clouds: Results from the Cloud Indirect Forcing Experiment (CIFEX)

Wilcox, Eric M.; Roberts, Greg; Ramanathan, V.; June 08, 2006; 9 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Aerosols over the Northeastern Pacific Ocean enhance the cloud drop number concentration and reduce the drop size for marine stratocumulus and cumulus clouds. These microphysical effects result in brighter clouds, as evidenced by a combination of aircraft and satellite observations. In-situ measurements from the Cloud Indirect Forcing Experiment (CIFEX) indicate that the mean cloud drop number concentration in low clouds over the polluted marine boundary layer is greater by 53/cu cm compared to clean clouds, and the mean cloud drop effective radius is smaller by 4 microns. We link these in-situ measurements of cloud modification by aerosols, for the first time, with collocated satellite broadband radiative flux observations from the Clouds and the Earth's Radiant Energy System (CERES) to show that these microphysical effects of aerosols enhance the top-of-atmosphere cooling by -9.9+/-4.3 W/sq m for overcast conditions.

Author

Aerosols; Cumulus Clouds; Stratocumulus Clouds; Marine Meteorology; Air Water Interactions; Cloud Cover; Pacific Ocean; Drop Size

20070021534 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Detecting Trends in Tropical Rainfall Characteristics, 1979-2003

Lau, K. M.; Wu, H. T.; [2006]; 31 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

From analyses of blended space-based and ground-based global rainfall data, we found increasing trends in the occurrence of extreme heavy and light rain events, coupled to a decreasing trend in moderate rain events in the tropics during 1979-2003. The trends are consistent with a shift in the large-scale circulation associated with a) a relatively uniform increase in warm rain over the tropical oceans, b) enhanced ice-phase rain over the near-equatorial oceans, and c) reduced mixed-phase rain over the tropical ocean and land regions. Due to the large compensation among different rain categories, the total tropical rainfall trend remained undetectable.

Author

Detection; Rain; Tropical Regions; Trends; Tropical Meteorology

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*.

20070021485 NASA Johnson Space Center, Houston, TX, USA
Mechanism of Action for Anti-radiation Vaccine in Reducing the Biological Impact of High-dose Gamma Irradiation
Maliev, Vladislav; Popov, Dmitri; Jones, Jeffrey A.; Casey, Rachael C.; [2007]; 8 pp.; In English; Copyright; Avail.: CASI: A02, Hardcopy

Ionizing radiation is a major health risk of long-term space travel, the biological consequences of which include genetic and oxidative damage. In this study, we propose an original mechanism by which high doses of ionizing radiation induce acute toxicity. We identified biological components that appear in the lymphatic vessels shortly after gamma irradiation. These radiation-induced toxins, which we have named specific radiation determinants (SRD), were generated in the irradiated tissues and then collected and circulated throughout the body via the lymph circulation and bloodstream. Depending on the type of SRD elicited, different syndromes of acute radiation sickness (ARS) were expressed. The SRDs were developed into a vaccine used to confer active immunity against acute radiation toxicity in immunologically naive animals. Animals that were pretreated with SRDs exhibited resistance to lethal doses of gamma radiation, as measured by increased survival times and survival rates. In comparison, untreated animals that were exposed to similar large doses of gamma radiation developed acute radiation sickness and died within days. This phenomenon was observed in a number of mammalian species. Initial analysis of the biochemical characteristics indicated that the SRDs were large molecular weight (200-250 kDa) molecules that were comprised of a mixture of protein, lipid, carbohydrate, and mineral. Further analysis is required to further identify the SRD molecules and the biological mechanism by which the mediate the toxicity associated with acute radiation sickness. By doing so, we may develop an effective specific immunoprophylaxis as a countermeasure against the acute effects of ionizing radiation.
Author
Biochemistry; Irradiation; Toxins and Antitoxins; Vaccines; Radiation Dosage; Gamma Rays; Radiation Effects

20070021573 NASA Johnson Space Center, Houston, TX, USA
Distribution of Micronuclei in Human Fibroblasts across the Bragg Curve of Light and Heavy Ions
Hada, M.; Lacy, S.; Gridley, D. S.; Rusek, A.; Cucinotta, F. A.; Wu, H.; July 08, 2007; 1 pp.; In English; 13th International Congress of Radiation Research, 8-12 July 2007, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The space environment consists of energetic particles of varying mass and energy, and understanding the :biological Bragg curve' is essential in optimizing shielding effectiveness against space radiation induced biological impacts. The 'biological Bragg curve' is dependent on the energy and the type of the primary particle, and may vary for different biological endpoints. Previously, we studied the induction of micronuclei (MN) across the Bragg curve of energetic Fe and Si ions, and observed no increased yield of MN at the location of the Bragg peak. However, the ratio of mono- to bi-nucleated cells, which indicates inhibition of cell progression, was found higher at the Bragg peak location in comparison to the plateau region of the Bragg curve. Here, we report the induction of MN in normal human fibroblast cells across the Bragg curve of incident protons generated at Loma Linda University. Similar to Si and Fe ions, the ratio of mono- to bi-nucleated cells showed a clear spike as the protons reached the Bragg peak. Unlike the two heavy ions, however, the MN yield also increased at the Bragg peak location. These results confirm the hypothesis that severely damaged cells at the Bragg peak of heavy, but not light ions are more likely to go through reproductive death and not be evaluated for micronuclei.
Author
Bragg Curve; Radiation Shielding; Heavy Ions; Extraterrestrial Radiation; Protons; Fibroblasts; Aerospace Environments; Energetic Particles

20070021582 NASA Johnson Space Center, Houston, TX, USA
Usefulness of Derived Frank Lead Parameters in Screening for Coronary Artery Disease and Cardiomyopathy
DePalma, J. L.; Schlegel, T. T.; Arenare, B.; Greco, E. C.; Starc, V.; Rahman, M. A.; Delgado, R.; [2007]; 1 pp.; In English; Computers in Cardiology, 30 Sep. - 3 Oct. 2007, Durhan, NC, USA; Copyright; Avail.: Other Sources; Abstract Only

We investigated the accuracy of several known as well as newly-introduced derived Frank-lead ECG parameters in differentiating healthy individuals from patients with obstructive coronary artery disease (CAD) and cardiomyopathy (CM).

Advanced high-fidelity 12-lead ECG tests (approx. 5-min supine) were first performed on a 'training set' of 99 individuals: 33 with ischemic or dilated CM and low ejection fraction (EF less than 40%); 33 with catheterization-proven obstructive CAD but normal EF; and 33 age-/gender-matched healthy controls. The following derived Frank lead parameters were studied for their accuracy in detecting CAD and CM: the spatial ventricular gradient (VG), including its beat-to-beat coefficient of variability (VG CV); the spatial mean QRS (SM-QRS) and T-waves (SM-T) and their beat-to-beat coefficients of variability; the spatial ventricular activation time (VAT); the mean and maximum spatial QRS-T angles; and standard late potentials parameters (RMS40, fQRSD and LAS). Several of these parameters were accurate in discriminating between the control group and both diseased groups at p less than 0.0001. For example the fQRSD, VG CV, mean spatial QRS-T angle and VG minus SM-QRS (which is similar to the SM-T) had retrospective areas under the ROC curve of 0.78, 0.78, 0.80, and 0.84 (CAD vs. controls) and 0.93, 0.88, 0.98 and 0.99 (CM vs. controls), respectively. The single most effective parameter in discriminating between the CAD and CM groups was the spatial VAT (44 plus or minus 5.8 vs. 53 plus or minus 9.9 ms, p less than 0.0001), with an area under the ROC curve of 0.80. Since subsequent prospective analyses using new groups of patients and healthy subjects have yielded only slightly less accurate results, we conclude that derived Frank-lead parameters show great promise for potentially contributing to the development of a rapid and inexpensive resting ECG-based screening test for heart disease. Author

Coronary Artery Disease; Electrocardiography; Cardiology; Life Sciences; Detection

20070021583 NASA Johnson Space Center, Houston, TX, USA, NASA Johnson Space Center, Houston, TX, USA

New and Improved T-wave Morphology Parameters to Differentiate Healthy Individuals from those with Cardiomyopathy and Coronary Artery Disease

Greco, E. C.; Schlegel, T. T.; Arenare, B.; DePalma, J. L.; Starc, V.; Rahman, M. A.; Delgado, R.; [2007]; 1 pp.; In English; Computers Cardiology, 30 Sep. - 3 Oct. 2007, Durham, NC, USA; Copyright; Avail.: Other Sources; Abstract Only

We investigated the ability of several known as well as new ECG repolarization parameters to differentiate healthy individuals from patients with obstructive coronary artery disease (CAD) and cardiomyopathy (CM). Advanced high-fidelity 12-lead ECG tests (approx. 5-min supine) were first performed on a 'training set' of 99 individuals: 33 with ischemic or dilated CM and low ejection fraction (EF less than 40%); 33 with catheterization-proven obstructive CAD but normal EF; and 33 age-/gender-matched healthy controls. The following multiple parameters of T-wave morphology (TWM) were derived via signal averaging and singular value decomposition (SVD, which yields 8 eigenvalues, rho(sub 1) greater than rho(sub 2)...greater than rho(sub 8) and studied for their retrospective accuracy in detecting underlying disease: 1) Principal component analysis ratio of the T wave (T-PCA) = 100*rho(sub 2)/rho(sub 1); 2) Relative T-wave residuum (rTWR) = 100* SIGMA (rho(sub 4)(sup 2) +...+ rho(sub 8)(sup 2)); 3) Modified complexity ratio of the T wave (T-mCR) = 100*SIGMA(rho(sub 3)(sup 2) +...+rho(sb 8) (sup 2)); and 4) Normalized 3-dimensional volume of the T wave (nTV) = 100*(rho(sub 2)*rho(sub 3)/rho(sub 1)(sup 2). All TWM parameters significantly differentiated CAD from controls (p less than 0.0001), and also CM from controls (p less than 0.0001). Retrospective areas under the ROC curve were 0.77, 0.81, 0.82, and 0.83 (CAD vs. controls) and 0.93, 0.89, 0.95 and 0.96 (CM vs. controls) for T-PCA, rTWR, T-mCR and nTV respectively. The newer TWM parameters (T-mCR and nTV) thus outperformed the more established parameters (T-PCA and rTWR), presumably by putting a greater emphasis on the third T-wave eigenvalue, which in most healthy subjects has little energy compared to the first two eigenvalues. Subsequent prospective analyses have also yielded similar results, such that we conclude that diagnostic differentiation of pathology from non-pathology may be especially aided by detecting the transference of energy from the first and second T-wave eigenvalues into the third T-wave eigenvalue.
Author

Coronary Artery Disease; Morphology; Cardiology; Health Physics; Electrocardiography; Heart

20070021584 NASA Johnson Space Center, Houston, TX, USA

Multi-channel System for Beat to Beat QT Interval Variability and its Use in Screening for Coronary Artery Disease and Cardiomyopathy

Starc, V.; Schlegel, T. T.; Arenare, B.; Greco, E. C.; DePalma, J. L.; Nunez, T.; Medina, R.; Jugo, D.; Rahman, M. A.; Delgado, R.; [2007]; 1 pp.; In English; Computers in Cardiology, 30 Sep. - 3 Oct. 2007, Durham, NC, USA; Copyright; Avail.: Other Sources; Abstract Only

We investigated the ability of beat-to-beat QT interval variability (QTV) and related parameters to differentiate healthy individuals from patients with obstructive coronary artery disease (CAD) and cardiomyopathy (CM). For this purpose we developed a PC-based ECG software program that in real time, acquires, analyzes and displays QTV in each of the eight independent channels that constitute the 12-lead conventional ECG. The system also analyzes and displays the QTV from QT interval signals that are derived from multiple channels and from singular value decomposition (SVD) to substantially reduce

the effect of noise and other artifacts on the QTV results. It also provides other useful SVD-related parameters such as the normalized 3-dimensional volume of the T wave (nTV) = 100*(rho(sub 2)*rho(sub 3)rho(sub 1^2). Advanced high-fidelity 12-lead ECG tests (approx. 5-min supine) were first performed on a 'training set' of 99 individuals: 33 with ischemic or dilated CM and low ejection fraction (EF less than 40%); 33 with catheterization-proven obstructive CAD but normal EF; and 33 age-/gender-matched healthy controls. All QTV parameters that were studied for their accuracy in detecting CM and CAD significantly differentiated both CM and CAD from controls (p less than 0.0001). Retrospective areas under the ROC curve (AUC) of SDNN-QTV, rmsSD-QTV, and QTV Index (QTVI) for CM vs. controls in the lead V5 were 0.85, 0.90, and 0.99, respectively, and those for CAD vs. controls in the lead II were 0.82, 0.82, and 0.89. Other advanced ECG parameters, such as HFQRS RAZ score, LF Lomb of RRV or QRS-T angle, differentiated both CM and CAD from controls less significantly, with the respective AUC values of 0.89, 0.88 and 0.98 for CM vs. controls, and 0.73, 0.71 and 0.80 for CAD vs. controls. QTV parameters (especially QTVI, which is QTV as indexed to RRV) were, diagnostically speaking, amongst the best performing of the advanced ECG techniques studied thus far.
Author
Coronary Artery Disease; Electrocardiography; Channels (Data Transmission); Synchronism; Intervals; Variability

20070021585 NASA Johnson Space Center, Houston, TX, USA
Break Point Distribution on Chromosome 3 of Human Epithelial Cells exposed to Gamma Rays, Neutrons and Fe Ions
Hada, M.; Saganti, P. B.; Gersey, B.; Wilkins, R.; Cucinotta, F. A.; Wu, H.; [2007]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Most of the reported studies of break point distribution on the damaged chromosomes from radiation exposure were carried out with the G-banding technique or determined based on the relative length of the broken chromosomal fragments. However, these techniques lack the accuracy in comparison with the later developed multicolor banding in situ hybridization (mBAND) technique that is generally used for analysis of intrachromosomal aberrations such as inversions. Using mBAND, we studied chromosome aberrations in human epithelial cells exposed in vitro to both low or high dose rate gamma rays in Houston, low dose rate secondary neutrons at Los Alamos National Laboratory and high dose rate 600 MeV/u Fe ions at NASA Space Radiation Laboratory. Detailed analysis of the inversion type revealed that all of the three radiation types induced a low incidence of simple inversions. Half of the inversions observed after neutron or Fe ion exposure, and the majority of inversions in gamma-irradiated samples were accompanied by other types of intrachromosomal aberrations. In addition, neutrons and Fe ions induced a significant fraction of inversions that involved complex rearrangements of both inter- and intrachromosome exchanges. We further compared the distribution of break point on chromosome 3 for the three radiation types. The break points were found to be randomly distributed on chromosome 3 after neutrons or Fe ions exposure, whereas non-random distribution with clustering break points was observed for gamma-rays. The break point distribution may serve as a potential fingerprint of high-LET radiation exposure.
Author
Chromosome Aberrations; Gamma Rays; Extraterrestrial Radiation; Exposure; Radiation Dosage; Irradiation; Chromosomes

20070021787 NASA Johnson Space Center, Houston, TX, USA
High-LET Patterns of DSBs in DNA Loops, the HPRT Gene and Phosphorylation Foci
Ponomarev, Artem L.; Huff, Janice L.; Cucinotta, Francis A.; July 13, 2007; 1 pp.; In English; 18th Annual NASA Space Radiation Investigators' Workshop, 13-15 July 2007, Rohnert Park, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We present new results obtained with our model based on the track structure and chromatin geometry that predicts the DSB spatial and genomic distributions in a cell nucleus with the full genome represented. The model generates stochastic patterns of DSBs in the physical space of the nucleus filled with the realistic configuration of human chromosomes. The model was re-used to find the distribution of DSBs in a physical volume corresponding to a visible phosphorylation focus believed to be associated with a DSB. The data shows whether there must more than one DSB per foci due to finite size of the visible focus, even if a single DSB is radiochemically responsible for the phosphorylation of DNA in its vicinity. The same model can predict patterns of closely located DSBs in a given gene, or in a DNA loop, one of the large-scale chromatin structures. We demonstrated for the example of the HPRT gene, how different sorts of radiation lead to proximity effect in DSB locations, which is important for modeling gene deletions. The spectrum of intron deletions and total gene deletions was simulated for

the HPRT gene. The same proximity effect of DSBs in a loop can hinder DSB restitutions, as parts of the loop between DSBs is deleted with a higher likelihood. The distributions of DSBs and deletions of DNA in a loop are presented.
Author
Deoxyribonucleic Acid; Foci; Genome; Phosphorylation

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*.

20070021294 NASA Johnson Space Center, Houston, TX, USA
Hypovolemia-induced Orthostatic Hypotension Relates To Hypo-sympathetic Responsiveness
Meck, Janice V.; May 24, 2007; 34 pp.; In English; 16th IAA Humans in Space Symposium, 20-24 May 2007, Beijing, China; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021294

We report a new model which uses hypovolemia to force humans into a hemodynamic state that is similar to that after spaceflight. This model can be used to test candidate countermeasures for postflight orthostatic hypotension and to identify crewmembers who will be most susceptible to that symptom on landing day.
Derived from text
Hemodynamic Responses; Space Flight; Hypovolemia; Hypotension

20070021295 NASA Johnson Space Center, Houston, TX, USA
Organization and Management of the International Space Station (ISS) Multilateral Medical Operations
Duncan, J. M.; Bogomolov, V. V.; Castrucci, F.; Koike, Y.; Comtois, J. M.; Sargsyan, A. E.; May 20, 2007; 21 pp.; In English; 16th IAA Humans in Space Symposium, 20-25 May 2007, Beijing, China; Original contains black and white illustrations
Contract(s)/Grant(s): NAS9-02078; Copyright; Avail.: CASI: A03, Hardcopy

The goal of this work is to review the principles, design, and function of the ISS multilateral medical authority and the medical support system of the ISS Program. Multilateral boards and panels provide operational framework, direct, and supervise the ISS joint medical operational activities. The Integrated Medical Group (IMG) provides front-line medical support of the crews. Results of ongoing activities are reviewed weekly by physician managers. A broader status review is conducted monthly to project the state of crew health and medical support for the following month. All boards, panels, and groups function effectively and without interruptions. Consensus prevails as the primary nature of decisions made by all ISS medical groups, including the ISS medical certification board. The sustained efforts of all partners have resulted in favorable medical outcomes of the initial fourteen long-duration expeditions. The medical support system appears to be mature and ready for further expansion of the roles of all Partners, and for the anticipated increase in the size of ISS crews.
Author
International Space Station; Support Systems; Aerospace Medicine; Spacecrews; Health; Certification

20070021378 NASA Johnson Space Center, Houston, TX, USA
Risk Assessment of Physiological Effects of Atmospheric Composition and Pressure in Constellation Vehicles
Scheuring, Richard A.; Conkin, Johnny; Jones, J. A.; Gernhardt, M.; May 20, 2007; 43 pp.; In English; 16th Annual Humans In Space 2007, 20-24 May 2007, Beijing, China; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021378

This viewgraph presentation reviews the work to assess the risk of Physiological Effects of atmospheric composition and atmospheric pressure in the planned consellation vehicles. The concerns of the work are the risks associated with the change in atmospheric pressure and atmospheric concentration that come with space flight and Extravehicular Activities. The historic experience is reviewed from the Mercury Program to the International Space Station. Countermeasures to these conditions are discussed. The future atmospheres in the Crew Exploration Vehicles and Mars and Lunar habitats are reviewed. The background for the recommendations made are summarized as hypoxia, decompression sickness, and flammability. Self reporting on Acute mountain sickness (AMS) are used to assess the probability of negative physiological effects due to atmospheric pressure. Based on extrapolation from current research, it is unlikely that future astronauts will experience severe

AMS, though performance issues and development of a mitigation plan are concerns.
CASI
Atmospheric Composition; Atmospheric Pressure; Hypoxia; Physiological Effects; Risk; Spacecrews; Life Support Systems; Aerospace Environments; Aerospace Medicine; Spacecraft Environments; Altitude Sickness; Decompression Sickness; Environmental Engineering

20070021398 NASA Johnson Space Center, Houston, TX, USA
Person to Person Biological Heat Bypass During EVA Emergencies
Koscheyev, Victor S.; Leon, Gloria R.; Lee, Joo-Young; Kim, Jung-Hyun; Berowiski, Anna; Trevino, Robert C.; [2007]; 12 pp.; In English; International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color illustrations
Contract(s)/Grant(s): NRA9-1521; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021398

During EVA and other extreme environments, mutual human support is sometimes the last way to survive when there is a failure of the life support equipment. The possibility to transfer a coolant to remove heat or a warming fluid to increase heat from one individual to another to support the thermal balance of the individual with system failure was assessed. The following scenarios were considered: 1. one participant has a cooling system that is not working well and already has a body heat deficit equal to 100-120 kcal and a finger temperature decline to 25 C; 2. one participant has the same status of overcooling and the other mild overheating. Preliminary findings showed promise in using such sharing tactics to extend the time duration of survival in extreme situations when there is a high metabolic rate in the donor.
Author
Extravehicular Activity; Bypasses; Emergencies; Life Support Systems; Temperature Measurement; Survival; Metabolism; Cooling Systems

20070021452 NASA Johnson Space Center, Houston, TX, USA
NASA Strategy to Safely Live and Work in the Space Radiation Environment
Cucinotta, Francis; Wu, Honglu; Corbin, Barbara; Sulzman, Frank; Kreneck, Sam; May 20, 2007; 25 pp.; In English; 16th IAA Humans in Space Symposium. From Dream to Reality: Living, Working and Creating for Humans in Space, 20-24 May 2007, Beijing, China; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021452

This viewgraph document reviews the radiation environment that is a significant potential hazard to NASA's goals for space exploration, of living and working in space. NASA has initiated a Peer reviewed research program that is charged with arriving at an understanding of the space radiation problem. To this end NASA Space Radiation Laboratory (NSRL) was constructed to simulate the harsh cosmic and solar radiation found in space. Another piece of the work was to develop a risk modeling tool that integrates the results from research efforts into models of human risk to reduce uncertainties in predicting risk of carcinogenesis, central nervous system damage, degenerative tissue disease, and acute radiation effects acute radiation effects.
CASI
Aerospace Environments; Extraterrestrial Radiation; Radiation Effects; Risk; Solar Radiation; Radiation Hazards; Radiation Injuries; Bioastronautics; Aerospace Medicine

20070021453 NASA Johnson Space Center, Houston, TX, USA
Painting Analysis of Chromosome Aberrations Induced by Energetic Heavy Ions in Human Cells
Wu, Honglu; Hada, Megumi; Cucinotta, Francis; May 20, 2007; 20 pp.; In English; 16th IAA Humans in Space Symosium, 20-24 May 2007, Beijing, China; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews some of the techniques used to analyze the damage done to chromosome from ion radiation. Fluorescence in situ hybridization (FISH), mFISH, mBAND, telomere and centromereprobes have been used to study chromosome aberrations induced in human cells exposed to low-and high-LET radiation in vitro. There is some comparison of the different results from the various techniques. The results of the study are summarized.
CASI
Chromosome Aberrations; Heavy Ions; Chromosomes; Radiation Damage; Linear Energy Transfer (LET); Detection; Genes

20070021527 Lund Univ. Hospital, Lund, Sweden, NASA Johnson Space Center, Houston, TX, USA

High-frequency Electrocardiogram Analysis in the Ability to Predict Reversible Perfusion Defects during Adenosine Myocardial Perfusion Imaging

Tragardh, Elin; Schlegel, Todd T.; Carlsson, Marcus; Pettersson, Jonas; Nilsson, Klas; Pahlm, Olle; [2007]; 17 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

Background: A previous study has shown that analysis of high-frequency QRS components (HF-QRS) is highly sensitive and reasonably specific for detecting reversible perfusion defects on myocardial perfusion imaging (MPI) scans during adenosine. The purpose of the present study was to try to reproduce those findings. Methods: 12-lead high-resolution electrocardiogram recordings were obtained from 100 patients before (baseline) and during adenosine Tc-99m-tetrofosmin MPI tests. HF-QRS were analyzed regarding morphology and changes in root mean square (RMS) voltages from before the adenosine infusion to peak infusion. Results: The best area under the curve (AUC) was found in supine patients (AUC=0.736) in a combination of morphology and RMS changes. None of the measurements, however, were statistically better than tossing a coin (AUC=0.5). Conclusion: Analysis of HF-QRS was not significantly better than tossing a coin for determining reversible perfusion defects on MPI scans.

Author

Electrocardiography; Myocardium; Defects; Adenosines; Imaging Techniques

20070021528 NASA Johnson Space Center, Houston, TX, USA

Biochemical Kinetics Model of DSB Repair and GammaH2AX FOCI by Non-homologous End Joining

Cucinotta, Francis, A.; Pluth, Janice M.; Anderson, Jennifer A.; Harper, Jane V.; O'Neill, Peter; [2007]; 32 pp.; In English; Projected release date is August 2007

Contract(s)/Grant(s): NASA 03-OBPR-07-0032-0027; DE-FG02-05ER64090; DE-A103-05ER64088; Copyright; Avail.: CASI: A03, Hardcopy

We developed a biochemical kinetics approach to describe the repair of double strand breaks (DSB) produced by low LET radiation by modeling molecular events associated with the mechanisms of non-homologous end-joining (NHEJ). A system of coupled non-linear ordinary differential equations describes the induction of DSB and activation pathways for major NHEJ components including Ku(sub 70/80), DNA-PK(sub cs), and the Ligase IV-XRCC4 hetero-dimer. The autophosphorylation of DNA-PK(sub cs and subsequent induction of gamma-H2AX foci observed after ionizing radiation exposure were modeled. A two-step model of DNA-PK(sub cs) regulation of repair was developed with the initial step allowing access of other NHEJ components to breaks, and a second step limiting access to Ligase IV-XRCC4. Our model assumes that the transition from the first to second-step depends on DSB complexity, with a much slower-rate for complex DSB. The model faithfully reproduced several experimental data sets, including DSB rejoining as measured by pulsed-field electrophoresis (PFGE), quantification of the induction of gamma-H2AX foci, and live cell imaging of the induction of Ku(sub 70/80). Predictions are made for the behaviors of NHEJ components at low doses and dose-rates, where a steady-state is found at dose-rates of 0.1 Gy/hr or lower.

Author

Biochemistry; Deoxyribonucleic Acid; Ionizing Radiation; Kinetics; Radiation Dosage; Mathematical Models

20070021530 NASA Johnson Space Center, Houston, TX, USA

Cardiac Autonomic Effects of Acute Exposures to Airborne Particulates in Men and Women

Howarth, M. S.; Schlegel, T. T.; Knapp, C. F.; Patwardhan, A. R.; Jenkins, R. A.; Ilgner, R. H.; Evans, J. M.; [2007]; 1 pp.; In English; 2007 Experimental Biology Annual Meeting, 28 Apr. - 2 May 2007, Washington, DC, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The aim of this research was to investigate cardiac autonomic changes associated with acute exposures to airborne particulates. Methods: High fidelity 12-lead ECG (CardioSoft, Houston, TX) was acquired from 19 (10 male / 9 female) non-smoking volunteers (age 33.6 +/- 6.6 yrs) during 10 minutes pre-exposure, exposure and post-exposure to environmental tobacco smoke (ETS), cooking oil fumes, wood smoke and sham (water vapor). To control exposure levels, noise, subject activity, and temperature, all studies were conducted inside an environmental chamber. Results: The short-term fractal scaling exponent (Alpha-1) and the ratio of low frequency to high frequency Heart Rate Variability (HRV) powers (LF/HF, a purported sympathetic index) were both higher in males (p\h0.017 and p\h0.05, respectively) whereas approximate entropy (ApEn) and HF/(LF+HF) (a purported parasympathetic index) were both lower in males (p\h0.036, and p\h0.044, respectively). Compared to pre-exposure (p\h0.0002) and sham exposure (p\h0.047), male heart rates were elevated during early ETS post-exposure.

Our data suggest that, in addition to tonic HRV gender differences, cardiac responses to some acute airborne particulates are gender related.
Author
Air Pollution; Autonomic Nervous System; Females; Heart; Males; Aerosols; Particulates; Contaminants; Hemodynamic Responses; Physiological Effects; Human Reactions; Biological Effects

20070021565 NASA Johnson Space Center, Houston, TX, USA
Vestibulo-Cervico-Ocular Responses and Tracking Eye Movements after Prolonged Exposure to Microgravity
Kornilova, L. N.; Naumov, I. A.; Azarov, K. A.; Sagalovitch, S. V.; Reschke, Millard F.; Kozlovskaya, I. B.; [2007]; 2 pp.; In English; 16th IAA Humans in Space Symposium, 20-24 May 2007, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

The vestibular function and tracking eye movements were investigated in 12 Russian crew members of ISS missions on days 1(2), 4(5-6), and 8(9-10) after prolonged exposure to microgravity (126 to 195 days). The spontaneous oculomotor activity, static torsional otolith-cervico-ocular reflex, dynamic vestibulo-cervico-ocular responses, vestibular reactivity, tracking eye movements, and gaze-holding were studied using videooculography (VOG) and electrooculography (EOG) for parallel eye movement recording. On post-flight days 1-2 (R+1-2) some cosmonauts demonstrated: - an increased spontaneous oculomotor activity (floating eye movements, spontaneous nystagmus of the typical and atypical form, square wave jerks, gaze nystagmus) with the head held in the vertical position; - suppressed otolith function (absent or reduced by one half amplitude of torsional compensatory eye counter-rolling) with the head inclined statically right- or leftward by 300; - increased vestibular reactivity (lowered threshold and increased intensity of the vestibular nystagmus) during head turns around the longitudinal body axis at 0.125 Hz; - a significant change in the accuracy, velocity, and temporal characteristics of the eye tracking. The pattern, depth, dynamics, and velocity of the vestibular function and tracking eye movements recovery varied with individual participants in the investigation. However, there were also regular responses during readaptation to the normal gravity: - suppression of the otolith function was typically accompanied by an exaggerated vestibular reactivity; - the structure of visual tracking (the accuracy of fixational eye rotations, smooth tracking, and gaze-holding) was disturbed (the appearance of correcting saccades, the transition of smooth tracking to saccadic tracking) only in those cosmonauts who, in parallel to an increased reactivity of the vestibular input, also had central changes in the oculomotor system (spontaneous nystagmus, gaze nystagmus).
Author
Microgravity; Exposure; Eye Movements; Tracking (Position); Vestibular Nystagmus; Accuracy; Saccadic Eye Movements

20070021566 NASA Johnson Space Center, Houston, TX, USA
Muscle Mass and Function after Long Duration Bed Rest: Results from the NASA Flight Analog Project
Lee, Stuart M. C.; Guilliams, Mark E.; Loehr, James A.; Laughlin, Mitzi; Hagan, R. Donald; [2007]; 41 pp.; In English; Copyright; Avail.: Other Sources

Bed rest (BR) has been employed as an analog to space flight to assess muscle atrophy and associated performance changes. This project assessed muscle mass, strength, and endurance changes after long-duration bed rest in subjects who performed no countermeasures. METHODS: Eight males and five females (28-54 yr) completed 60- or 90-days of 6 head-down tilt BR without countermeasures. Subjects participated in pre- and post-BR tests of lean tissue mass (DEXA), isokinetic strength and endurance (knee, ankle, and trunk extension and flexion), iso-inertial strength and endurance (bench press strength, leg press strength, push-ups, hanging pull-ups, and crunches), and low back/hamstring flexibility using protocols similar to those currently employed for US crewmembers on ISS before and after space flight. Inferential statistics were not performed on 60-d BR data due to the small subject number; pre-to post-BR scores for 90-d subjects were compared using paired t-tests. RESULTS: Lean tissue mass decreased after BR in almost all subjects, with \g60% of the loss occurring in the legs. Most measures of lower body muscle performance were reduced post-BR, but not in the upper body. Changes in muscle strength were greater than could be explained solely by the loss of lean tissue mass. CONCLUSIONS: Responses to BR were variable across the subjects tested, but in general indicated muscular deconditioning. The loss of muscle mass and performance in BR subjects were directionally similar to that reported for ISS crewmembers, but the respective groups differ in pre-exposure fitness, countermeasure participation, nutrition, and exposure duration.
Author
Muscles; Bed Rest; Physiological Responses; Hypokinesia; Deconditioning; Muscular Function; Atrophy

20070021570 NASA Johnson Space Center, Houston, TX, USA, Wyle Life Sciences, Inc., Houston, TX, USA
Validation of the Pulmonary Function System for Use on the International Space Station
McCleary, Frank A.; Moore, Alan D., Jr.; Hagan, R. Donald; March 23, 2007; 16 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

Aerobic deconditioning occurs during long duration space flight despite the use of exercise countermeasures (Convertino, 1996). As a part of International Space Station (ISS) medical operations, periodic tests designed to estimate aerobic capacity are performed to track changes in aerobic fitness and to determine the effectiveness of exercise countermeasures. These tests are performed prior to, during, and after missions of greater than 30 days in duration. Crewmembers selected for missions aboard the ISS perform a graded exercise test on a cycle ergometer approximately 270 days prior to their scheduled launch date in order to measure peak oxygen consumption (VO2PK) and peak heart rate (HRpk). Approximately 30 to 45 days prior to launch, crewmembers perform a submaximal cycle ergometer test at work rates set to elicit 25, 50 and 75% of their pre-flight VO2PK. This test, known as the Periodic Fitness Evaluation (PFE), serves as a baseline measure to which subsequent in-and post-flight exercise tests are compared. While onboard the ISS, crewmembers are normally scheduled to perform the PFE beginning with flight day (FD) 14 and every 30 days thereafter. The PFE is also conducted 5 and 30 days following flight. Using PFE data, aerobic fitness is estimated by quantifying the VO2 vs. HR relationship using linear regression and calculating the VO2 that would occur at the crewmember s previously measured HRpk. Currently, for data collected during flight, this technique assumes that the pre- vs. in-flight oxygen consumption per given cycle workload is similar. However, the validity of this assumption is based upon a sparse amount of data collected during the Skylab era (Michel, et al. 1977). The method of using heart rate and cycle ergometer work rates has been used to estimate aerobic fitness in normal gravity (Astrand and Ryhming, 1954; Lee, 1993). Due to spaceflight induced physiological alterations, such as shifts in extracellular fluid (e.g. plasma) volume, this method may not be valid during space flight. In addition, the ergometer onboard ISS is vibration-isolated and moves with the astronaut s application of force into the pedals. The effect of this movement on the VO2 of cycle exercise on ISS has not been quantified.
Derived from text
Physical Exercise; Deconditioning; Long Duration Space Flight; Countermeasures; Workloads (Psychophysiology); Physiology; Oxygen Consumption; Heart Rate

20070021575 NASA Johnson Space Center, Houston, TX, USA
Skeletal Adaptations to Different Levels of Eccentric Resistance Following Eight Weeks of Training
English, Kirk L.; Loehr, James A.; Lee, Stuart M. C.; Maddocks, Mary J.; Laughlin, Mitzi S.; Hagan, R. Donald; May 30, 2007; 1 pp.; In English; American College of Sports Medicine 54th Annual Meeting, 30 May - 2 June 2007, New Orleans, LA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Coupled concentric-eccentric resistive exercise maintains bone mineral density (BMD) during bed rest and aging. PURPOSE: We hypothesized that 8 wks of lower body resistive exercise training with higher ratios of eccentric to concentric loading would enhance hip and lumbar BMD. METHODS: Forty untrained male volunteers (34.9+/-7.0 yrs, 80.9+/-9.8 kg, 178.2+/-7.1 cm; mean+/-SD) were matched for leg press (LP) 1-Repetition Maximum (1-RM) strength and randomly assigned to one of 5 training groups. Concentric load (% 1-RM) was constant across groups, but each group trained with different levels of eccentric load (0, 33, 66, 100, or 138% of concentric) for all training sessions. Subjects performed a periodized supine LP and heel raise (HR) training program 3 d wk-1 for 8 wks using a modified Agaton Fitness System (Agaton Fitness AB, Boden, Sweden). Hip and lumbar BMD (g/sq cm) was measured in triplicate pre- and post-training using DXA (Hologic Discovery). Pre- and post-training means were compared using the appropriate ANOVA and Tukey's post hoc tests. Within group pre- to post-training BMD was compared using paired t-tests with a Bonferroni adjustment. RESULTS: There was a main effect of training on L1, L2, L3, L4, total lumbar, and greater trochanter BMD, but there were no differences between groups. CONCLUSION: Eights wks of lower body resistive exercise increased greater trochanter and lumbar BMD. Inability to detect group differences may have been influenced by a potentially osteogenic vibration associated with device operation in the 0, 33, and 66% groups.
Author
Musculoskeletal System; Microgravity; Physical Exercise; Lumbar Region; Bone Mineral Content; Analysis of Variance; Bed Rest

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*.

20070021223 NASA Johnson Space Center, Houston, TX, USA
Crew Exploration Vehicle Environmental Control and Life Support Fire Protection Approach
Lewis, John F.; Barido, Richard; Tuan, George C.; 2007; 4 pp.; In English; 37th International Conference on Environmental Systems, 9-12 July 2007, Chicago, IL, USA
Report No.(s): 2007-07ICES-231; Copyright; Avail.: CASI: A01, Hardcopy

As part of preparing for the Crew Exploration Vehicle (CEV), the National Aeronautics and Space Administration (NASA) worked on developing the requirements to manage the fire risk. The new CEV poses unique challenges to current fire protection systems. The size and configuration of the vehicle resembles the Apollo capsule instead of the current Space Shuttle or the International Space Station. The smaller free air volume and fully cold plated avionic bays of the CEV requires a different approach in fire protection than the ones currently utilized. The fire protection approach discussed in this paper incorporates historical lessons learned and fire detection and suppression system design philosophy spanning from Apollo to the International Space Station. Working with NASA fire and materials experts, this approach outlines the best requirements for both the closed out area of the vehicle, such as the avionics bay, and the crew cabin area to address the unique challenges due to the size and configuration of the CEV.
Author
Environmental Control; Fire Prevention; International Space Station; Life Support Systems; Crew Exploration Vehicle; Avionics; Space Shuttles

20070021224 NASA Johnson Space Center, Houston, TX, USA
Evaluation of Hands-Free Devices for the Display of Maintenance Procedures
Whitmore, Mihriban; Hoffman, Ronald B.; Litaker, Harry, Jr.; Solem, Jody; Holden, Kritina; Twyford, Evan; Conlee, Carl; [2007]; 3 pp.; In English; Copyright; Avail.: CASI: A01, Hardcopy

Over the past year, NASA's focus has turned to crewed long duration and exploration missions. On these journeys, crewmembers will be required to execute thousands of procedures to maintain life support systems, check out space suits, conduct science experiments, and perform medical exams. To support the many complex tasks crewmembers undertake in microgravity, NASA is interested in providing crewmembers a hands-free work environment to promote more efficient operations. The overarching objective is to allow crewmembers to use both of their hands for tasks related to their mission, versus holding a paper manual or interacting with a display. The use of advanced, hands-free tools will undoubtedly make the crewmembers task easier, but they can also add to overall task complexity if not properly designed. A leading candidate technology for supporting a hands-free environment is the Head-Mounted Display (HMD). A more recent technology (e-book reader) that could be easily temp-stowed near the work area is also a potential hands-free solution. Previous work at NASA involved the evaluation of several commercially available HMDs for visual quality, comfort, and fit, as well as suitability for use in microgravity. Based on results from this work, three HMDs were selected for further evaluation (along with an e-book reader), using International Space Station (ISS)-like maintenance procedures. Two evaluations were conducted in the Space Station Mockup and Trainer Facility (SSMTF) located at the NASA Johnson Space Center (building 9). The SSMTF is a full scale, medium fidelity replica of the pressurized portions of the ISS. It supports crew training such as ingress and egress, habitability, and emergency procedures. In each of the two evaluations, the participants performed two maintenance procedures. One maintenance procedure involved inspecting air filters in a life support system and replacing them with a clean filter if one were found to be contaminated. The second maintenance procedure focused on working in a confined space; specifically, pulling down a rack to inspect wiring configurations, and rewiring in a different pattern. The maintenance procedures were selected to assess mobility, tool use, and access to multiple document sources during task performance. That is, the participant had to move from rack to rack, use a wrench, a camera, etc., replace components, and refer to diagrams to complete tasks. A constraint was imposed that the ISS-like format of the procedures was to be retained, and not modified or optimized for the electronic device ('plug and play' approach). This was based on future plans to test with real procedures on ISS.
Author
Life Support Systems; Human Performance; Training Devices; Space Suits; Microgravity; Maintenance; International Space Station; Task Complexity; Mobility

20070021325 User Interaction Research and Design, Point Roberts, WA, USA, Foster-Miller Associates, Inc., Waltham, MA, USA

Human-Centered Technologies Tool

Riley, V.; Reinach, S.; Green, D.; Apr. 2007; 89 pp.; In English

Contract(s)/Grant(s): DFRA-040038

Report No.(s): PB2007-107485; No Copyright; Avail.: CASI: A05, Hardcopy

Operator error is a leading cause of incidents and accidents, and equipment design has been shown to facilitate such errors. Human factors expertise is often used to evaluate the design of equipment and user interfaces for their potential to cause, facilitate, or permit operator error. Developing broad and deep expertise in human factors, however, requires many years of formal training, and Federal Railroad Administration (FRA) regulators are often asked to evaluate equipment and user interface design without the benefit of such training. This report describes the development and evaluation of a computer-based analysis tool to help FRA Office of Safety personnel determine whether specific railroad technology designs may cause operator errors and, if so, what types of errors. The tool allows an analyst to model the layout, physical appearance, and functionality of controls and displays. The tool then applies standard human factors principles to analyze the design for errors that may be caused by factors such as violation of cultural conventions, inconsistencies within the interface, hidden functions, and inadequate feedback. The tools I designed to evaluate a single interface or compare two interfaces for interoperability. This report describes the software and summarizes the development and evaluation effort. It also contains a users' guide to assist tool users.

NTIS

Errors; Human Factors Engineering; Interoperability; Safety; Transportation

20070021577 NASA Johnson Space Center, Houston, TX, USA

ISRU Production of Life Support Consumables for a Lunar Base

Cooper, Bonnie L.; Simon, Tom; 2007; 6 pp.; In English; International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color illustrations

Contract(s)/Grant(s): 387498.04.01.03.01.10

Report No.(s): 2007-01-3106; Copyright; Avail.: CASI: A02, Hardcopy

Similar to finding a home on Earth, location is important when selecting where to set up an exploration outpost. Essential considerations for comparing potential lunar outpost locations include: (1) areas nearby that would be useful for In-Situ Resource Utilization (ISRU) oxygen extraction from regolith for crew breathing oxygen as well as other potential uses; (2) proximity to a suitable landing site; (3) availability of sunlight; (4) capability for line-of-sight communications with Earth; (5) proximity to permanently-shadowed areas for potential in-situ water ice; and (6) scientific interest. The Mons Malapert1 (Malapert Mountain) area (85.5degS, 0degE) has been compared to these criteria, and appears to be a suitable location for a lunar outpost.

Author

Consumables (Spacecraft); Landing Sites; Life Support Systems; Position (Location); Extraction; Lunar Bases; Line of Sight Communication

20070021586 NASA Johnson Space Center, Houston, TX, USA

Atmosphere Selection for Long-duration Manned Space Missions

Hirsch, David B.; June 08, 2007; 18 pp.; In English; NASA/JAXA Technical Interchange Meeting, 4-8 Jun. 2007, Tsukuba, Japan; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021586

This viewgraph reviews the spacecraft environment for future human space exploration missions. The choice of a atmosphere mix will play a critical role in the ultimate safety, productivity, and cost. There are a multitude of factors involved in selection of spacecraft environments.

CASI

Long Duration Space Flight; Manned Space Flight; Spacecraft Environments; Life Support Systems; Spacecraft Cabin Atmospheres; Selection; Bioastronautics; Gas Mixtures

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*.

20070021275 Connolly Bove Lodge and Hutz, LLP, Wilmington, DE, USA
Organization of Cache Memory for Hardware Acceleration of the Finite-Difference Time-Domain Method
Humphrey, J. R., Inventor; Durbano, J. P., Inventor; Ortiz, F. E., Inventor; Prather, D. W., Inventor; 24 Mar 04; 11 pp.; In English
Contract(s)/Grant(s): DAAB07-01-C-L545
Patent Info.: Filed Filed 24 Mar 04; US-Patent-Appl-SN-10-808-895
Report No.(s): PB2007-102492; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed herein is an organization of cache memory for hardware acceleration of the FDTD method. The organization of cache memory for hardware acceleration of the FDTD method provides a substantial speedup to the finite-difference time-domain (FDTD) algorithm when implemented in a piece of digital hardware. The organization of cache memory for hardware acceleration of the FDTD method utilizes a very high bandwidth dual-port on-chip memory in a particular way. By creating many small banks of internal memory and arranging them carefully, all data dependencies can be statically wired. This allows for a many-fold speedup over SRAM-based solutions and removes the burden of data dependence calculation that streaming SDRAM-based solutions must perform.
NTIS
Finite Difference Theory; Finite Difference Time Domain Method; Patent Applications; Random Access Memory; Time Domain Analysis

20070021279 California Univ., Berkeley, CA USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Minimizing I/O Costs of Multi-Dimensional Queries with Bitmap Indices
Rotem, D.; Stockinger, K.; Wu, K.; Mar. 30, 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898945; LBNL--59949; No Copyright; Avail.: National Technical Information Service (NTIS)

Bitmap indices have been widely used in scientific applications and commercial systems for processing complex, multi-dimensional queries where traditional tree-based indices would notwork efficiently. A common approach for reducing the size of a bitmap index for high cardinality attributes is to group ranges of values of an attribute into bins and then build a bitmap for each bin rather than a bitmap for each value of the attribute. Binning reduces storage costs, however, results of queries based on bins often require additional filtering for discarding it false positives, i.e., records in the result that do not satisfy the query constraints. This additional filtering, also known as 'candidate checking,' requires access to the base data on disk and involves significant I/O costs. This paper studies strategies for minimizing the I/O costs for 'candidate checking' for multi-dimensional queries. This is done by determining the number of bins allocated for each dimension and then placing bin boundaries in optimal locations. Our algorithms use knowledge of data distribution and query workload. We derive several analytical results concerning optimal bin allocation for a probabilistic query model. Our experimental evaluation with real life data shows an average I/O cost improvement of at least a factor of 10 for multi-dimensional queries on datasets from two different applications. Our experiments also indicate that the speedup increases with the number of query dimensions.
NTIS
Costs; Io; Cost Reduction; Workloads (Psychophysiology)

20070021280 California Univ., Davis, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Using a Fast Multipole Method-Based Poisson Solver in an Approximate Projection
Williams, S. A.; Almgren, A. S.; Puckett, E. G.; Mar. 28, 2006; 17 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898942; LBNL--59934; No Copyright; Avail.: National Technical Information Service (NTIS)

Approximate projection methods are useful computational tools for solving the equations of time-dependent incompressible flow. In this report we will present a new discretization of the approximate projection in an approximate projection method. The discretizations of divergence and gradient will be identical to those in existing approximate projection methodology using cell-centered values of pressure; however, we will replace inversion of the five-point cell-centered discretization of the Laplacian operator by a Fast Multipole Method-based Poisson Solver (FMM-PS). We will show that the FMM-PS solver can be an accurate and robust component of an approximation projection method for constant density,

inviscid, incompressible flow problems. Computational examples exhibiting second-order accuracy for smooth problems will be shown. The FMM-PS solver will be found to be more robust than inversion of the standard five-point cell-centered discretization of the Laplacian for certain time-dependent problems that challenge the robustness of the approximate projection methodology.
NTIS
Multipoles; Poisson Equation

20070021297 Sandia National Labs., Albuquerque, NM USA
Critical Infrastructure Systems of Systems Assessment Methodology
Depoy, J.; Phelan, J.; Sholander, P.; Smith, B. J.; Varnado, G. B.; Oct. 01, 2006; 180 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-899076; SAND2006-6399; No Copyright; Avail.: National Technical Information Service (NTIS)

Assessing the risk of malevolent attacks against large-scale critical infrastructures requires modifications to existing methodologies that separately consider physical security and cyber security. This research has developed a risk assessment methodology that explicitly accounts for both physical and cyber security, while preserving the traditional security paradigm of detect, delay, and respond. This methodology also accounts for the condition that a facility may be able to recover from or mitigate the impact of a successful attack before serious consequences occur. The methodology uses evidence-based techniques (which are a generalization of probability theory) to evaluate the security posture of the cyber protection systems. Cyber threats are compared against cyber security posture using a category- based approach nested within a path-based analysis to determine the most vulnerable cyber attack path. The methodology summarizes the impact of a blended cyber/physical adversary attack in a conditional risk estimate where the consequence term is scaled by a willingness to pay avoidance approach.
NTIS
Information Systems; Security

20070021309 Government Accountability Office, Washington, DC, USA
Information Security: Sustained Progress Needed to Strengthen Controls at the Securities and Exchange Commission
Mar. 2007; 25 pp.; In English
Report No.(s): PB2007-107730; GAO-07-256; No Copyright; Avail.: CASI: A03, Hardcopy

SEC has made important progress toward correcting previously reported information security control weaknesses. Specifically, it has corrected or mitigated 58 of the 71 weaknesses previously reported as unresolved at the conclusion of GAO's 2005 audit. The commission resolved all of the previously reported weaknesses in security related activities and contingency planning, and made significant progress in resolving access control weaknesses. A key reason for its progress was that SEC's senior management was actively engaged in implementing information security related activities. Despite this progress, SEC has not consistently implemented certain key controls to effectively safeguard the confidentiality, integrity, and availability of its financial and sensitive information and information systems. In addition to 13 previously identified weaknesses that remain unresolved, 15 new information security weaknesses were identified. By the conclusion of GAO's review, SEC took action to address 11 of the 15 new weaknesses. A primary reason for these control weaknesses is that SEC had not consistently implemented elements of its information security program. This included inconsistent implementation of agency policies and procedures, not sufficiently testing and evaluating the effectiveness of controls for a major system as required by its certification and accreditation process, and not consistently taking effective and timely action to correct deficiencies identified in remedial action plans. Until SEC does, it will have limited assurance that it will be able to manage risks and protect sensitive information on an ongoing basis.
NTIS
Computer Information Security; Computer Networks

20070021313 Newcastle-upon-Tyne Univ., Newcastle, UK
Active Learning in Computing: Engaging Learners in a Cross-Site Team Project
Devlin, M.; Marshall, L.; Phillips, C.; Jan. 2007; 14 pp.; In English
Report No.(s): PB2007-107520; CS-TR-997; Copyright; Avail.: National Technical Information Service (NTIS)

Active Learning in Computing (ALiC) is a CETL project led by the University of Durham, with the University of Newcastle, Leeds Metropolitan University and the University of Leeds as partners. The project focuses on increasing the level of student engagement within the Computing curriculum, aiming to make the student experience more relevant to industry.

This paper concerns an experiment being undertaken jointly by the ALiC researchers at Newcastle and Durham. The pedagogical aims are to increase engagement and simulate the working practices of large companies, specifically running software development projects with teams at different geographical locations. The experiment consists of an assignment shared between teams of second year students on the Software Engineering Modules at Durham and Newcastle, where regular communication helps achieve success. The teams can use communication methods such as email and face-to-face meetings onsite and email, SMS, bulletin boards and video-conferencing for contacting their offsite counterparts. The structure of the assignment gives an insight into Software Engineering in an industrial context, makes problem-solving more realistic and also encourages the development of transferable skills. The assessments allow students to reflect upon their individual and team performance and to explore the roles and skills required when working in teams. This paper reviews the Newcastle students' perceptions of their skill levels and choice of team structure at the beginning of the team project and compares them to their reports at the interim stage.
NTIS
Computer Programs; Students

20070021314 Newcastle-upon-Tyne Univ., Newcastle, UK
CROSSBOARD: Crossmodal Access of Dense Public Displays
Gilroy, S.; Olivier, P.; Cao, H.; Jackson, D.; Kray, C.; Feb. 2007; 9 pp.; In English
Report No.(s): PB2007-107518; CS-TR-1005; Copyright; Avail.: National Technical Information Service (NTIS)

Crossmodal displays aim to bridge the gap between ambient display technology and personal mobile human computer interaction through the exploitation of aspects of crossmodal cognition. We extend the notion of sequential temporal multiplexing, introduced for crossmodal ambient displays, and describe a hierarchical temporal multiplexing approach. We demonstrate this through CROSSBOARD, a prototype public display application that harnesses hierarchical crossmodal cues to support efficient multi-user interaction with dense public information displays. Results of a pilot user study are presented in which the potential of CROSSBOARD for improving the retrieval of unindexed information from dense information displays is clearly demonstrated.
NTIS
Display Devices; Access Control; Modes

20070021315 Newcastle-upon-Tyne Univ., Newcastle, UK
Virtual Machines in DynaSOAr: Creating an On-Demand Ad-Hoc Virtual Grid
Mukherjee, A.; Watson, P.; Feb. 2007; 14 pp.; In English
Report No.(s): PB2007-107519; CS-TR-1002; Copyright; Avail.: National Technical Information Service (NTIS)

DynaSOAr is an infrastructure for dynamically deploying web services over a Grid or a set of networked resources. The DynaSOAr view of grid computing focussed entirely on the concept of services, rather than the more traditional jobs. Services are deployed on demand to meet the changing performance requirements. DynaSOAr includes the support to deploy services in pre-built Virtual Machines on demand thereby creating an ad-hoc Virtual Grid. This paper describes the DynaSOAr architecture with respect to the on-demand deployment of Virtual Machines and shows that in case of services involving a large amount of data transfer, there are advantages in creating an ad-hoc grid of services close to the data through the dynamic deployment of Virtual Machines.
NTIS
Dynamic Characteristics; Web Services

20070021317 Newcastle-upon-Tyne Univ., Newcastle, UK
Synthesis of Elementary Net Systems with Context Arcs and Localities
Koutny, M.; Pietkiewicz-Koutny, M.; Jan. 2007; 23 pp.; In English
Report No.(s): PB2007-107506; CS-TR-1000; Copyright; Avail.: National Technical Information Service (NTIS)

We investigate the synthesis problem for ENCL-systems, defined as Elementary Net Systems extended with context (inhibitor and activator) arcs and explicit event localities. Since co-located events are meant to be executed synchronously, the behaviour of such systems is captured by step transition systems, where arcs are labelled by sets of events rather than by single events. We completely characterize transition systems generated by ENCL-systems after extending the standard notion of a

region--defined as a certain set of states--with explicit information about events which, in particular, are responsible for crossing its border. As a result, we are able to construct, for each such transition system, a suitable ENCL-system generating it.
NTIS
Petri Nets; Synthesis

20070021318 Newcastle-upon-Tyne Univ., Newcastle, UK
Model for Systematic Analysis of Voting Systems
Tjostheim, T.; Peacock, T.; Ryan, P. Y. A.; Jan. 2007; 21 pp.; In English
Report No.(s): PB2007-107505; CS-TR-1001; Copyright; Avail.: National Technical Information Service (NTIS)

There has recently been keen interest in the threat analysis of voting systems. While it is important to verify the system itself, it has been found that certain vulnerabilities only become apparent when taking a systems-based view, i.e. considering interactions between the various components of a scheme. Threat analysis has so far been of three main forms: systems-based, protocol-level and taxonomy check-lists. We discuss these approaches before presenting a model for analysis of voting systems that essentially combines the first two methods, while avoiding the repetition that can occur with the latter. The model is described in detail, and demonstrated with an example from a case study of the Ryan-Randell Scratch Card voting system.
NTIS
Design Analysis; Voting; Models

20070021319 Newcastle-upon-Tyne Univ., Newcastle, UK
High-Level Petri Net Framework for Multi-Valued Genetic Regulatory Networks
Banks, R.; Steggles, L. J.; Feb. 2007; 19 pp.; In English
Report No.(s): PB2007-107504; CS-TR-1007; Copyright; Avail.: National Technical Information Service (NTIS)

To understand the function of genetic regulatory networks in the development of cellular systems, we must not only realize the individual network entities, but also the manner by which they interact. Multi-valued networks are a promising qualitative approach for modelling such genetic regulatory networks, providing an interesting compromise between the simplicity of Boolean models and more detailed quantitative models. However, at present multi-valued networks lack the formal analysis techniques and tools required to comprehensively investigate a genetic regulatory model. This is compounded by the fact that little appears to be known about the relationship between multi-valued models and their more abstract Boolean counterparts. We present a flexible formal framework for modelling and analyzing multi-valued genetic regulatory networks using high-level Petri nets. We propose an approach for translating a multi-valued model in to a corresponding compact high-level Petri net model using logic minimization techniques and consider coping with the problem of incomplete data that often occurs in practice. We demonstrate our approach with a detailed case study in which part of the genetic regulatory network responsible for the carbon starvation stress response in Escherichia coli is modelled and analyzed.
NTIS
Computer Networks; Genetics; Petri Nets; Mathematical Models

20070021320 Newcastle-upon-Tyne Univ., Newcastle, UK
Enhancing Privacy in Public Spaces through Crossmodal Displays
Cao, H.; Olivier, P.; Jackson, D.; Armstrong, A.; Huang, L.; Feb. 2007; 18 pp.; In English
Report No.(s): PB2007-107503; CS-TR-1003; Copyright; Avail.: National Technical Information Service (NTIS)

The selection of appropriate display technology and interaction techniques relies upon an understanding of the public-private nature of information and the spaces from which it is accessed. We propose a crossmodal ambient display framework that supports multiple users simultaneously accessing information which contains both public and personal elements. Crossmodal ambient displays are multi-user interfaces that facilitate the efficient public access of personalized information, while maintaining the anonymity of each user in physical public spaces. Based on psychological theories of crossmodal attention which characterize human capabilities for matching information picked up by different modalities, the framework takes advantage of both public displays and mobile devices through the use of peripheral cues, and makes possible the integration of multi-task performance and information personalization in public space.
NTIS
Display Devices; Privacy

20070021324 Newcastle-upon-Tyne Univ., Newcastle, UK

Note on the Well-Foundedness of Adequate Orders Used for Truncating Unfoldings

Chatain, T.; Khomenko, V.; Jan. 2007; 11 pp.; In English

Report No.(s): PB2007-107500; CS-TR-998; Copyright; Avail.: National Technical Information Service (NTIS)

Petri net unfolding prefixes are an important technique for formal verification and synthesis. In this paper we show that the requirement that the adequate order used for truncating a Petri net unfolding must be well-founded is superfluous in many important cases, i.e. it logically follows from other requirements. We give a complete analysis when this is the case. These results concern the very 'core' of the unfolding theory.

NTIS

Petri Nets; Approximation

20070021326 Government Accountability Office, Washington, DC, USA

Data Mining: Early Attention to Privacy in Developing a Key DHS Program Could Reduce Risks

Feb. 2007; 35 pp.; In English

Report No.(s): PB2007-107735; GAO-07-293; No Copyright; Avail.: CASI: A03, Hardcopy

ADVISE is a data mining tool under development intended to help DHS analyze large amounts of information. It is designed to allow an analyst to search for patterns in data--such as relationships among people, organizations, and events--and to produce visual representations of these patterns, referred to as semantic graphs. None of the three planned DHS implementations of ADVISE that GAO reviewed are fully operational. (GAO did not review uses of the tool by the DHS Office of Intelligence and Analysis.) The intended benefit of the ADVISE tool is to help detect threatening activities by facilitating the analysis of large amounts of data. DHS is currently in the process of testing the tool's effectiveness. Use of the ADVISE tool raises a number of privacy concerns. DHS has added security controls to the tool; however, it has not assessed privacy risks. Privacy risks that could apply to ADVISE include the potential for erroneous association of individuals with crime or terrorism and the misidentification of individuals with similar names. A privacy impact assessment would identify specific privacy risks and help officials determine what controls are needed to mitigate those risks. ADVISE has not undergone such an assessment because DHS officials believe it is not needed given that the tool itself does not contain personal data. However, the tool's intended uses include applications involving personal data, and the E-Government Act and related guidance emphasize the need to assess privacy risks early in systems development. Further, if an assessment were conducted and privacy risks identified, a number of controls could be built into the tool to mitigate those risks. For example, controls could be implemented to ensure that personal information is used only for a specified purpose or compatible purposes, and they could provide the capability to distinguish among individuals that have similar names to address the risk of misidentification. Because privacy has not been assessed and mitigating controls have not been implemented, DHS faces the risk that ADVISE-based system implementations containing personal information may require costly and potentially duplicative retrofitting at a later date to add the needed controls.

NTIS

Data Mining; Information Dissemination; Information Retrieval; Privacy; Protection; Security

20070021343 Government Accountability Office, Washington, DC, USA

Information Security: Further Efforts Needed to Address Significant Weaknesses at the Internal Revenue Service

Mar. 2007; 33 pp.; In English

Report No.(s): PB2007-107714; GAO-07-364; No Copyright; Avail.: CASI: A03, Hardcopy

In fiscal year 2006, the Internal Revenue Service (IRS) collected about $2.5 trillion in tax payments and paid about $277 billion in refunds. Because IRS relies extensively on computerized systems, effective information security controls are essential to ensuring that financial and taxpayer information is adequately protected from inadvertent or deliberate misuse, fraudulent use, improper disclosure, or destruction. As part of its audit of IRS's fiscal years 2006 and 2005 financial statements, GAO assessed (1) IRS's actions to correct previously reported information security weaknesses and (2) whether controls were effective in ensuring the confidentiality, integrity, and availability of financial and sensitive taxpayer information. To do this, GAO examined IRS information security policies and procedures, guidance, security plans, reports, and other documents; tested controls over five critical applications at three IRS sites; and interviewed key security representatives and management officials.

NTIS

Revenue; Computer Information Security

20070021352 Environmental Protection Agency, Washington, DC, USA
Data Quality Objectives Decision Error Feasibility Trials (DQO/DEFT). User's Guide-Version 4.0
Sep. 1994; 30 pp.; In English
Report No.(s): PB2007-106192; EPA/600/R-96/056; No Copyright; Avail.: CASI: A03, Hardcopy

The two most intensive steps in the DQO Process are Step 6: Specify Tolerable Limits on Decision Errors and Step 7: Optimize the Design. During step 7, the entire set of DQO outputs is incorporated into a sampling design. If the DQO constraints are not feasible, it is necessary to iterate through one or more of the earlier steps of the DQO Process to identify a sampling design that will meet the budget and generate data that are adequate for the decision. This iteration can be time-consuming and costly. Therefore, the Decision Error Feasibility Trials (DEFT) software was developed to reduce the need for this iteration before implementing the final step of the DQO process. The DEFT software allows a decision maker or member of the DQO planning team to quickly generate cost information about several simple sampling designs based on the DQO constraints. Through this process, the planning team can evaluate whether these constraints are appropriate or feasible before the sampling and analysis design team begins developing a final sampling design in the last step of the DQO process.

NTIS
Errors; Feasibility; Decision Making; Iteration

20070021355 Sandia National Labs., Albuquerque, NM USA
Presto Users Guide Version 2.6
Gullerud, A. S.; Loteras, J. R.; Hales, S. D.; Crene, N. K.; Oct. 01, 2006; 504 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2007-896867; SAND2006-6093; No Copyright; Avail.: National Technical Information Service (NTIS)

Presto is a Lagrangian, three-dimensional explicit, transient dynamics code for the analysis of solids subjected to large, suddenly applied loads. Presto is designed for problems with large deformations, nonlinear material behavior, and contact. There is a versatile element library incorporating both continuum and structural elements. The code is designed for a parallel computing environment. This document describes the input for the code that gives users access to all of the current functionality in the code. Presto is built in an environment that allows it to be coupled with other engineering analysis codes. The input structure for the code, which uses a concept called scope, reflects the fact that Presto can be used in a coupled environment. This guide describes the scope concept and the input from the outermost to the innermost input scopes. Within a given scope, the descriptions of input commands are grouped based on code functionality. For example, all material input command lines are described in a section of the user's guide for all of the material models in the code.

NTIS
Lagrangian Function; User Manuals (Computer Programs); Parallel Processing (Computers)

20070021357 Sandia National Labs., Albuquerque, NM USA
Updating Time-to-Failure Distributions Based on Field Observations and Sensor Data
Lowder, K. S.; Briand, D.; Shirah, D.; Oct. 01, 2006; 147 pp.; In English
Contract(s)/Grant(s): AC04-94AL85000
Report No.(s): DE2007-896865; SAND2006-6890; No Copyright; Avail.: National Technical Information Service (NTIS)

Enterprise level logistics and prognostics and health management (PHM) modeling efforts use reliability focused failure distributions to characterize the probability of failure over the lifetime of a component. This research characterized the Sandia National Laboratories developed combined lifecycle (CMBL) distribution and explored methods for updating this distribution as systems age and new failure data becomes available. The initial results obtained in applying a Bayesian sequential updating methodology to the CMBL distribution shows promise. This research also resulted in the development of a closed-form full life cycle (CFLC) distribution similar to the CMBL distribution but with slightly different, yet commonly recognized, input parameters. Further research is warranted to provide additional theoretical validation of the distributions, complete the updating methods for the CMBL distribution, evaluate a Bayesian updating methodology for the CFLC distribution, and determine which updating methods would be most appropriate for enterprise level logistics and PHM modeling.

NTIS
Failure Analysis; Sensors; Mathematical Models

20070021385 Woodcock Washburn, LLP, Philadelphia, PA, USA
Exact Half Pulse Synthesis Via the Inverse Scattering Transform
Magland, J., Inventor; Epstein, C. L., Inventor; 13 Dec 04; 28 pp.; In English
Contract(s)/Grant(s): NSF DMS02-03075
Patent Info.: Filed Filed 13 Dec 04; US-Patent-Appl-SN-11-010 543
Report No.(s): PB2007-102557; No Copyright; Avail.: CASI: A03, Hardcopy

A method of obtaining an arbitrary, admissible transverse magnetization profile as the summed response of two, self refocused selective 'half pulse' excitations for use in, e.g., magnetic resonance imaging pulse generation. The problem of finding the pair of half pulses is rephrased in the inverse scattering formalism and a simple closed form algorithm for the solution is given, provided the target transverse profile has constant phase (modulo 180 degrees). The problem has a unique low energy solution for sufficiently small, complex valued data, and an algorithm for finding the solution is provided. This solution is used to generate pairs of half pulses for given target transverse profiles.
NTIS
Inverse Scattering; Transformations (Mathematics)

20070021388 Finnegan, Henderson, Farabow, Garrett, Dunner, LLP, Washington, DC, USA
Differential Optical Technique for Chiral Analysis
Gibbs, P. R., Inventor; 24 Nov 04; 23 pp.; In English
Contract(s)/Grant(s): NSF-0320299
Patent Info.: Filed Filed 24 Nov 04; US-Patent-Appl-SN-10-995 118
Report No.(s): PB2007-102563; No Copyright; Avail.: CASI: A03, Hardcopy

A differential method has been developed which determines displacement from the midpoint of optical transmission (+ or - 45 degrees) and utilizes the coupled nature of the two signals for common mode noise rejection to enhance the detection of chiral species. A beam of light is modulated, applied to the chiral mixture, and then split into a first beam and a related orthogonal beam by a polarizer or prism. The first beam and orthogonal beam are converted into electrical signals before a differential comparison of the signals is performed to detect a desired chiral species within the chiral mixture.
NTIS
Chirality; Light Transmission

20070021793 National Chung Hsing Univ., Taichung, Taiwan, Province of China
Performance Comparisons of Index-Based Communication-Induced Checkpointing Protocols
Tsai, Jichiang; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1113-1118; In English; See also 20070021790
Contract(s)/Grant(s): NSC9 95-2221-E-005-079; Copyright; Avail.: Other Sources

Communication-induced checkpointing (CIC) protocols can be used to prevent the domino effect. Such protocols that belong to the index-based category have been shown to perform more efficiently. In this paper, some results of comparing index-based CIC protocols are proposed. First, we prove that comparing several protocols based on the lazy indexing strategy can be simply based on their checkpoint-inducing conditions. Next, we show that improved indexing strategies may not always yield a better performance than the classical strategy. Finally, we present a simulation study to verify our foregoing theoretical results. The simulation is conducted in the typical point-to-point computational environment. Influences of enhancements on indexing strategies and checkpoint-inducing conditions for index-based CiC protocols are discussed.
Author
Communication Networks; Distributed Parameter Systems; Protocol (Computers)

20070021794 National Chung Hsing Univ., Taichung, Taiwan, Province of China
Design and Analysis for a Delay-Bounded Fair Queuing Algorithm
Liu, Mingshou; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1105-1108; In English; See also 20070021790; Copyright; Avail.: Other Sources

In this paper, we propose a fair resource reservation and scheduling algorithm for delay-bounded services. User applications initiate the requests by specifying the tolerable delay and priorities. Packets are scheduled according to the requirements negotiated during the resource reservation phase. Instead of tracking the fair utilization before the packet can be served in WFQ, the bandwidth share is monitored after the packet is sent. This approach can significantly reduce the

computational complexity resulting from WFQ while maintaining the long-term fairness. Examples and simulations are illustrated to show the performance difference from WFQ.
Author
Design Analysis; Algorithms; Bandwidth; Scheduling

20070021810 National Inst. of Information and Communications Technology, Japan
Empirical Evaluation of Real-Time Vertical Handover for Beyond 3G Wireless Network
Saito, Yoshia; Kuroda, Masahiro; Ishizu, Kentaro; Miyamoto, Goh; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 75-82; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

The Beyond 3G Wireless Network, which is discussed at ITU-R, integrates various radio systems including 3G, WLAN, and 4G. It provides an all IP wireless solution to offer services taking advantage of each radio system. Current approach to integrate wireless systems is to localize wireless dependent functions and to integrate into all IP network using Mobile IP technologies. We proposed the Mobile Ethernet architecture, a Beyond 3G, as all IP integrated wireless network using MAC layer technologies. There are some discussions to extend the Ethernet format to hold wireless frames efficiently caring about Mobility, QoS, and security along with the standardization activities in IEEE802 wireless technologies. In this paper we discuss mobility using common radio signaling scheme on the Mobile Ethernet and the vertical handover on the scheme. We design the Mobile Ethernet having W-CDMA and IEEE802.11b with the common radio signaling and evaluate the vertical handover performance in an outdoor test bed environment. We describe issues on packet loss in relation to link quality threshold for handover and speed of terminal movement. We also clarify remaining issues for the standardization.
Author
Ethernet; Mobility; Real Time Operation; Performance Tests; Security; Wireless Communication

20070021811 National Inst. of Information and Communications Technology, Japan
Mobile Ring Network for Large-Scale Mobile Internet
Miyamoto, Goh; Kuroda, Masahiro; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 45-53; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

Mobile networking technologies for use in metropolitan areas are needed to realize IP-based new-generation mobile networks. For this purpose, provision of high scalability in the number of mobile devices to be accommodated and the volume of traffic they receive and transmit as well as low latency in switching connection from one access point to another while accommodating a huge volume of traffic is of great importance. We proposed a new mobility management architecture where multiple Localized Mobility Agents (LMA) are interconnected on a flat ring to de-centralize location information of the visiting mobile nodes and packet forward processing. Performance evaluations of the packet forwarding and outdoor experimental demonstration using testbed network were carried out. The proposed Mobile Ring has an advantage in a large-scale network that accommodates tens of thousands of mobile nodes against conventional hierarchical network.
Author
Internets; Mobility; Computer Networks

20070021815 National Inst. of Information and Communications Technology, Japan
A Study of a Naming Scheme for User-Centric Environment
Murakami, Homare; Olsen, Rasmus Lovenstein; Schwefel, Hans-Peter; Prasad, Ramjee; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 121-129; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

We will be able to access to our all resources from anywhere through Personal Network (PN) connecting a user's Private Personal Area Network (P-PAN) and his/her clusters in a secure manner. We describe in this paper requirements on the naming scheme for the user-centric environment. Hereafter we propose a naming scheme, named New Naming Scheme (NNS). The naming scheme is developed based on Domain Name System (DNS) and satisfies the requirements. The naming scheme introduces two-layer concept to divide name space into private flat name space and public hierarchical name space.
Author
Direct Numerical Simulation; Naming; Computer Networks; Domains

20070021816 National Inst. of Information and Communications Technology, Japan

Mobile Ethernet and its Security toward Ubiquitous Network

Miyamoto, Goh; Kuroda, Masahiro; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 45-53; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

The ubiquitous environment is a seamless integration of radio systems, such as the 3G, WLAN and wireless MANS, and is expected popular in near future combined with small RF devices. The Mobile Ethernet is an architecture to integrate different types of radio systems and provide transparent network access anytime anywhere. We explain the Mobile Ethernet architecture for future ubiquitous environment from the viewpoint of 3GPP and IEEE802 LMSC. We, then, talk the Mobile Ethernet Security which is the security framework to accommodate both application and network authentications. We, then, discuss wireless security issues. One is to have a common mechanism to keep confidentiality among radio systems. The other is to provide functions to maintain availability. The wireless security discussion is still on the way and need to investigate privacy issues for security of future ubiquitous network.

Author

Communication Networks; Ethernet; Security; Radio Frequencies

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.

20070021676 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Built But Not Used, Needed But Not Built: Ground System Guidance Based On Cassini-Huygens Experience

Larsen, Barbara S.; June 19, 2006; 7 pp.; In English; 9th International Conference on Spacecraft Operations (SpaceOps), 16-24 Jun. 2006, Rome, Italy; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39919

These reflections share insight gleaned from Cassini-Huygens experience in supporting uplink operations tasks with software. Of particular interest are developed applications that were not widely adopted and tasks for which the appropriate application was not planned. After several years of operations, tasks are better understood providing a clearer picture of the mapping of requirements to applications. The impact on system design of the changing user profile due to distributed operations and greater participation of scientists in operations is also explored. Suggestions are made for improving the architecture, requirements, and design of future systems for uplink operations.

Author

Computer Programs; Systems Engineering; Uplinking; Applications Programs (Computers); Software Engineering; Architecture (Computers)

20070021747 NASA Langley Research Center, Hampton, VA, USA

Revealing the ISO/IEC 9126-1 Clique Tree for COTS Software Evaluation

Morris, A. Terry; May 07, 2007; 13 pp.; In English; Infotech\@Aerospace 2007 Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color and black and white illustrations

Report No.(s): AIAA Paper 2007-2960; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021747

Previous research has shown that acyclic dependency models, if they exist, can be extracted from software quality standards and that these models can be used to assess software safety and product quality. In the case of commercial off-the-shelf (COTS) software, the extracted dependency model can be used in a probabilistic Bayesian network context for COTS software evaluation. Furthermore, while experts typically employ Bayesian networks to encode domain knowledge, secondary structures (clique trees) from Bayesian network graphs can be used to determine the probabilistic distribution of any software variable (attribute) using any clique that contains that variable. Secondary structures, therefore, provide insight into the fundamental nature of graphical networks. This paper will apply secondary structure calculations to reveal the clique tree of the acyclic dependency model extracted from the ISO/IEC 9126-1 software quality standard. Suggestions will be provided to describe how the clique tree may be exploited to aid efficient transformation of an evaluation model.

Author

Applications Programs (Computers); Commercial Off-the-Shelf Products; Computer Programs; Mathematical Models; Software Engineering; Software Reliability; Program Verification (Computers); Computer Systems Performance

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.

20070021235 NASA Johnson Space Center, Houston, TX, USA
Development and Operation of a Modern Information Portal for the ISS Medical Groups
Damann, V.; Johnson, MaGee; Sargsyan, Ashot; McDonald, P. Vernon; Armstrong, C.; Scheer, M.; Duncan, J. Michael; [2007]; 24 pp.; In English; 78th Annual ASMA Scientific Meeting, 13-17 May 2007, New Orleans, LA, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS9-02078; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021235

This viewgraph presentation begins with a review of some of the problems inherent in running medical services for the International Space Station. Part of the solution for the problems is the development of the information portal for the ISS medical groups. The presentation shows the tools that have been developed to assist in collaboration for the medical services, the security system and the capabilities of the portal.
CASI
International Space Station; Medical Services; Web Services; On-Line Systems; Websites; Telemedicine; Aerospace Medicine

20070021809 National Inst. of Information and Communications Technology, Japan
Context-Aware Service Mobility and Smart Space
Hasegawa, Mikio; Inoue, Masugi; Bandara, Udana; Minami, Masteru; Morikawaw, Hiroyuki; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 101-110; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

Various wireless and wired terminals have been well developed, but there are big differences between a compact mobile phone and a desktop PC connecting to the high-speed Internet, on their performances and qualities. If we could switch among those different terminals adaptively according to availability, quality, cost and usability, the most appropriate terminal can be always used. In the ubiquitous network environment, various sensors and actuators will be connected to the networks and new communication services are expected to come out. As a new communication service candidate, in this paper, we show cross-device handover technology which switches an on-going multimedia communication session from an actuator to another actuator. We also show a context sensing platform for providing context-aware services to the mobile users. We realize a ubiquitous network application that the sensors collect the user's current information, a server in the network estimates the user's context, and appropriate information is provided to the user by the optimum way according to the contextual information.
Author
Actuators; Detection; Multimedia; Telecommunication

64
NUMERICAL ANALYSIS

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

20070021470 Institute of Sound and Vibration Research, Southampton, UK
Derivation of the Rayleigh-Plesset Equation in Terms of Volume
Leighton, T. G.; January 2007; 25 pp.; In English
Contract(s)/Grant(s): EDP/D000580/1
Report No.(s): ISVR Technical Report No. 308; Copyright; Avail.: Other Sources

The most common nonlinear equations of motion for the pulsation of a spherical gas bubble in an infinite body of liquid arise in the various forms of the Rayleigh-Plesset equation, expressed in terms of the dependency of the bubble radius on the conditions pertaining in the gas and liquid. However over the past few decades several important analyses have begun with a heuristically-derived form of the Rayleigh-Plesset equation which considers the bubble volume, instead of the radius, as the parameter of interest, and for which the dissipation term is not derived from first principles. The predictions of these two sets

of equations can differ in important ways, largely through differences between the methods chosen to incorporate damping. As a result this report derives the Rayleigh-Plesset equation in terms of the bubble volume from first principles in such a way that it has the same physics for dissipation (viscous shear) as is used in the radius frame.
Author
Rayleigh Equations; Bubbles; Nonlinear Equations

20070021558 Institute of Sound and Vibration Research, Southampton, UK
Comparison of Two Wave Element Methods for the Helmholtz Problem
Huttunen, T.; Gamallo, P.; Astley, R. J.; November 2006; 27 pp.; In English; Original contains black and white illustrations
Report No.(s): ISVR-TR-307; Copyright; Avail.: Other Sources

In comparison with low-order finite element methods, the use of oscillatory basis functions has been shown to reduce the computational complexity associated with the numerical approximation of Helmholtz problems at high wave numbers. We compare two different wave element methods for the 2D Helmholtz problems. The methods chosen for this study are the partition of unity finite element method (PUFEM) and the ultra-weak variational formulation (UWVF). In both methods, the local approximation of wave field is computed using a set of plane waves for constructing the basis functions. However, the methods are based on different variational formulations; and the PUFEM basis also includes a polynomial component whereas the UWVF basis consists purely of plane waves. As model problems we investigate propagating and evanescent wave modes in a duct with rigid walls; and singular eigenmodes in an L-shaped domain. Results show a good performance of both methods for the modes in the duct but only a satisfactory accuracy was obtained in the case of the singular field. On the other hand, the both methods can suffer from the ill-conditioning of the resulting matrix system.
Author
Finite Element Method; Polynomials; Evanescent Waves; Approximation; Plane Waves; Oscillations

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20070021677 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Application of State Analysis and Goal-based Operations to a MER Mission Scenario
Morris, John Richard; Ingham, Michel D.; Mishkin, Andrew H.; Rasmussen, Robert D.; Starbird, Thomas W.; June 19, 2006; 12 pp.; In English; AIAA 9th International Conference on Spacecraft Operations (SpaceOps), 16-24 Jun. 2006, Rome, Italy; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39922

State Analysis is a model-based systems engineering methodology employing a rigorous discovery process which articulates operations concepts and operability needs as an integrated part of system design. The process produces requirements on system and software design in the form of explicit models which describe the system behavior in terms of state variables and the relationships among them. By applying State Analysis to an actual MER flight mission scenario, this study addresses the specific real world challenges of complex space operations and explores technologies that can be brought to bear on future missions. The paper first describes the tools currently used on a daily basis for MER operations planning and provides an in-depth description of the planning process, in the context of a Martian day's worth of rover engineering activities, resource modeling, flight rules, science observations, and more. It then describes how State Analysis allows for the specification of a corresponding goal-based sequence that accomplishes the same objectives, with several important additional benefits.
Author
Systems Integration; Software Engineering; Systems Engineering; Space Missions; Models

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*.

20070021242 Brinks Hofer Gilson and Lione, Chicago, IL, USA

Magneto-Optical Apparatus and Method for the Spatially-Resolved Detection of Weak Magnetic Fields

Eden, J. G., Inventor; Gao, J., Inventor; 20 Jan 03; 27 pp.; In English

Contract(s)/Grant(s): AFOSR-F49620-99-1-0106; AFOSR-F49620-00-1-0372

Patent Info.: Filed Filed 20 Jan 03; US-Patent-Appl-SN-10-762 223

Report No.(s): PB2007-104245; No Copyright; Avail.: CASI: A03, Hardcopy

A detector uses the magneto-optical Kerr effect and exploits the transition region between two magnetization states of a magneto-optical film to detect magnetic fields of less than 100 pT. The magnetic field of a subject is determined by examining the polarization of light reflected from the magneto-optical film. A several .mu.m thick, bismuth doped, YIG film is used for detection as the transition regions are steep, providing large changes in the polarization rotation angle for small variations in the applied magnetic field. The apparatus may be used in the functional imaging of various organs and systems in humans and animals or for the spatial and temporal tracking of nano or micro magnetic particles intentionally introduced into the circulatory or intestinal systems for diagnostic or research purposes.

NTIS

Animals; Iron; Magnetic Fields; Magneto-Optics; Metal Films; Organs; Yttrium-Aluminum Garnet

20070021248 Lawrence Livermore National Lab., Livermore, CA USA

Analyses in Support of Z-Pinch IFE and Actinide Transmutation - LLNL Progress Report for FY-06

Meier, W. R.; Moir, R. W.; Sep. 20, 2006; 98 pp.; In English

Report No.(s): DE2007-898441; UCRL-TR-224558; No Copyright; Avail.: National Technical Information Service (NTIS)

This report documents results of LLNLs work in support of two studies being conducted by Sandia National Laboratories (SNL): the development of the Z-pinch driven inertial fusion energy (Z-IFE), and the use of Z-pinch driven inertial fusion as a neutron source to destroy actinides from fission reactor spent fuel.

NTIS

Neutron Sources; Transmutation; Zeta Pinch

20070021250 Stockholm Univ., Sweden

Top Quarks at the Tevatron: Measurements of the Top Quark Production and Decay with the D0 Experiment

Strandberg, J.; Apr. 01, 2006; 155 pp.; In English

Contract(s)/Grant(s): AC02-76CH03000

Report No.(s): DE2007-898403; FERMILAB-THESIS-2006-33; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents two measurements of the to pquark using 230 pb(sup -1) of data recorded with the D0 detector at the Tevatron accelerator. The first measurement determines the top pair production cross section at (radical)s = 1.96 TeV in proton-antiproton collisions. In the standard model of particle physics the top quark decays almost exclusively into a W boson and a b quark. Candidate events are selected by requiring that at least one jet in the event is tagged with the secondary vertex algorithm.

NTIS

Particle Accelerators; Particle Decay; Quarks

20070021251 Florida State Univ., Tallahassee, FL, USA

Search for Large extra Dimensions in the Exclusive Photon + Missing Energy Channel in P Anti-P Collisions

Lazoflores, J. A.; Apr. 01, 2006; 129 pp.; In English

Contract(s)/Grant(s): AC02-76CH03000

Report No.(s): DE2007-898402; FERMILAB-THESIS-2006-35; No Copyright; Avail.: National Technical Information Service (NTIS)

A search was conducted for evidence of large extra dimensions (LED) at Fermi National Accelerator Laboratory's Tevatron using the D0 detector. The Tevatron is a p(bar p) collider at a center of mass energy of 1.96 TeV. Events with particles

escaping into extra dimensions will have large missing energy. The search was carried out using data from a total luminosity of 197 (+-) 13 pb(sup -1) with an observable high transverse momentum photon and a large transverse missing energy. The 70 observed events are consistent with photons produced by standard known reactions plus other background processes produced by cosmic muons. The mass limits on the fundamental mass scale at 95% confidence level for large extra dimensions of 2, 4, 6 and 8 are 500 GeV, 581 GeV, 630 GeV, and 668 GeV respectively.
NTIS
Collisions; Photons

20070021252 California State Univ., San Diego, CA, USA
WW and WZ Production at the Tevatron
Lipeles, E.; Jan. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-898401; FERMILAB-CONF-07-003-E; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes recent measurements of the production properties of WW and WZ pairs of bosons at the Tevatron. This includes measurements of the cross-section and triple gauge couplings in the WW process and the first evidence for WZ production.
NTIS
Particle Accelerators; Pair Production

20070021253 Fermi National Accelerator Lab., Batavia, IL, USA, Chicago Univ., Chicago, IL USA, Indiana Univ., South Bend, IN, USA
COUPP - A Search for Dark Matter with a Continuously Sensitive Bubble Chamber
Collar, J.; Crum, K.; Mishra, S.; Behnke, E.; Levine, I.; Jan. 01, 2007; 32 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-898400; FERMILAB-PROPOSAL-0961; No Copyright; Avail.: National Technical Information Service (NTIS)

We propose to construct and operate a 60-kg room temperature CF3I bubble chamber as a prototype dark matter (WIMP) detector. Operating in weakly-superheated mode, the chamber will be sensitive to WIMP induced nuclear recoils above 10 keV, while rejecting background electron recoils at a level approaching 1010. We would first commission and operate this chamber in the MINOS near detector hall with the goal to demonstrate stable operation and measure internal contamination and any other backgrounds. This chamber, or an improved version, would then be relocated to an appropriate deep underground site such as the Soudan Mine. This detector will have unique sensitivity to spin-dependent WIMP-nucleon couplings, and even in this early stage of development will attain competitive sensitivity to spin-independent couplings.
NTIS
Bubble Chambers; Dark Matter; Sensitivity

20070021254 Fermi National Accelerator Lab., Batavia, IL, USA, Kansas Univ., Lawrence, KS, USA, Oxford Univ., Oxford, UK
B(caret)0(underscore)s Mixing at D0 Experiment
Moulik, T.; Nomerotski, A.; Oct. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-898399; FERMILAB-CONF-06-496-E; No Copyright; Avail.: National Technical Information Service (NTIS)

In this report, we present a report on B(sub s)(sup 0) mixing studies at the D0 experiment. New results based on use of two additional decay modes are discussed and limits are given on the B(sub s)(sup 0) mixing parameter.
NTIS
Antiparticles; Decay

20070021255 Fermi National Accelerator Lab., Batavia, IL, USA
Measurements of the Persistent Current Decay and Snapback Effect in Tevatron Dipole Magnets
Velev, G. V.; Bauer, P.; DiMarco, J.; Hanft, R.; Lamm, M.; Aug. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-898398; FERMILAB-CONF--06-302-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

A systematic study of the persistent current decay and snapback effect in the fields of Tevatron accelerator dipoles was performed at the Fermilab Magnet Test Facility (MTF). The decay and snapback were measured under a range of conditions including variations of the current ramp parameters and magnet operational history. The study has mostly focused on the dynamic behavior of the normal sextupole component. In addition, the paper presents the persistent current effects observed in the other allowed field harmonics as well. The results provide new information about the previously observed 'excess' decay during the first several seconds of the sextupole decay during injection and the correlation between the snapback amplitude and its duration.
NTIS
Magnets; Particle Accelerators

20070021256 Florida Univ., Gainesville, FL, USA
New Results on Jet Fragmentation at CDF
Jindariani, S.; Dec. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-898397; FERMILAB-CONF-06-466-E; No Copyright; Avail.: Department of Energy Information Bridge

Presented are the latest results of jet fragmentation studies at the Tevatron using the CDF Run II detector. Studies include the distribution of transverse momenta (Kt) of particles jets, two-particle momentum correlations, and indirectly global event shapes in p(bar p) collisions. Results are discussed within the context of recent Next-to-Leading Log calculations as well as earlier experimental results from the Tevatron and e(sup +)e(sup -) colliders.
NTIS
Fragmentation; Particle Accelerators

20070021257 Fermi National Accelerator Lab., Batavia, IL, USA
Recycler Transverse Instability in Context of Proton Plan II
Balbekov, V.; Jan. 02, 2007; 20 pp.; In English
Report No.(s): DE2007-898396; FERMILAB-TM-2372-AD; No Copyright; Avail.: Department of Energy Information Bridge

Transverse instability of a bunched beam in a ring accelerator is considered. An emphasis is given to an investigation of rigid modes at space charge dominating beam coupling impedance and about linear synchrotron oscillations. The theory is applied to the Fermilab Recycler (1) which is treated as a proton accumulator in context of Proton Plan II (2). It is shown that the instability growth time can reach about 0.3 ms, and chromaticity about -7 to -10 is required to suppress it. The suppression by means of 26 MHz damper is considered also, and required parameters of the damper are provided. Arguments are adduced that obtained stability conditions are not only necessary but also sufficient, because other modes except the rigid ones are more stable.
NTIS
Proton 2 Satellite; Accumulators; Protons

20070021260 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, College of William and Mary, Williamsburg, VA, USA
Progress in Understanding the Nuclear Equation of State at the Quark Level
Thomas, A. W.; Guichon, P. A. M.; Jan. 03, 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-898362; JLAB-THY-07-607; DOE/OR/23177-0008; No Copyright; Avail.: Department of Energy Information Bridge

At the present time there is a lively debate within the nuclear community concerning the relevance of quark degrees of freedom in understanding nuclear structure. We outline the key issues and review the impressive progress made recently within

the framework of the quark-meson coupling model. In particular, we explain in quite general terms how the modification of the internal structure of hadrons in-medium leads naturally to three- and four-body forces, or equivalently, to density dependent effective interactions.
NTIS
Equations of State; Progress; Quarks

20070021261 Morehouse Coll., Atlanta, GA, USA
Surface Area, Volume, Mass, and Density Distributions for Sized Biomass Particles. Fifth Semi-Annual Progress Report. Reporting Period: July 01, 2006 to December 31, 2006
Sampath, R.; Jan. 01, 2007; 14 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT42130
Report No.(s): DE2007-898361; No Copyright; Avail.: Department of Energy Information Bridge

This semi-annual technical progress report describes work performed at Morehouse College under DOE Grant No. DE-FC26-04NT42130 during the period July 01, 2006 to December 31, 2006 which covers the fifth six months of the project. Presently work is in progress to characterize surface area, volume, mass, and density distributions for sized biomass particles. During this reporting period, Morehouse completed analyzing the physical property raw data for biomass particles obtained by our sub contractor, REM Engineering services, employing the electrodynamic balance (EDB) measurement system discussed in the previous reporting periods. Results of the analysis for the physical property such as surface area, volume, mass, and density of biomass particles tested are reported here. Mean mass of biomass particles obtained employing the EDB approach was then compared with that obtained employing the gravimetric approach reported in the last performance period, and found to be in good agreement to within (plus or minus) 1%.
NTIS
Biomass; Density Distribution; Mass Distribution

20070021262 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Results on Deeply Virtual Compton Scattering at Jefferson Lab
Sabatie, F.; Dec. 22, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC05-84ER40150
Report No.(s): DE2007-898353; JLAB-PHY-07-604; DOE/ER/40150-4220,NUCL-EX/061 2023,DAPNIA-06-444; No Copyright; Avail.: National Technical Information Service (NTIS)

After about 10 years of growing interest for Generalized Parton Distributions come the first results from dedicated experiments, using the golden Deeply Virtual Compton Scattering process. After a short introduction, we will explain the experimental methodology and show results of the Hall A E00-110 experiment, which aimed at measuring helicity-dependent photon electroproduction cross sections. We will emphasize how this experiment provided the first stringent tests of the scaling property of this process, allowing for the first time a model-independent extraction of a linear combination of Generalized Parton Distributions. We will also describe the Hall B E01-113 experiment which measured the photon electroproduction beam spin asymmetry over a wide kinematical range. The summary will include an outlook on the next generation of experiments which are already planned at Jefferson Lab at 6 GeV, but also after the planned 12 GeV upgrade.
NTIS
Compton Effect; Electron Scattering

20070021263 Sandia National Labs., Albuquerque, NM USA
Erbium Hydride Decomposition Kinetics
Ferrizz, R. M.; Nov. 2006; 41 pp.; In English
Report No.(s): DE2007-897616; SAND2006-7014; No Copyright; Avail.: National Technical Information Service (NTIS)

Thermal desorption spectroscopy (TDS) is used to study the decomposition kinetics of erbium hydride thin films. The TDS results presented in this report are analyzed quantitatively using Redhead's method to yield kinetic parameters (E(sub A) (approx) 54.2 kcal/mol), which are then utilized to predict hydrogen outgassing in vacuum for a variety of thermal treatments. Interestingly, it was found that the activation energy for desorption can vary by more than 7 kcal/mol (0.30 eV) for seemingly similar samples. In addition, small amounts of less-stable hydrogen were observed for all erbium dihydride films. A detailed explanation of several approaches for analyzing thermal desorption spectra to obtain kinetic information is included as an appendix.
NTIS
Decomposition; Desorption; Erbium; Hydrides; Kinetics; Spectroscopy

20070021266 Kavli Institute for Particle Astrophysics and Cosmology, Stanford, CA, USA, Stanford Linear Accelerator Center, Stanford, CA, USA

Dark Energy and the Hierarchy Problem

Chien, P.; Dec. 2006; 6 pp.; In English

Report No.(s): DE2006-896162; SLAC-PUB-12445; No Copyright; Avail.: Department of Energy Information Bridge

The well-known hierarchy between the Planck scale (approx. 10(sup 19)GeV) and the TeV scale, namely a ratio of (approx) 10(sup 16) between the two, is coincidentally repeated in a inverted order between the TeV scale and the dark energy scale at (approx) 10(sup -3) eV implied by the observations. We argue that this is not a numerical coincidence. The same brane-world setups to address the first hierarchy problem may also in principle address this second hierarchy issue. Specifically, we consider supersymmetry in the bulk and its breaking on the brane and resort to the Casimir energy induced by the bulk graviton-gravitino mass-shift on the brane as the dark energy. For the ADD model we found that our notion is sensible only if the number of extra dimension n = 2. We extend our study to the Randall-Sundrum model. Invoking the chirality-flip on the boundaries for SUSY-breaking, the zero-mode gravitino contribution to the Casimir energy does give rise to the double hierarchy. Unfortunately since the higher Kaluza-Klein modes acquire relative mass-shifts at the TeV level, the zero-mode contribution to Casimir energy is overshadowed.

NTIS

Dark Energy; Hierarchies

20070021269 Shapiro and Dupont, LLP, Santa Monica, CA, CA, USA

Ultrahigh Resolution Multi-Color Colocalization of Single Fluorescent Probes

Weiss, S., Inventor; Michalet, X., Inventor; Lacoste, T. D., Inventor; 7 Jan 05; 14 pp.; In English

Contract(s)/Grant(s): DE-AC03-76F00098

Patent Info.: Filed Filed 7 Jan 05; US-Patent-Appl-SN-11-031-496

Report No.(s): PB2007-102512; No Copyright; Avail.: CASI: A03, Hardcopy

A novel optical ruler based on ultrahigh-resolution colocalization of single fluorescent probes is described. Two unique families of fluorophores are used, namely energy-transfer fluorescent beads and semiconductor nanocrystal (NC) quantum dots, that can be excited by a single laser wavelength but emit at different wavelengths. A novel multicolor sample-scanning confocal microscope was constructed which allows one to image each fluorescent light emitter, free of chromatic aberrations, by scanning the sample with nanometer scale steps using a piezo-scanner. The resulting spots are accurately localized by fitting them to the known shape of the excitation point-spread-function of the microscope.

NTIS

Color; Fluorescence; Patents; Excitation

20070021276 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Enhanced Ginger Simulation Code with Harmonic Emission and HDF 5 IO Capabilities

Fawley, W. M.; Sep. 01, 2006; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-05CH11231

Report No.(s): DE2007-898954; LBNL--60155; No Copyright; Avail.: National Technical Information Service (NTIS)

GINGER (1) is an axisymmetric, polychromatic (r-z-t) FEL simulation code originally developed in the mid-1980s to model the performance of single-pass amplifiers. Over the past 15 years GINGER's capabilities have been extended to include more complicated configurations such as undulators with drift spaces, dispersive sections, and vacuum chamber wakefield effects; multi-pass oscillators; and multi-stage harmonic cascades. Its coding base has been tuned to permit running effectively on platforms ranging from desktop PC's to massively parallel processors such as the IBM-SP. Recently, we have made significant changes to GINGER by replacing the original predictor corrector field solver with a new direct implicit algorithm, adding harmonic emission capability, and switching to the HDF5 IO library (2) for output diagnostics. In this paper, we discuss some details regarding these changes and also present simulation results for LCLS SASE emission at =0.15 nm and higher harmonics.

NTIS

Computerized Simulation; Free Electron Lasers; Harmonics; Io

20070021277 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Design of an XUV FEL Driven by the Laser-Plasma Accelerator at the LBNL Loasis Facility
Schroeder, C. B.; Fawley, W. M.; Esarey, E.; Leemans, W. P.; Sep. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898953; LBNL--60154; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a design for a compact FEL source of ultrafast, high-peak flux, soft x-ray pulses employing a high current, GeV-energy electron beam from the existing laser plasma accelerator at the LBNL LOASIS laser facility. The proposed ultra-fast source would be intrinsically temporally synchronized to the drive laser pulse, enabling pump probe studies in ultra-fast science with pulse lengths of tens of fs. Owing both to the high current (10 kA) and reasonable charge/pulse (0.10.5 nC) of the laser-plasma accelerated electron beams, saturated output fluxes are potentially 10(13)--10(14) photons/pulse. We examine devices based both on SASE and high-harmonic generated input seeds to give improved coherence and reduced undulator length, presenting both analytic scalings and numerical simulation results for expected FEL performance. A successful source would result in a new class of compact laser-driven FELs in which a conventional RF accelerator is replaced by a GeV-class laser-plasma accelerator whose active acceleration region is only a few cm in length.
NTIS
Extreme Ultraviolet Radiation; Free Electron Lasers; Laser Plasmas; Plasma Accelerators

20070021278 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Design of an RFQ-Based Neutron Source for Cargo Container Interrogation
Staples, J. W.; Hoff, M. D.; Kwan, J. W.; Li, D.; Ludewigt, A.; Aug. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898948; LBNL--59992; No Copyright; Avail.: National Technical Information Service (NTIS)

An RFQ-based neutron generator system is described that produces pulsed neutrons for the active screening of sea-land cargo containers for the detection of shielded special nuclear materials (SNM). A microwave-driven deuteron source is coupled to an electrostatic LEBT that injects a 40 mA D+ beam into a 6 MeV, 5.1 meter-long 200 MHz RFQ. The RFQ has a unique beam dynamics design and is capable of operating at duty factors of 5 to 10 percent accelerating a D+ time-averaged current of up to 1.5 mA at 5 percent duty factor, including species and transmission loss. The beam is transported through a specially-designed thin window into a 2.5-atmosphere deuterium gas target. A high-frequency dipole magnet is used to scan the beam over the long dimension of the 5 by 35 cm target window. The source will deliver a neutron flux of 1 cdot107 n/(cm2s) to the center of an empty cargo container. Details of the ion source, LEBT, RFQ beam dynamics and gas target design are presented.
NTIS
Cargo; Interrogation; Neutron Sources

20070021283 Stanford Linear Accelerator Center, Stanford, CA, USA
Start-to-End Transport Design and Multi-Particle Tracking for the ILC Electron Source
Zhou, F.; Batygin, Y.; Brachmann, A.; Clendenin, J.; Miller, R. H.; Jan. 01, 2007; 17 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-898870; SLAC-PUB-12240; No Copyright; Avail.: National Technical Information Service (NTIS)

A train of 2-ns micro bunches of longitudinally polarized electrons are generated in a 120-kV DC-gun based injector in the ILC electron source; a bunching system with extremely high bunching efficiency to compress the micro-bunch down to 20 ps FWHM is designed. Complete optics to transport the electron bunch to the entrance of the 5-GeV damping ring injection line is developed. Start-to-end multi-particle tracking through the beamline is performed including the bunching system, pre-acceleration, chicane, 5-GeV superconducting booster linac, spin rotators and energy compressor. It shows that 94% of the electrons from the DC-gun are captured within the damping ring 6-D acceptance - + = 0.09 x y A A m and .E OE .z = (-25MeV)OE(-3.46cm) - at the entrance of th damping ring injection line. The field and alignment errors and orbit correction are analyzed.
NTIS
Electron Sources; Electrons

20070021289 Fermi National Accelerator Lab., Batavia, IL, USA

Measurement of the Top Quark Mass Using the Template Method in the Lepton Plus Jets Channel with In Situ W ---\g j j Calibration at CDF-II

Adelman, J. A.; Arquin, J. F.; Bellettini, G.; Brubaker, E.; Budagov, J.; May 01, 2006; 12 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-899066; FERMILAB-FN-0794-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We report an updated measurement of the top quark mass in the lepton plus jets channel of t1t events from p1p collisions at ps = 1.96 TeV. This measurement uses a dataset with integrated luminosity of 680 pb 1, containing 360 t1t candidates separated into four subsamples. A top quark mass is reconstructed for each event by using energy and momentum constraints on the top quark pair decay products. We also employ the reconstructed mass of hadronic W boson decays W jj to constrain in situ the largest systematic uncertainty of the top quark mass measurement: the jet energy scale. Monte Carlo templates of the reconstructed top quark and W boson mass are produced as a function of the true top quark mass and the jet energy scale. The distribution of reconstructed top quark and W boson mass in the data are compared to the Monte Carlo templates using a likelihood t to obtain: Mtop =173.4 (+)(-) 2.8 GeV/c2.

NTIS

Calibrating; Leptons; Quarks; Templates

20070021299 Stanford Linear Accelerator Center, CA, USA

Application of Kick Minimization to the RTML Front End

Tenenbaum, P.; Jan. 30, 2007; 4 pp.; In English

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

Report No.(s): DE2007-898865; SLAC-TN-07-002; No Copyright; Avail.: Department of Energy Information Bridge

The front end of the ILC RTML constitutes the sections of the RTML which are upstream of the first RF cavity of the first stage bunch compressor: specifically, the SKEW, COLL, TURN, SPIN, and EMIT sections. Although in principle it should be easy to transport the beam through these sections with low emittance growth, since the energy spread of the beam is relatively low, in practice it is difficult because of the large number of betatron wavelengths and strong focusing, especially in the TURN section. We report here on the use of the Kick Minimization Method for limiting the emittance growth in the front end of the RTML. Kick Minimization (KM) is a steering method which balances two optima: minimization of the RMS measured orbit on the BPMs (often called 1:1 steering), and minimization of the RMS corrector strength (1). The simulation program used for these studies is Lucretia (2).

NTIS

Linear Accelerators; Optimization

20070021335 Lawrence Livermore National Lab., Livermore, CA USA

Verification Test Suite for Physics Simulation Codes

Brock, J. S.; Kamm, J. R.; Rider, W. J.; Brandon, S.; Woodward, C.; Dec. 22, 2006; 5 pp.; In English

Report No.(s): DE2007-898449; UCRL-TR-226984; No Copyright; Avail.: Department of Energy Information Bridge

The DOE/NNSA Advanced Simulation & Computing (ASC) Program directs the development, demonstration and deployment of physics simulation codes. The defensible utilization of these codes for high-consequence decisions requires rigorous verification and validation of the simulation software. The physics and engineering codes used at Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratory (SNL) are arguably among the most complex utilized in computational science. Verification represents an important aspect of the development, assessment and application of simulation software for physics and engineering. The purpose of this note is to formally document the existing tri-laboratory suite of verification problems used by LANL, LLNL, and SNL, i.e., the Tri-Lab Verification Test Suite.

NTIS

Computerized Simulation; Program Verification (Computers); Physics

20070021347 Stanford Linear Accelerator Center, CA, USA

Flux-induced Isometry Gauging in Heterotic Strings

Chuang, W. Y.; Gao, P.; Jan. 05, 2007; 11 pp.; In English

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

Report No.(s): DE2007-896927; SLAC-PUB-12266; No Copyright; Avail.: Department of Energy Information Bridge

We study the effect of flux-induced isometry gauging of the scalar manifold in N = 2 heterotic string compactification with

gauge fluxes. We show that a vanishing theorem by Witten provides the protection mechanism. The other ungauged isometries in hyper moduli space could also be protected, depending on the gauge bundle structure. We also discuss the related issue in IIB setting.
NTIS
String Theory; Manifolds (Mathematics); Mathematical Models; Flux (Rate); Gauge Theory

20070021350 Float (Kenneth W.), Braselton, GA, USA
Methods of Forming Oxide Masks with Submicron Openings and Microstructures Formed Thereby
Ayazi, F., Inventor; Abdolvand, R., Inventor; Anaraki, S. P., Inventor; 22 Nov 04; 14 pp.; In English
Contract(s)/Grant(s): DAAH01-01-1-R004
Patent Info.: Filed Filed 22 Nov 04; US-Patent-Appl-SN-10-996-683
Report No.(s): PB2007-102516; No Copyright; Avail.: CASI: A03, Hardcopy

Processing techniques are disclosed for batch fabrication of microstructures comprising an oxide mask on a substrate with submicron openings formed therein, and microstructures having deep-submicron, high aspect-ratio etched trenches, using conventional optical photolithography. Exemplary high aspect-ratio etched-trench microstructures that may be produced include single crystal resonators and sensors.
NTIS
Fabrication; Masks; Microstructure; Openings; Oxides

20070021359 Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA
Lead Radius Experiment PREX
Chaels, R. M.; Oct. 02, 2006; 5 pp.; In English
Contract(s)/Grant(s): AC05-84ER40150
Report No.(s): DE2007-896851; DOE/ER/40150-4175; JLAB-PHY-06-583; No Copyright; Avail.: National Technical Information Service (NTIS)

The proposed PREX experiment at Jefferson Lab will measure the parity-violating electroweak asymmetry in the elastic scattering of polarized electrons at an energy of 850 MeV and a scattering angle of 6 degrees. Since the Z0 boson couples mainly to neutrons, this asymmetry provides a clean measurement of R(sub n) with a projected experimental precision of 1%. In addition to being a fundamental test of nuclear theory, a precise measurement of R(sub n) pins down the density dependence of the symmetry energy of neutron rich nuclear matter which has impacts on neutron star structure, heavy ion collisions, and atomic parity violation experiments.
NTIS
Asymmetry; Elastic Scattering; Neutrons; Radii

20070021360 Pacific Northwest National Lab., Richland, WA, USA
Comparison of LaBr3:Ce and NaI(Tl) Scintillators for Radio-Isotope Identification Devices
Milbrath, B. D.; Coatic, B. J.; Fast, J. E.; Hensley, W. K.; Kouzes, R. T.; Jul. 31, 2006; 26 pp.; In English
Contract(s)/Grant(s): AC06-76RL01830
Report No.(s): DE2007-894484; PNNL-15831; No Copyright; Avail.: National Technical Information Service (NTIS)

Lanthanum halide (LaBr3:Ce) scintillators offer significantly better resolution (\h3 percent at 662 kilo-electron volt (keV)) relative to sodium iodide (NaI(Tl)) and have recently become commercially available in sizes large enough for the hand-held radio-isotope identification device (RIID) market. There are drawbacks to lanthanum halide detectors, however. These include internal radioactivity that contributes to spectral counts and a low-energy response that can cause detector resolution to be lower than that of NaI(Tl) below 100 keV. To study the potential of this new material for RIIDs, we performed a series of measurements comparing a 1.5 1.5 inch LaBr3:Ce detector with an Exploranium GR 135 RIID, which contains a 1.5-2.2 inch NaI(Tl) detector. Measurements were taken for short time frames, as typifies RIID usage. Measurements included examples of naturally occurring radioactive material (NORM), typically found in cargo, and special nuclear materials. Some measurements were noncontact, involving short distances or cargo shielding scenarios. To facilitate direct comparison, spectra from the different detectors were analyzed with the same isotope identification software (ORTEC ScintiVision TM). In general, the LaBr3:Ce detector was able to find more peaks and find them faster than the NaI(Tl) detector. To the same level of significance, the LaBr3:Ce detector was usually two to three times faster. The notable exception was for 40K containing NORM where interfering internal contamination in the LaBr3:Ce detector exist. NaI(Tl) consistently outperformed LaBr3:Ce for this important isotope. LaBr3:Ce currently costs much more than NaI(Tl), though this cost-difference is expected to

diminish (but not completely) with time. As is true of all detectors, LaBr3:Ce will need to be gain-stabilized for RIID applications. This could possibly be done using the internal contaminants themselves. It is the experience of the authors that peak finding software in RIIDs needs to be improved, regardless of the detector material.
NTIS
Bromides; Isotopes; Lanthanum; Scintillation Counters

20070021374 Department of Energy, Washington, DC, USA
Final Technical Report on STTR Project DE-FG02-02ER86145 Pressurized RF Cavities for Muon Ionization Cooling
Johnson, R.; Jan. 13, 2006; 83 pp.; In English
Contract(s)/Grant(s): FG02-02ER86145
Report No.(s): DE2007-886710; DOE/ER86145-F; No Copyright; Avail.: National Technical Information Service (NTIS)

This project was to design and build an RF test cell (TC), which could be operated at 800 MHz, filled with high pressure gases including hydrogen, at temperatures down to that of liquid nitrogen, in strong magnetic fields, in a strong radiation environment, and with interchangeable electrodes, in order to examine the use of high-pressure RF cavities for muon beam cooling.
NTIS
Cavities; Cooling; Ionization; Muons; Radio Frequencies

20070021463 NASA Marshall Space Flight Center, Huntsville, AL, USA, National Space Science and Technology Center, Huntsville, AL, USA
Simulation Study of Magnetic Fields Generated by the Electromagnetic Filamentation Instability
Nishikawa, K.-I.; Ramirez-Ruiz, E.; Hardee, P.; Hededal, C. B.; Mizuno, Y.; Fishman, G. J.; February 02, 2007; 2 pp.; In English; First GLAST Symposium, 5-8 February 2007, Stanford, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): NSF AST-0506719; NASA-INTEG04-0000-0046; HST-AR-10966.01-A; NCC8-256; NSF AST-0506666; Copyright; Avail.: CASI: A01, Hardcopy

We have investigated the effects of plasma instabilities driven by rapid e(sup plus or minus) pair cascades, which arise in the environment of GRB sources as a result of back-scattering of a seed fraction of the original spectrum. The injection of e(sup plus or minus) pairs induces strong streaming motions in the ambient medium. One therefore expects the pair-enriched medium ahead of the forward shock to be strongly sheared on length scales comparable to the radiation front thickness. Using three-dimensional particle-in-cell simulations, we show that plasma instabilities driven by these streaming e(sup plus or minus) pairs are responsible for the excitation of near-equipartition, turbulent magnetic fields. Our results reveal the importance of the electromagnetic filamentation instability in ensuring an effective coupling between e(sup plus or minus) pairs and ions, and may help explain the origin of large upstream fields in GRB shocks.
Author
Magnetic Fields; Simulation; Weibel Instability; Electromagnetism; Electron-Positron Pairs

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ACOUSTICS

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

20070021687 NASA Langley Research Center, Hampton, VA, USA
Analytic Formulation and Numerical Implementation of an Acoustic Pressure Gradient Prediction
Lee, Seongkyu; Brentner, Kenneth S.; Farassat, Fereidoun; May 21, 2007; 20 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): NNL05AD50P; WBS 561581.02.07.07
Report No.(s): AIAA-2007-3710; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021687

The scattering of rotor noise is an area that has received little attention over the years, yet the limited work that has been done has shown that both the directivity and intensity of the acoustic field may be significantly modified by the presence of scattering bodies. One of the inputs needed to compute the scattered acoustic field is the acoustic pressure gradient on a scattering surface. Two new analytical formulations of the acoustic pressure gradient have been developed and implemented in the PSU-WOPWOP rotor noise prediction code. These formulations are presented in this paper. The first formulation is

derived by taking the gradient of Farassat's retarded-time Formulation 1A. Although this formulation is relatively simple, it requires numerical time differentiation of the acoustic integrals. In the second formulation, the time differentiation is taken inside the integrals analytically. The acoustic pressure gradient predicted by these new formulations is validated through comparison with the acoustic pressure gradient determined by a purely numerical approach for two model rotors. The agreement between analytic formulations and numerical method is excellent for both stationary and moving observers case. Author

Acoustics; Aerodynamic Noise; Analysis (Mathematics); Mathematical Models; Noise Prediction; Pressure Gradients; Rotor Aerodynamics; Sound Pressure; Aircraft Noise

20070021690 NASA Langley Research Center, Hampton, VA, USA

Noise Spectra and Directivity For a Scale-Model Landing Gear

Humphreys, William M., Jr.; Brooks, Thomas F.; May 23, 2007; 22 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.18.02

Report No.(s): AIAA 2007-3458; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021690

An extensive experimental study has been conducted to acquire detailed noise spectra and directivity data for a high-fidelity, 6.3%-scale, Boeing 777 main landing gear. The measurements were conducted in the NASA Langley Quiet Flow Facility using a 41-microphone directional array system positioned at a range of polar and azimuthal observer angles with respect to the model. DAMAS (Deconvolution Approach for the Mapping of Acoustic Sources) array processing as well as straightforward individual microphone processing were employed to compile unique flyover and sideline directivity databases for a range of freestream Mach numbers (0.11 - 0.17) covering typical approach conditions. Comprehensive corrections were applied to the test data to account for shear layer ray path and amplitude variations. This allowed proper beamforming at different measurement orientations, as well as directivity presentation in free-field emission coordinates. Four different configurations of the landing gear were tested: a baseline configuration with and without an attached side door, and a noise reduction concept 'toboggan' truck fairing with and without side door. DAMAS noise source distributions were determined. Spectral analyses demonstrated that individual microphones could establish model spectra. This finding permitted the determination of unique, spatially-detailed directivity contours of spectral band levels over a hemispherical surface. Spectral scaling for the baseline model confirmed that the acoustic intensity scaled with the expected sixth-power of the Mach number. Finally, comparison of spectra and directivity between the baseline gear and the gear with an attached toboggan indicated that the toboggan fairing may be of some value in reducing gear noise over particular frequency ranges.
Author

Noise Spectra; Landing Gear; Spectrum Analysis; Sound Generators; Shear Layers; Frequency Ranges; Boeing 777 Aircraft; Scale Models

20070021691 NASA Langley Research Center, Hampton, VA, USA

Airframe Noise Results from the QTD II Flight Test Program

Elkoby, Ronen; Brusniak, Leon; Stoker, Robert W.; Khorrami, Mehdi R.; Abeysinghe, Amal; Moe, Jefferey W.; May 21, 2007; 18 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08

Report No.(s): AIAA 2007-3457; Copyright; Avail.: CASI: A03, Hardcopy

With continued growth in air travel, sensitivity to community noise intensifies and materializes in the form of increased monitoring, regulations, and restrictions. Accordingly, realization of quieter aircraft is imperative, albeit only achievable with reduction of both engine and airframe components of total aircraft noise. Model-scale airframe noise testing has aided in this pursuit; however, the results are somewhat limited due to lack of fidelity of model hardware, particularly in simulating full-scale landing gear. Moreover, simulation of true in-flight conditions is non-trivial if not infeasible. This paper reports on an investigation of full-scale landing gear noise measured as part of the 2005 Quiet Technology Demonstrator 2 (QTD2) flight test program. Conventional Boeing 777-300ER main landing gear were tested, along with two noise reduction concepts, namely a toboggan fairing and gear alignment with the local flow, both of which were down-selected from various other noise reduction devices evaluated in model-scale testing at Virginia Tech. The full-scale toboggan fairings were designed by Goodrich Aerostructures as add-on devices allowing for complete retraction of the main gear. The baseline-conventional gear, faired gear, and aligned gear were all evaluated with the high-lift system in the retracted position and deployed at various flap settings, all at engine idle power setting. Measurements were taken with flyover community noise microphones and a large

aperture acoustic phased array, yielding far-field spectra, and localized sources (beamform maps). The results were utilized to evaluate qualitatively and quantitatively the merit of each noise reduction concept. Complete similarity between model-scale and full-scale noise reduction levels was not found and requires further investigation. Far-field spectra exhibited no noise reduction for both concepts across all angles and frequencies. Phased array beamform maps show inconclusive evidence of noise reduction at selective frequencies (1500 to 3000 Hz) but are otherwise in general agreement with the far-field spectra results (within measurement uncertainty).
Author
Aerodynamic Noise; Airframes; Boeing 777 Aircraft; Noise Reduction; Noise Pollution; Landing Gear; Flight Tests; Aircraft Noise; Aeroacoustics

20070021693 NASA Langley Research Center, Hampton, VA, USA
Curved Duct Noise Prediction Using the Fast Scattering Code
Dunn, M. H.; Tinetti, Ana F.; Farassat, F.; May 21, 2007; 15 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA 2007-3528; Copyright; Avail.: CASI: A03, Hardcopy

Results of a study to validate the Fast Scattering Code (FSC) as a duct noise predictor, including the effects of curvature, finite impedance on the walls, and uniform background flow, are presented in this paper. Infinite duct theory was used to generate the modal content of the sound propagating within the duct. Liner effects were incorporated via a sound absorbing boundary condition on the scattering surfaces. Simulations for a rectangular duct of constant cross-sectional area have been compared to analytical solutions and experimental data. Comparisons with analytical results indicate that the code can properly calculate a given dominant mode for hardwall surfaces. Simulated acoustic behavior in the presence of lined walls (using hardwall duct modes as incident sound) is consistent with expected trends. Duct curvature was found to enhance weaker modes and reduce pressure amplitude. Agreement between simulated and experimental results for a straight duct with hard walls (no flow) was excellent.
Author
Curvature; Ducts; Noise Prediction; Scattering; Computer Programs

20070021694 NASA Langley Research Center, Hampton, VA, USA
Working With the Wave Equation in Aeroacoustics: The Pleasures of Generalized Functions
Farassat, F.; Brentner, Kenneth S.; Dunn, mark H.; May 21, 2007; 33 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA 2007-3562; Copyright; Avail.: CASI: A03, Hardcopy

The theme of this paper is the applications of generalized function (GF) theory to the wave equation in aeroacoustics. We start with a tutorial on GFs with particular emphasis on viewing functions as continuous linear functionals. We next define operations on GFs. The operation of interest to us in this paper is generalized differentiation. We give many applications of generalized differentiation, particularly for the wave equation. We discuss the use of GFs in finding Green s function and some subtleties that only GF theory can clarify without ambiguities. We show how the knowledge of the Green s function of an operator L in a given domain D can allow us to solve a whole range of problems with operator L for domains situated within D by the imbedding method. We will show how we can use the imbedding method to find the Kirchhoff formulas for stationary and moving surfaces with ease and elegance without the use of the four-dimensional Green s theorem, which is commonly done. Other subjects covered are why the derivatives in conservation laws should be viewed as generalized derivatives and what are the consequences of doing this. In particular we show how we can imbed a problem in a larger domain for the identical differential equation for which the Green s function is known. The primary purpose of this paper is to convince the readers that GF theory is absolutely essential in aeroacoustics because of its powerful operational properties. Furthermore, learning the subject and using it can be fun.
Author
Aeroacoustics; Wave Equations; Functions (Mathematics); Linearity

20070021696 NASA Langley Research Center, Hampton, VA, USA
ANOPP Landing Gear Noise Prediction Comparisons to Model-scale Data
Burley, Casey L.; Brooks, Thomas F.; Humphreys, William M., Jr.; Rawls, John W., Jr.; May 21, 2007; 19 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA-2007-3459; Copyright; Avail.: CASI: A03, Hardcopy

The NASA Aircraft NOise Prediction Program (ANOPP) includes two methods for computing the noise from landing gear: the 'Fink' method and the 'Guo' method. Both methods have been predominately validated and used to predict full-scale landing gear noise. The two methods are compared, and their ability to predict the noise for model-scale landing gear is investigated. Predictions are made using both the Fink and Guo methods and compared to measured acoustic data obtained for a high-fidelity, 6.3%-scale, Boeing 777 main landing gear. A process is developed by which full-scale predictions can be scaled to compare with model-scale data. The measurements were obtained in the NASA Langley Quiet Flow Facility for a range of Mach numbers at a large number of observer polar (flyover) and azimuthal (sideline) observer angles. Spectra and contours of the measured sound pressure levels as a function of polar and azimuthal angle characterize the directivity of landing gear noise. Comparisons of predicted noise spectra and contours from each ANOPP method are made. Both methods predict comparable amplitudes and trends for the flyover locations, but deviate at the sideline locations. Neither method fully captures the measured noise directivity. The availability of these measured data provides the opportunity to further understand and advance noise prediction capabilities, particularly for noise directivity.
Author
Acoustic Properties; Noise Prediction; Noise Spectra; Landing Gear; Noise (Sound); Boeing 777 Aircraft; Sound Pressure

20070021732 NASA Langley Research Center, Hampton, VA, USA, Goodrich (B. F.) Aerospace, Chula Vista, CA, USA
Comparison of Predicted and Measured Attenuation of Turbine Noise from a Static Engine Test
Chien, Eugene W.; Ruiz, Marta; Yu, Jia; Morin, Bruce L.; Cicon, Dennis; Schwieger, Paul S.; Nark, Douglas M.; May 21, 2007; 14 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2007-3533; Copyright; Avail.: CASI: A03, Hardcopy

Aircraft noise has become an increasing concern for commercial airlines. Worldwide demand for quieter aircraft is increasing, making the prediction of engine noise suppression one of the most important fields of research. The Low-Pressure Turbine (LPT) can be an important noise source during the approach condition for commercial aircraft. The National Aeronautics and Space Administration (NASA), Pratt & Whitney (P&W), and Goodrich Aerostructures (Goodrich) conducted a joint program to validate a method for predicting turbine noise attenuation. The method includes noise-source estimation, acoustic treatment impedance prediction, and in-duct noise propagation analysis. Two noise propagation prediction codes, Eversman Finite Element Method (FEM) code [1] and the CDUCT-LaRC [2] code, were used in this study to compare the predicted and the measured turbine noise attenuation from a static engine test. In this paper, the test setup, test configurations and test results are detailed in Section II. A description of the input parameters, including estimated noise modal content (in terms of acoustic potential), and acoustic treatment impedance values are provided in Section III. The prediction-to-test correlation study results are illustrated and discussed in Section IV and V for the FEM and the CDUCT-LaRC codes, respectively, and a summary of the results is presented in Section VI.
Derived from text
Engine Tests; Static Tests; Aircraft Noise; Aeroacoustics; Turbine Engines; Acoustic Attenuation; Nozzle Design

20070021733 NASA Langley Research Center, Hampton, VA, USA
Frequency Domain Modeling of SAW Devices
Wilson, W. C.; Atkinson, G. M.; May 20, 2007; 5 pp.; In English; NSTI Nanotech 2007 - 10th International Conference on Modeling and Simulation of Microsystems, 20-24 May 2007, Santa Clara, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

New SAW sensors for integrated vehicle health monitoring of aerospace vehicles are being investigated. SAW technology is low cost, rugged, lightweight, and extremely low power. However, the lack of design tools for MEMS devices in general, and for Surface Acoustic Wave (SAW) devices specifically, has led to the development of tools that will enable integrated design, modeling, simulation, analysis and automatic layout generation of SAW devices. A frequency domain model has been

created. The model is mainly first order, but it includes second order effects from triple transit echoes. This paper presents the model and results from the model for a SAW delay line device.
Author
Surface Acoustic Wave Devices; Frequency Domain Analysis; Mathematical Models; Microelectromechanical Systems; Sensors; Systems Health Monitoring

20070021735 NASA Langley Research Center, Hampton, VA, USA
Optimization of Acoustic Pressure Measurements for Impedance Eduction
Jones, M. G.; Watson, W. R.; Nark, D. M.; May 21, 2007; 21 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color and black and white illustrations
Report No.(s): AIAA-2007-3531; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021735

As noise constraints become increasingly stringent, there is continued emphasis on the development of improved acoustic liner concepts to reduce the amount of fan noise radiated to communities surrounding airports. As a result, multiple analytical prediction tools and experimental rigs have been developed by industry and academia to support liner evaluation. NASA Langley has also placed considerable effort in this area over the last three decades. More recently, a finite element code (Q3D) based on a quasi-3D implementation of the convected Helmholtz equation has been combined with measured data acquired in the Langley Grazing Incidence Tube (GIT) to reduce liner impedance in the presence of grazing flow. A new Curved Duct Test Rig (CDTR) has also been developed to allow evaluation of liners in the presence of grazing flow and controlled, higher-order modes, with straight and curved waveguides. Upgraded versions of each of these two test rigs are expected to begin operation by early 2008. The Grazing Flow Impedance Tube (GFIT) will replace the GIT, and additional capabilities will be incorporated into the CDTR. The current investigation uses the Q3D finite element code to evaluate some of the key capabilities of these two test rigs. First, the Q3D code is used to evaluate the microphone distribution designed for the GFIT. Liners ranging in length from 51 to 610 mm are investigated to determine whether acceptable impedance eduction can be achieved with microphones placed on the wall opposite the liner. This analysis indicates the best results are achieved for liner lengths of at least 203 mm. Next, the effects of moving this GFIT microphone array to the wall adjacent to the liner are evaluated, and acceptable results are achieved if the microphones are placed off the centerline. Finally, the code is used to investigate potential microphone placements in the CDTR rigid wall adjacent to the wall containing an acoustic liner, to determine if sufficient fidelity can be achieved with 32 microphones available for this purpose. Initial results indicate 32 microphones can provide acceptable measurements to support impedance eduction with this test rig.
Author
Impedance; Optimization; Pressure Measurement; Aeroacoustics; Pipes (Tubes)

20070021800 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
A Leakage Reduction Via Balanced Circuit and Masking Noise Design against the Differential Power Analysis
Shen, Sung-Shiou; Chiu, Jung-Hui; Journal of The Chinese Institute of Engineers, Volume 29, No. 6; October 2006, pp. 1119-1122; In English; See also 20070021790; Copyright; Avail.: Other Sources

In implementing the cryptographic algorithm for a cryptographic system, since not all the side channels can be taken into account, there is always a leakage of information, and the resulting systems is deemed vulnerable to hostile attack. To reduce the leakage a compensation circuit is introduced to combine with the original circuit into a balanced configuration. The reduced leakage signal can be further masked by the addition of a noise source.
Author
Algorithms; Leakage; Noise Generators; Cryptography

20070021820 NASA Langley Research Center, Hampton, VA, USA
Investigation of a Parabolic Iterative Solver for Three-dimensional Configurations
Nark, Douglas M.; Watson, Willie R.; Mani, Ramani; May 21, 2007; 16 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07
Report No.(s): AIAA 2007-3539; Copyright; Avail.: CASI: A03, Hardcopy

A parabolic iterative solution procedure is investigated that seeks to extend the parabolic approximation used within the internal propagation module of the duct noise propagation and radiation code CDUCT-LaRC. The governing convected Helmholtz equation is split into a set of coupled equations governing propagation in the positive and negative directions. The

proposed method utilizes an iterative procedure to solve the coupled equations in an attempt to account for possible reflections from internal bifurcations, impedance discontinuities, and duct terminations. A geometry consistent with the NASA Langley Curved Duct Test Rig is considered and the effects of acoustic treatment and non-anechoic termination are included. Two numerical implementations are studied and preliminary results indicate that improved accuracy in predicted amplitude and phase can be obtained for modes at a cut-off ratio of 1.7. Further predictions for modes at a cut-off ratio of 1.1 show improvement in predicted phase at the expense of increased amplitude error. Possible methods of improvement are suggested based on analytic and numerical analysis. It is hoped that coupling the parabolic iterative approach with less efficient, high fidelity finite element approaches will ultimately provide the capability to perform efficient, higher fidelity acoustic calculations within complex 3-D geometries for impedance eduction and noise propagation and radiation predictions.
Author
Acoustic Properties; Iterative Solution; Noise Propagation; Acoustic Ducts; Three Dimensional Models; Noise Prediction

73
NUCLEAR PHYSICS

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

20070021377 NASA Marshall Space Flight Center, Huntsville, AL, USA
Experimental Evaluation of the Thermal Performance of a Water Shield for a Surface Power Reactor
Pearson, J. Boise; Stewart, Eric T.; Reid, Robert S.; February 12, 2007; 18 pp.; In English; Space Technology and Applications International Forum (STAIF) 2007, 11-15 Feb. 2007, Albuquerque, NN, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021377

A viewgraph presentation on the case the thermal performance of a water shield for lunar surface power reactors is shown. The topics include: 1) Testbed Configuration; 2) Core Heater Placement and Instrumentation; 3) Thermocouple Placement; 4) Core Thermocouple Placement; 5) Outer Tank Thermocouple Placement; 6) Integrated Testbed; 7) Methodology; 8) Experimental Results: Core Temperatures; 9) Experimental Results; Outer Tank Temperatures; 10) CFD Modeling; 11) CFD Model: Anchored to Experimental Results (1-g); 12) CFD MOdel: Prediction for 1/6-g; and 13) CFD Model: Comparison of 1-g to 1/6-g.
CASI
Lunar Surface; Power Reactors; Water; Temperature Measurement; Fission; Test Stands

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20070021241 Lawrence Livermore National Lab., Livermore, CA USA, California Univ., Berkeley, CA, USA
Optical Spectroscopy for the Detection of Ischemic Tissue Injury
Demos, S., Inventor; Fitzgerald, J., Inventor; Troppmann, C., Inventor; Michalopoulou, A., Inventor; 8 Jan 05; 13 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 8 Jan 05; US-Patent-Appl-SN-11-031 936
Report No.(s): PB2007-104246; No Copyright; Avail.: CASI: A03, Hardcopy

An optical method and apparatus is utilized to quantify ischemic tissue and/or organ injury. Such a method and apparatus is non-invasive, non-traumatic, portable, and can make measurements in a matter of seconds. Moreover, such a method and apparatus can be realized through optical fiber probes, making it possible to take measurements of target organs deep within a patient's body. Such a technology provides a means of detecting and quantifying tissue injury in its early stages, before it is clinically apparent and before irreversible damage has occurred.
NTIS
Detection; Injuries; Ischemia; Spectroscopy; Tissues (Biology)

20070021243 Myers Dawes Andras and Sherman, LLP, Irvine, CA, USA

High Speed Spectral Domain Functional Optical Coherence Tomography and Optical Doppler Tomography for in Vivo Blood Flow Dynamics and Tissue Structure

Chen, Z., Inventor; Zhang, J., Inventor; Nelson, J. S., Inventor; 9 Dec 04; 29 pp.; In English

Contract(s)/Grant(s): NIH-WF23281; NIH-RR01192

Patent Info.: Filed Filed 9 Dec 04; US-Patent-Appl-SN-11-009 717

Report No.(s): PB2007-104243; No Copyright; Avail.: CASI: A03, Hardcopy

A method for tomographic imaging comprises the steps of providing a source of at least partially coherent radiation and a frequency-swept laser source through an interferometer; phase modulating the radiation in the interferometer at a modulation frequency for elimination of DC and autocorrelation noises as well as the mirror image; detecting interference fringes of the radiation backscattered from the sample into the interferometer to obtain a spectral signal; transforming the spectral signal of the detected backscattered interference fringes to obtain a time and location dependent signal, including the Doppler shift and variance, at each pixel location in a data window; and generating a tomographic image of the fluid flow in the data window and of the structure of the scanned fluid flow sample in the data window from the time and location dependent signal. The apparatus comprises a system for tomographic imaging operating according to the above method.

NTIS

Blood Flow; Fluid Dynamics; High Speed; Imaging Techniques; In Vivo Methods and Tests; Spectra; Tomography

20070021302 Lawrence Livermore National Lab., Livermore, CA USA

Overview of Tabletop X-Ray Laser Development at the Lawrence Livermore National Laboratory

Dunn, J.; Shlyaptsev, V. N.; Nilsen, J.; Smith, R. F.; Keenan, R.; Oct. 31, 2006; 15 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2007-898465; UCRL-PROC-225933; No Copyright; Avail.: Department of Energy Information Bridge

It is almost a decade since the first tabletop x-ray laser experiments were implemented at the Lawrence Livermore National Laboratory (LLNL). The decision to pursue the picosecond-driven schemes at LLNL was largely based around the early demonstration of the tabletop Ne-like Ti x-ray laser at the Max Born Institute (MBI) as well as the established robustness of collisional excitation schemes. These picosecond x-ray lasers have been a strong growth area for x-ray laser research. Rapid progress in source development and characterization has achieved ultrahigh peak brightness rivaling the previous activities on the larger facilities. Various picosecond soft-x-ray based applications have benefited from the increased repetition rates. We will describe the activities at LLNL in this area.

NTIS

X Ray Lasers; Excitation; Characterization

20070021411 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Temperature-dependent Refractive Index of Silicon and Germanium

Frey, Bradley J.; Leviton, Douglas B.; Madison, Timothy J.; [2006]; 10 pp.; In English; SPIE Astronomical Telescopes and Instruments Conference, 24-31 May 2006, Orlando, FL, USA; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070021411

Silicon and germanium are perhaps the two most well-understood semiconductor materials in the context of solid state device technologies and more recently micromachining and nanotechnology. Meanwhile, these two materials are also important in the field of infrared lens design. Optical instruments designed for the wavelength range where these two materials are transmissive achieve best performance when cooled to cryogenic temperatures to enhance signal from the scene over instrument background radiation. In order to enable high quality lens designs using silicon and germanium at cryogenic temperatures, we have measured the absolute refractive index of multiple prisms of these two materials using the Cryogenic, High-Accuracy Refraction Measuring System (CHARMS) at NASA's Goddard Space Flight Center, as a function of both wavelength and temperature. For silicon, we report absolute refractive index and thermo-optic coefficient (dn/dT) at temperatures ranging from 20 to 300 K at wavelengths from 1.1 to 5.6 pin, while for germanium, we cover temperatures ranging from 20 to 300 K and wavelengths from 1.9 to 5.5 microns. We compare our measurements with others in the literature and provide temperature-dependent Sellmeier coefficients based on our data to allow accurate interpolation of index to other wavelengths and temperatures. Citing the wide variety of values for the refractive indices of these two materials found in the literature, we reiterate the importance of measuring the refractive index of a sample from the same batch of raw material from which final optical components are cut when absolute accuracy greater than k5 x 10' is desired.

Author

Temperature Dependence; Refractivity; Germanium; Silicon; Infrared Radiation; Cryogenic Temperature; Semiconductors (Materials); Micromachining

20070021682 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Performance of Dispersed Fringe Sensor in the Presence of Segmented Mirror Aberrations: Modeling and Simulation

Shi, Fang; Basinger, Scott A.; Redding, David C.; May 24, 2006; 12 pp.; In English; SPIE Astronomical Telescopes 2006: Space Telescopes and Instrumentation I: Optical, Infrared, and Millimeter, 24-31 May 2006, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39902

Dispersed Fringe Sensing (DFS) is an efficient and robust method for coarse phasing of a segmented primary mirror such as the James Webb Space Telescope (JWST). In this paper, modeling and simulations are used to study the effect of segmented mirror aberrations on the fringe image, DFS signals and DFS detection accuracy. The study has shown due to the pixilation spatial filter effect from DFS signal extraction the effect of wavefront error is reduced and DFS algorithm will be more robust against wavefront aberration by using multi-trace DFS approach. We also studied the JWST Dispersed Hartmann Sensor (DHS) performance in presence of wavefront aberrations caused by the gravity sag and we use the scaled gravity sag to explore the JWST DHS performance relationship with the level of the wavefront aberration. This also includes the effect from line-of-sight jitter.

Author

James Webb Space Telescope; Aberration; Segmented Mirrors; Vibration; Line of Sight; Extraction; Detection

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*.

20070021364 Paten (T. A. Lober) Services, Concord, MA, USA, Harvard Coll. Observatory, Cambridge, MA, USA, Agilent Technologies, Inc., Palo Alto, CA, USA

High-Precision Feedback Control for Ion Sculpting of Solid State Features

Golovchenko, J. A., Inventor; Stein, D. M., Inventor; Yefchak, G. E., Inventor; Pittaro, R. J., Inventor; Flory, C., Inventor; 7 Oct 04; 55 pp.; In English

Contract(s)/Grant(s): NSF-DMR-0073590; DARPA-F49620-01-1-0467

Patent Info.: Filed Filed 7 Oct 04; US-Patent-Appl-SN-10-960 176

Report No.(s): PB2007-102548; No Copyright; Avail.: CASI: A04, Hardcopy

The invention provides a method for controlled fabrication of a solid state structural feature. In the method, a solid state structure is provided and the structure is exposed to an ion beam, under fabrication process conditions for producing the structural feature. A physical detection species is directed toward a designated structure location, and the rate at which the detection species proceeds from the designated structure location is measured. Detection species rate measurements are fit to a mathematical model, and the fabrication process conditions are controlled, based on the fitted detection species rate measurements, to fabricate the structural feature.

NTIS

Fabrication; Feedback Control; Solid State

20070021371 Fermi National Accelerator Lab., Batavia, IL, USA, Royal Holloway and Bedford New Coll., Egham, UK, London Univ., UK, Stanford Linear Accelerator Center, CA, USA

Simulation of the ILC Collimation System using BDSIM, MARS15 and STRUCT

Carter, J.; Agapov, I.; Blair, G. A.; Deacon, L.; Drozhdin, A. I.; Jul. 12, 2006; 4 pp.; In English

Contract(s)/Grant(s): AC02-76CH03000

Report No.(s): DE2007-892356; FERMILAB-CONF-06-219-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The simulation codes BDSIM (1), MARS15 (2) and STRUCT (3) are used to simulate in detail the collimation section of the International Linear Collider (ILC) (4). A comparative study of the collimation system performance for the 250 GeV machine is conducted, and the key radiation loads are calculated. Results for the latest ILC designs are presented together with their implications for future design iterations.

NTIS

Collimation; Particle Accelerators; Simulation

20070021372 UT-Battelle, LLC, Oak Ridge, TN, USA
Tungsten Alloy High Temperature Tool Materials
Ohriner, E. K., Inventor; David, S. A., Inventor; 15 Dec 03; 4 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 15 Dec 03; US-Patent-Appl-SN-10-735 974
Report No.(s): PB2007-102568; No Copyright; Avail.: CASI: A01, Hardcopy

A tungsten alloy tool includes, in weight %, 3% to 27% rhenium, 0.03% to 3% hafnium, and 0.002% to 0.2% carbon, balance tungsten.

NTIS
High Temperature; Refractory Materials; Tungsten Alloys

20070021729 Evan Law Group, LLC, Chicago, IL, USA
Multi-Functional Plasmon-Resonant Contrast Agents for Optical Coherence Tomography
Boppart, S. A., Inventor; Wei, A., Inventor; 4 Aug. 2005; 19 pp.; In English
Contract(s)/Grant(s): NAS2-02057
Patent Info.: Filed Filed 8 Jan 04; US-Patent-Appl-SN-10-753 972
Report No.(s): PB2007-104244; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021729

A method of forming an image of a sample, comprising: forming an image of a mixture, by exposing the mixture to electromagnetic radiation; wherein the mixture comprises the sample and plasmon-resonant nanoparticles, and wherein the electromagnetic radiation is in the frequency range of infra-red to ultraviolet light.

Official Gazette of the U.S. Patent and Trademark Office
Plasmons; Tomography; Coherence

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20070021396 NASA Goddard Space Flight Center, Greenbelt, MD, USA
PBMA Pause and Learn Video Nuggets Transcript
Rogers, Ed; [2006]; 3 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021396

This document is a transcript for a video about a practice practiced at Goddard Space Flight Center called Pause and Learn (PaL). The PaL process is intended to, first of all, help the team learn. So, the team that was involved in the activity, the group that actually did the work, that handled the review, or ran the tests, or developed the piece of equipment, they sit down and actually say, 'What did we learn from this exercise?' The idea is to create a learning environment at various key milestones in the execution of a process, rather than wait until the end of the given process, be it a launch or a mission.

CASI
Teams; Projects; Learning; Project Planning

20070021529 NASA Johnson Space Center, Houston, TX, USA
CM Process Improvement and the International Space Station Program (ISSP)
Stephenson, Ginny; July 02, 2007; 10 pp.; In English; Configuration Management Conference 2007, 2-4 July 2007, Hamburg, Germany; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021529

This viewgraph presentation reviews the Configuration Management (CM) process improvements planned and undertaken for the International Space Station Program (ISSP). It reviews the 2004 findings and recommendations and the progress towards their implementation.

CASI
Configuration Management; International Space Station; Space Station Modules; Qualifications

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*.

20070021804 National Inst. of Information and Communications Technology, Japan

Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4

December 2006; ISSN 1349-3191; 138 pp.; In Japanese; See also 20070021805 - 20070021818; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Subjects covered include: Researches on New Generation Mobile in NICT; Broadband Wireless Access System for Next Generation Seamless Mobile Communication; Advanced Wireless Packet Cellular System using Multi User OFDM-SDMA/Inter-BTS; Cooperation with 1.3 Gbit/s Downlink Capacity; Software Defined Radio; Technology and Devices for 4th Generation Mobile Communication Terminals using Software Defined Radio; Mobile Ethernet and its Security toward Ubiquitous Network; Secure Service Framework on Mobile Ethernet; Scalable Mobile Ethernet and Fast Vertical Handover; Empirical Evaluation of Real-Time Vertical Handover for Beyond 3G Wireless Network; Overview of Research and Development on Seamless Networking Technologies; Basic Access Signaling and Context-Aware Seamless Networking; Context-Aware Service Mobility and Smart Space; Mobile Ring Network for Large-Scale Mobile Internet; and A Study of a Naming Scheme for User-Centric Environment.

Derived from text

Telecommunication; Real Time Operation; Internets; Downlinking; Broadband

20070021805 National Inst. of Information and Communications Technology, Japan

Software Defined Radio

Harada, Hiroshi; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 29-36; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

In this paper, the configuration of the newly developed small-size software radio terminal for new generation seamless mobile communication systems is introduced. The terminal consists of a common platform that includes an original FPGA board, a CPU board, and RF boards with open interface. Users have only to prepare software for FPGAs and CPUs that can configure mobile communication systems that users hope to operate. In addition, the common platform has a control software that can change several communication systems as users like by using several algorithms based on certain conditions. On the common platform, the software of WCDMA and IEEE802.lla that realizes physical layer, data-link layer, and network (TCP/IP) layer has been established.

Author

Mobile Communication Systems; Radio Communication; Software Engineering; Field-Programmable Gate Arrays

20070021806 National Inst. of Information and Communications Technology, Japan

Researches on New Generation Mobile in NICT

Adachi, Fumiyuki; Ogawa, Hiroyo; Miura, Ryu; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 1-6; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

R&D on new generation mobile network has attracted a growing interest over the world on the background of rapid market growth for 2nd and 3rd - generation cellular networks and wireless LANs/MANs. The National Institute of Information and Communications Technology (NICT) started the New Generation Mobile Network Project in April 2002, and has developed fundamental technologies to enable seamless and secure integration of various wireless access networks such as existing cellular networks, wireless LANs, home networks, intelligent transport systems (ITS), the Beyond-3G (B3G) cellular and other wireless access systems. This paper overviews the achievements of the project focusing on network and access technologies.

Author

Mobile Communication Systems; Computer Networks; Research and Development; Technology Utilization

20070021807 National Inst. of Information and Communications Technology, Japan

Broadband Wireless Access System for Next Generation Seamless Mobile Communication

Harada, Hiroshi; Funada, Ryuhei; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 7-19; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

In this paper, we propose a new generation mobile communication system that can realize over 100 Mbps carrier bit rate

under high mobility environment and can access IP network easily. The new system is based on dynamic parameter controlled orthogonal frequency and time division multiple access (DPC-OF/TDMA) in which users share 'slots' that use certain number of subcarriers and certain time. To access the slots, mobile stations use a packet-reservation-based protocol: packet reservation dynamic time-slotted multiple access (PR-DSMA). In addition, to avoid co-channel interference from adjacent cells and increase frequency utilization efficiency, we use an adaptive modulation scheme that is based on an interference detection algorithm. In this paper, we mention the concept and the basic transmission performance of the proposed system.
Author
Broadband; Mobile Communication Systems; Wireless Communication; Time Division Multiple Access; Frequency Division Multiple Access

20070021808 National Inst. of Information and Communications Technology, Japan
Scalable Mobile Ethernet and Fast Vertical Handover
Ishizu, Kentaro; Kuroda, Masahiro; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 65-74; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

The 3G cellular system has infiltrated into market and the next generation wireless system called Beyond 3G is discussed at ITU-R. The Beyond 3G system integrates various wireless accesses including 3G and wireless LANs and provides an all IP wireless solution to offer services taking advantage of each wireless communication of the system. Current approach to integrate wireless systems is to localize wireless dependent functions and to integrate into all IP network using IP technologies. We propose a scalable Mobile Ethernet architecture for the all IP integrated network using MAC layer technologies, such as Provider Bridge, RPR, and IEEE802, and the fast vertical handover introducing common radio resource and signaling managements. We discuss network segmentation with mobility management and multicast management for the scalability of the Mobile Ethernet by reducing network traffic. We evaluate the network from the viewpoint of scalability. In the evaluation we understand that the design that the gateway switch of a segment forwarding MAC frames as an anchor point becomes effective in case that the gateway switch of each segment cannot hold entries for all mobile terminals. We also evaluate the vertical handover comparing to Mobile IPv6 fast handover, and understand that the fast vertical handover consumes less network resources and flexible in having an anchor point for handover.
Author
Ethernet; Wireless Communication; Mobile Communication Systems; Machine Learning

20070021812 National Inst. of Information and Communications Technology, Japan
Advanced Wireless Packet Cellular System using Multi User OFDM-SDMA/Inter-BTS Cooperation with 1.3 Gbit/s Downlink Capacity
Kawazawa, Toshio; Inoue, Takashi; Fujishima, Kenzaburo; Taira, Masanori; Yoshida, Makoto; Akasegawa, Akihiko; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 20-27; In English; See also 20070021804; Copyright; Avail.: Other Sources

To realize the 4th generation mobile communications system, we have been developing elements of advanced wireless signal processing technologies for space, time and frequency domain, that are MU-OFDM (Multi User-Orthogonal Frequency Division Multiplexing) technology, Cryogenic RF front-end technology, SDMA and space-time inter BTS (Base Transmission Station) scheduling using multi beamforming technology. This report proposes MU-OFDM-SDMA/Inter BTS cooperation packet cellular system with integration of the technology elements. We also report that the downlink transmission performance and spectral efficiency by simulation using the elements technology results achieved 1.3 [Gbit/s] and 18 [bit/s/Ht/cell], respectively.
Author
Downlinking; Mobile Communication Systems; Packets (Communication); Frequency Division Multiplexing; Orthogonal Functions; Wireless Communication

20070021813 National Inst. of Information and Communications Technology, Japan
Secure Service Framework on Mobile Ethernet
Inoue, Daisuke; Kuroda, Masahiro; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 55-64; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

Diverse and highly-developed mobile services will arise on next generation wireless networks. Users on the networks will have to securely manage a lot of credentials in their mobile terminals. It is necessary to provide a secure and easy-to-use framework for managing credentials independent of mobile terminals. In the New Generation Mobile Network Project, we

have designed a secure service framework that separates credentials from a mobile terminal and stores them into a tamper resistant smartcard. This paper describes an overview of the secure service framework and its prototype implementation.
Author
Ethernet; Mobile Communication Systems; General Overviews; Computer Networks; Wireless Communication

20070021814 National Inst. of Information and Communications Technology, Japan
Basic Access Signaling and Context-Aware Seamless Networking
Inoue, Masugi; Hasegawa, Mikio; Murakami, Homare; Mahmud, Khaled; Morikawa, Hiroyuki; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 93-100; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

A variety of wireless access technologies such as cellular system, wireless LAN, Bluetooth, and WiMAX emerged or are emerging. Appliances that can be connected to the network have also been diversified from telephone terminals to consumer electronics and game machines. Such diversified heterogeneous networks and appliances would characterize new-generation mobile network era, where it would be needed to advance telecommunication services and to architecture where an out-of-band signaling network separated from other networks for data transfer is established and have studied the feasibility and enhancement of the concept. This papaer describes the characteristics, deployment scenarios, experimental systems of the MIRAI architecture.
Author
Wireless Communication; Computer Networks; Technologies; Architecture (Computers); Signal Transmission

20070021817 National Inst. of Information and Communications Technology, Japan
Overview of Research and Development on Seamless Networking Technologies
Morikawaw, Hiroyuki; Inoue, Masugi; Hasegawa, Mikio; Murakami, Homare; Mahmud, Khaled; Ryoki, Nobuo; Pyo, Chang Woo; Tran, Ha Nguyen; Minami, Masateru; Teraoka, Fumio; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 83-91; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

National institute of Information and Communications Technology of Japan (NICT) completed a project on new-generation mobile communications networks for beyond 3G or 4G in March 2006. This paper presents our vision of new-generation mobile communications networks from networking perspective and their capabilities to be offered: fast and large-capacity handover, cross-network handover, cross-device handover, and interworking between real and cyber worlds. Then, Metro Mobile Ring network technology for the first capability, MIRAI architecture for the second and third capabilities, and other works are presented.
Author
Mobile Communication Systems; Information Systems; Communication Networks

20070021818 National Inst. of Information and Communications Technology, Japan
Technology and Devices for 4th Generation Mobile Communication Terminals using Software Defined Radio
Sunaga, Terumi; Terashima, Yoshiaki; Kiyohara, Ryozo; Suematsu, Noriharu; Itakura, Tetsuro; Hirose,Yoshio; Review of the National Institute of Information and Communications Technology: Vol. 52 No. 4; December 2006, pp. 37-44; In Japanese; See also 20070021804; Copyright; Avail.: Other Sources

In the future mobile communication, it is expected that various wireless communication systems will coexist. Therefore mobile terminal must have multi-band/multi-mode features. Software defined radio (SDR) is one of the technique achieve these functions. In this paper, we describe the development results of device and element technology for SDR.
Author
Wireless Communication; Mobile Communication Systems; Technology Utilization; Radio Communication; Software Engineering

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*.

20070021416 NASA Marshall Space Flight Center, Huntsville, AL, USA, Colorado Univ., Boulder, CO, USA
Space Tow Solar Sails: Design Study Exploring Performance and Operational Issues
Montgomery, Edward E., IV; Greschik, Gyula; [2007]; 16 pp.; In English; 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 April 2007, Honolulu, HI, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2007-1826; Copyright; Avail.: CASI: A03, Hardcopy

The reflecting surface of a space tow photon sail consists of separate panels integrated as floors in a filament truss column. Light pressure on each panel combines with the rest along the column, contributing to the resultant thrust on the spacecraft at the rear end. By its modularity, small panel sizes, and tensile skeleton, this concept effectively overcomes scalability-related bottlenecks in solar sail engineering, enabling truly incremental and cost- and risk-effective development. The present paper probes the limits of space tow performance and considers engineering and mission challenges by taking a practical look at an example design. Via incisions, the panel film quadrants are strean~linedto work according to the structurally optimal striped paradigm. The booms have a novel 'plicate' architecture whereby the sail film itself forms the member walls via local corrugation, with reinforcing filters nested in the folds. The filament truss has no diagonals -only longerons - because the in-plane panel thrust components, combined, would otherwise de-stabilize attitude. Via these design solutions effective gross surface densities for a 10,000 sq m sail nearly at the material limit of 1.0 g/sq m (the net areal density of the thinnest, 0.3 micron. Mylar film commercially available) are easily approached. The dominant vibration period is within a couple of hours-high for a 'classic' application but low considering the several miles' length and ethereal nature of the tow. Also discussed is the mechanics of na~igation via spacecraft position control and proposed is for passive spin stabilization a non-planar panel geometry coupled with spacecraft suspension with a four bar linkage geometry. Some practicalities of deployment are also touched upon.
Author
Solar Sails; Reflection; Reliability Engineering; Performance Prediction; Panels; Photons; Attitude (Inclination); Modularity; Mylar (Trademark)

20070021479 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Dryden Overview
Miller, Chris J.; May 11, 2007; 16 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021479

A general overview of NASA Dryden Flight Research Center is presented. The topics include: 1) Personal Background; 2) NASA Background; 3) Dryden History; and 4) Recent and Current Dryden Projects.
CASI
General Overviews; NASA Space Programs; Manned Space Flight; Space Missions

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ASTRONOMY

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

20070021222 Ceskoslovenska Akademie Ved, Ondrejov, Czechoslovakia
LP 400-22, A Very Low Mass and High-Velocity White Dwarf
Kawka, Adela; Vennes, Stephane; Oswalt, Terry D.; Smith, J. Allyn; Silvestri, Nicole M.; The Astrophysical Journal; June 2006; Volume 643, pp. L123-L126; In English
Contract(s)/Grant(s): NNG05GE33G; NNG05GL42G; NGT-51086; NST-200415; NSF AST-02-06115; NSF AST-02-05875; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/505143

We report the identification of LP 400-22 (WD 2234+222) as a very low mass and high-velocity white dwarf. The

ultraviolet GALEX and optical photometric colors and a spectral line analysis of LP 400-22 show this star to have an effective temperature of 11,080+/-140 K and a surface gravity of log g = 6.32 +/-0.08. Therefore, this is a helium-core white dwarf with a mass of 0.17 M,. The tangential velocity of this white dwarf is 414+/-43 km/s, making it one of the fastest moving white dwarfs known. We discuss probable evolutionary scenarios for this remarkable object.
Author
White Dwarf Stars; Gravitation; Photometry; Helium; Line Spectra

20070021232 Ceskoslovenska Akademie Ved, Ondrejov, Czechoslovakia
White Dwarfs in the GALEX Survey
Kawka, Adela; Vennes, Stephane; Feb. 15, 2007; 4 pp.; In English; Original contains black and white illustrations
Report No.(s): astro-ph/0702420v1; Copyright; Avail.: Other Sources
ONLINE: http://arxiv.org/abs/astro-ph/0702420

We have cross-correlated the 2dF QSO Redshift Survey (2QZ) white dwarf catalog with the GALEX 2nd Data Release and the Sloan Digital Sky Survey (SDSS) data release 5 to obtain ultraviolet photometry (FUV, NUV) for approximately 700 objects and optical photometry (ugriz) for approximately 800 objects. We have compared the optical-ultraviolet colors to synthetic white dwarf colors to obtain temperature estimates for approximately 250 of these objects. These white dwarfs have effective temperatures ranging from 10 000 K (cooling age of about 1Gyr) up to about 40000 K (cooling age of about 3 Myrs), with a few that have even higher temperatures. We found that to distinguish white dwarfs from other stellar luminosity classes both optical and ultraviolet colors are necessary, in particular for the hotter objects where there is contamination from B and 0 main-sequence stars. Using this sample we build a luminosity function for the DA white dwarfs with Mv \h 12 mag.
Author
White Dwarf Stars; Red Shift; Main Sequence Stars; Stellar Luminosity; Digital Data; Optical Measurement; Cross Correlation; Sky Surveys (Astronomy)

20070021303 Lawrence Livermore National Lab., Livermore, CA USA
Gemini Planet Imager
Macintosh, B.; May 15, 2006; 14 pp.; In English
Report No.(s): DE2007-898473; UCRL-CONF-221360; No Copyright; Avail.: National Technical Information Service (NTIS)

The next major frontier in the study of extrasolar planets is direct imaging detection of the planets themselves. With high-order adaptive optics, careful system design, and advanced coronagraphy, it is possible for an AO system on a 8-m class telescope to achieve contrast levels of 10-7 to 10-8, sufficient to detect warm self-luminous Jovian planets in the solar neighborhood. Such direct detection is sensitive to planets inaccessible to current radial-velocity surveys and allows spectral characterization of the planets, shedding light on planet formation and the structure of other solar systems. We have begun the construction of such a system for the Gemini Observatory. Dubbed the Gemini Planet Imager (GPI), this instrument should be deployed in 2010 on the Gemini South telescope. It combines a 2000-actuator MEMS-based AO system, an apodized-pupil Lyot coronagraph, a precision infrared interferometer for real-time wavefront calibration at the nanometer level, and a infrared integral field spectrograph for detection and characterization of the target planets. GPI will be able to achieve Strehl ratios \g 0.9 at 1.65 microns and to observe a broad sample of science targets with I band magnitudes less than 8. In addition to planet detection, GPI will also be capable of polarimetric imaging of circumstellar dust disks, studies of evolved stars, and high-Strehl imaging spectroscopy of bright targets. We present here an overview of the GPI instrument design, an error budget highlighting key technological challenges, and models of the system performance.
NTIS
Imaging Techniques; Images; Gas Giant Planets; Extrasolar Planets

20070021361 National Health and Environmental Effects Research Lab., Duluth, MN, USA
PRIMENet. Ultraviolet Radiation/Amphibian Populations Research Planning Workshop, February 1-3,1999
Trenham, P. C.; Diamond, S. A.; Detenbeck, N. E.; Ankley, G. T.; Jun. 1999; 36 pp.; In English
Report No.(s): PB2007-106210; EPA/600/R-99/066; No Copyright; Avail.: CASI: A03, Hardcopy

The PRIMENet (Parks Research and Intensive Monitoring of Ecosystems Network) is a system of 14 national parks, established as index sites for long-term monitoring of environmental quality and use as outdoor laboratories. From February 1-3, 1999, biologists from various Federal agencies and academia gathered in Duluth, MN to discuss research to be conducted at PRIMENet sites under a new interagency agreement (IAG) between the U.S. Environmental Protection Agency and the U.S.

National Park Service. Pursuant to the recommendations of the IAG, participants were asked to formulate a research program that would address issues of amphibian malformations and declines and the potential role of ultraviolet radiation. Prior to this meeting biologists from EPA's Mid-Continent Ecology Division compiled data on amphibian populations and park characteristics, and determined that Acadia, Smoky Mountains, Rocky Mountains, Glacier, Sequoia-Kings Canyon, and Olympic National Parks were the feasible sites for this research. Plenary session presentations and follow-up discussions elaborated the key issues to be addressed under this IAG, and representatives from each of the 6 candidate sites further described the relevant characteristics of their parks. Hypotheses to be addressed by this research fell under two broad headings: (1) the importance of metapopulation dynamics for amphibian surveys and monitoring; and (2) the potential effects of ultraviolet radiation on amphibians.
NTIS
Populations; Ultraviolet Radiation

20070021394 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The X-ray Emitting Components towards l = 111 deg: The Local Hot Bubble and Beyond
Kuntz, K. D.; Snowden, S. L.; [2006]; 11 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We have obtained an XMM-Newton spectrum of the diffuse X-ray emission towards (l, b) = (111.14,1.11), a line of sight with a relatively simple distribution of absorbing clouds; \g 9 x 10(exp 19)/sq cm at R\g170 pc, a 6 x 10(exp 21)/sq cm molecular cloud at 2.5-3.3 kpc, and a total column of 1.2 x 10(exp 22)/sq cm. We find that the analysis of the XMM-Newton spectrum in conjunction with the RASS spectral energy distribution for the same direction requires three thermal components to be well fit: a 'standard' Local Hot Bubble component with kT = 0.089, a component beyond the molecular cloud with kT = 0.59, and a component before the molecular cloud with kT = 0.21. The strength of the O VII 0.56 keV line from the Local Hot Bubble, 2.1+/-0.7 photons/sq cm/s/sr, is consistent with other recent measures. The 0.21 keV component has an emission measure of 0.0022+/-0.0006 pc and is not localized save as diffuse emission within the Galactic plane; it is the best candidate for a pervasive hot medium. The spatial separation of the approx. 0.2 keV component from the approx. 0.6 keV component suggests that the spectral decompositions of the emission from late-type spiral disks found in the literature do represent real temperature components rather than reflecting more complex temperature distributions.
Author
X Rays; Molecular Clouds; Spectral Energy Distribution; Spectral Emission; Decomposition

20070021409 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Capabilities of the GLAST Large Area Telescope for Blazar Variability Studies
McEnery, Julie; [2006]; 1 pp.; In English; Challenges of Relativistic Jets, 25 Jun. - 1 Jul. 2006, Cracow, Poland; Copyright; Avail.: Other Sources; Abstract Only

One of the more notable features of the Large Area Telescope (LAT) on GLAST is its extremely large field of view, which covers more than 20% of the sky at any instant. In survey mode the LAT will be rocked about the orbital plane to provide coverage of the entire gamma-ray sky above 20 MeV every three hours. This will be the default observing mode for the first year of operations and is likely to be the dominant observing mode throughout the rest of the mission. Thus the LAT will provide long, evenly sampled, gamma-ray lightcurves for a large number of sources. In this talk we describe the nature and quality of the data that will be provided by the LAT and use simulated lightcurves to illustrate some of the scientific questions that can be addressed with LAT observations.
Author
Telescopes; Gamma Rays; Field of View; Light Curve; Blazars

20070021410 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Prompt Emission: Recent Results
Barthelmy, Scott; [2005]; 1 pp.; In English; The Multicolored Landscape of Compact Objects and their Explosive Origins, 11-24 Jun. 2006, Cefalu, Italy; No Copyright; Avail.: Other Sources; Abstract Only

We will present a summary of prompt emission from GRBs and recent results of the prompt emission from INTEGRAL, HETE, and Swift.
Author
Gamma Ray Bursts; Swift Observatory; Emission

20070021526 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Experimental Verification of Dispersed Fringe Sensing as a Segment Phasing Technique using the Keck Telescope
Shi, Fang; Ohara, Catherine M.; Chanan, Gary; Troy, Mitch; Redding, Dave C.; June 21, 2004; 13 pp.; In English; Astronomical Telescopes and Instrumentations, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations
Contract(s)/Grant(s): NSF AST-98-76783; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39994

Dispersed Fringe Sensing (DFS) is an efficient and robust method for coarse phasing of segmented primary mirrors (from a quarter of a wavelength up to the depth of focus of a single segment, typically several tens of microns). Unlike phasing techniques currently used for ground-based segmented telescopes; this makes it particularly well-suited to the phasing of space-borne segmented telescopes, such as the James Webb Space Telescopes (JWST). In this work we validate DFS by using it to measure the pistons of the segments of one of the Keck telescopes; the results agree with those of the Shack-Hartmann based phasing scheme currently in use at Keck to within 2% over a range of initial piston errors of +/-16 microns.
Author
Segmented Mirrors; Spaceborne Telescopes; Detection; Depth; Infrared Telescopes

20070021668 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Observing NGC 4151 with the Keck Interferometer
Swain, Mark R.; June 21, 2004; 8 pp.; In English; SPIE Astronomical Telescopes and Instrumentation2004, 21 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40008

Observations of the nucleus of NGC 4151 at 2.2 microns using the two 10-meter Keck telescopes as an interferometer show a marginally resolved source less than or equal to 0.1 pc in diameter. These observations are the first measurement of an extragalactic source with an optical/IR interferometer. These observations represent a ten-fold improvement in angular resolution when compared to previous near-infrared measurements of AGN and make it possible to test the subparsecscale, near-infrared emission models of NGC 4151.
Author
Active Galactic Nuclei; Astronomical Interferometry; Scale Models; Infrared Telescopes

20070021674 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Integrated Modeling Approach for the Terrestrial Planet Finder Mission
Levine, Marie; Moore, Gregory; Basinger, Scott A.; Kissil, Andrew; Bloemhof, Eric; Gunter, Steve; June 21, 2004; 12 pp.; In English; Astronomical Telescopes and Instrumentation, 21-25 Jun. 2004, Glasgow, Scotland, UK; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40009

Because of the complexity of the Terrestrial Planet Finder (TPF) design concepts, the project will rely heavily on the use of engineering and science simulations to predict on-orbit performance. Furthermore, current understanding of these missions indicates that the 3m to 8m class optical systems need to be as stable as picometers in wavefront and sub-milli arcsec in pointing. These extremely small requirements impose on the models a level of predictive accuracy heretofore never achieved, especially in the area of microgravity effects, material property accuracy, thermal solution convergence, and all other second order modeling effects typically ignored. New modeling tools and analysis paradigms are developed which emphasize computational accuracy and fully integrated analytical simulations. The process is demonstrated on sample problems using the TPF Coronagraph design concept. The TPF project is also planning a suite of testbeds through which various aspects of the models and simulations will be verified.
Author
Terrestrial Planets; Performance Prediction; Accuracy; Coronagraphs; Convergence; Simulation

20070021751 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
High Resolution Global Topography of Eros from NEAR Imaging and LIDAR Data
Gaskell, Robert W.; Konopliv, A.; Barnouin-Jha, O.; Scheeres, D.; May 23, 2006; 9 pp.; In English; AGU Spring Meeting, 23-26 May 2006, Baltimore, MD, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39901

Principal Data Products: Ensemble of L-maps from SPC, Spacecraft state, Asteroid pole and rotation. Secondary Products:

Global topography model, inertia tensor, gravity. Composite high resolution topography. Three dimensional image maps. Derived from text

High Resolution; Topography; Imaging Techniques; Optical Radar; Gravitation; Asteroids; Eros Asteroid

20070021784 Michigan Univ., MI, USA

Applied Astronomy: An Optical Survey for Space Debris at GEO

Seitzer, Patrick; Barker, Edwin S.; Abercromby, K.; Rodriquez, H.; May 09, 2007; 24 pp.; In English; 38th Annual Div. of Dynamical Astronomy meeting, 5-9 May 2007, Ann Arbor, MI, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A viewgraph is presented to discuss space debris at Geosynchronous Earth Orbit (GEO). The topics include: 1) Syncom1 launched February 14, 1963 Failed on orbit insertion 1st piece of GEO debris!; 2) Example of recent GEO payload: XM-2 Rock satellite for direct broadcast radio; 3) MODEST Michigan Orbital DEbrisSurvey Telescope the telescope formerly known as the Curtis-Schmidt; 4) GEO Debris Survey; 5) Examples of Detections; 6) Brightness Variations Common; 7) Observed Angular Rates; 8) Two Populations at GEO; 9) High Area-to-Mass Ratio Material (A/M); 10) Examples of MLI; 11) Examples of MLI Release in LEO; 12) Liou & Weaver (2005) models; 13) ESA 1-m Telescope Survey; 14) Two Telescopes March 2007 Survey and Follow-up; 15) Final Eccentricity; and 16) How control Space Debris?

CASI

Geosynchronous Orbits; Space Debris; Surveys; Astronomy; Optics

90
ASTROPHYSICS

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

20070021288 Stanford Linear Accelerator Center, Stanford, CA, USA

What Einstein Did Not Know

Perl, M. L.; Feb. 02, 2007; 23 pp.; In English

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

Report No.(s): DE2007-898869; SLAC-PUB-12272; No Copyright; Avail.: Department of Energy Information Bridge

This public lecture is about 100 years of research on elementary particles and fundamental forces, beginning with the identification of the electron about 1900 and extending to the astonishing discovery of Dark Matter in the late 1900s. The author talks about the elementary particle concept. the discoveries of leptons, quarks and force carrying particles; and some of the experimental technology used. The author tells of their own research, the discovery of the tau lepton, the long, inconclusive search for fractional charged particles, and their new involvement in astronomical research on Dark Matter. The author concluded by looking ahead to old unsolved puzzles and new questions on the fundamental nature of matter and force that us in the 21st Century.

NTIS

Elementary Particles; High Energy Interactions

20070021349 Stanford Linear Accelerator Center, CA, USA, London Univ., UK

Relativistic Effects on Reflection X-ray Spectra of AGN

Furerst, S. Y.; Graziella, K. B.; Wu, K.; Crowler, O.; Jan. 05, 2007; 10 pp.; In English

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

Report No.(s): DE2007-896924; SLAC-PUB-12271; No Copyright; Avail.: National Technical Information Service (NTIS)

We have calculated the reflection component of the X-ray spectra of active galactic nuclei (AGN) and shown that they can be significantly modified by the relativistic motion of the accretion flow and various gravitational effects of the central black hole. The absorption edges in the reflection spectra suffer severe energy shifts and smearing. The degree of distortion depends on the system parameters, and the dependence is stronger for some parameters such as the inner radius of the accretion disk and the disk viewing inclination angles. The relativistic effects are significant and are observable. Improper treatment of the reflection component of the X-ray continuum in spectral fittings will give rise to spurious line-like features, which will mimic the fluorescent emission lines and mask the relativistic signatures of the lines.

NTIS

Active Galactic Nuclei; Relativistic Effects; X Ray Spectra

20070021413 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Swift Gamma-ray Burst Explorer: Early Views into Black-hole Creation
Hill, Joe; [2007]; 52 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-637; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021413

This viewgraph presentation reviews the discovery of Gamma-ray Bursts (GRBs) in the 1960's and early 1970's, and the characteristics of GRBs. Theoretical predictions and explanations are reviewed. The first observation of a GRB by the Beppo-SAX is discussed, and then the need develop a Gamma Ray Burst detector with a larger field of view, that has rapid follow-up capabilities and has the ability to rapidly get localized positions to the ground. The Swift instruments (i.e., the Burst Alert Telescope (BAT), the X-Ray Telescope (XRT) and the UV/Optical Telescope (UVOT)) are shown and described. The scenario for observing of GRBs is reviewed. Many charts of the some of the GRBs data and GRB spectra are shown.
CASI
Gamma Ray Bursts; Gamma Ray Astronomy; Swift Observatory; Gamma Ray Telescopes; Spaceborne Astronomy; Gamma Ray Sources (Astronomy)

20070021520 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Consistency of Post-Newtonian Waveforms with Numerical Relativity
Baker, John G.; vanMeter, James R.; McWilliams, Sean T.; Centrella, Joan; Kelly, Bernard J.; Submitted to the Physical Review; [2007]; 4 pp.; In English
Contract(s)/Grant(s): 05-BEFS-05-0044; Copyright; Avail.: CASI: A01, Hardcopy

General relativity predicts the gravitational radiation signatures of mergers of compact binaries,such as coalescing binary black hole systems. Derivations of waveform predictions for such systems are required for optimal scientific analysis of observational gravitational wave data, and have so far been achieved primarily with the aid of the post-Newtonian (PN) approximation. The quaIity of this treatment is unclear, however, for the important late inspiral portion. We derive late-inspiral wave forms via a complementary approach, direct numerical simulation of Einstein's equations, which has recently matured sufficiently for such applications. We compare waveform phasing from simulations covering the last approximately 14 cycles of gravitational radiation from an equal-mass binary system of nonspinning black holes with corresponding 3PN and 3.5PN waveforms. We find phasing agreement consistent with internal error estimates based in either approach, at the level of one radian over approximately 10 cycles. The result suggests that PN waveforms for this system are effective roughly until the system reaches its last stable orbit just prior to the final merger.
Author
Gravitational Waves; Relativity; Waveforms; Binary Stars

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

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

20070021450 NASA Johnson Space Center, Houston, TX, USA
The Lunar Lander 'HabiTank' Concept
Kennedy, Kriss J., et al.; July 9, 2007; 19 pp.; In English; International Conference on Environmental Systems, 9-12, 2007, Chicago, Il, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 986249.01.11.20.16.10
Report No.(s): Rept-2007-01-3058; Copyright; Avail.: Other Sources

This paper will summarize the study that was conducted under the auspices of the National Aeronautics and Space Administration (NASA), lead by Johnson Space Center s Engineering Directorate in support of the Lunar Lander Preparatory Study (LLPS) as sponsored by the Constellation Program Office (CxPO), Advanced Projects Office (APO). The lunar lander conceptual design and analysis is intended to provide an understanding of requirements for human space exploration of the Moon using the Advanced Projects Office Pre-Lander Project Office selected 'HabiTank' Lander concept. In addition, these analyses help identify system 'drivers,' or significant sources of cost, performance, risk, and schedule variation along with

areas needing technology development. Recommendations, results, and conclusions in this paper do not reflect NASA policy or programmatic decisions. This paper is an executive summary of this study.
Author
Design Analysis; NASA Programs; Space Exploration

20070021571 NASA Johnson Space Center, Houston, TX, USA
Excess Ar-40 in the Zagami Shergottite: Does It Reveal Crystallization History?
Bogard, Donald D.; Park, Jisun; August 13, 2007; 1 pp.; In English; Meteoritical Society Annual Meeting, 13-17 August 2007, Tucson, AZ, USA; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021571

The Zagami basaltic shergottite has fine- and coarse-grained (FG & CG) areas, which may reflect partial crystallization in a deep, slowly cooled magma chamber to form Mg-rich pyroxene cores, followed by entrainment of these crystals into a magma that rose and crystallized near the surface. Late-stage melt pockets formed mesostasis and feldspar (maskelynite) having a range of compositions, but low water abundance. Higher I(sub Sr) in the FG portion may result from the second stage having incorporated old crustal rocks that failed to reach isotopic equilibrium. Zagami, like other shergottites, contains excess Ar-40(sub xs) beyond that expected from internal decay of K-40 during its Sm-Nd age of 177 Myr. We suggest that at least a portion of this Ar-40(sub xs) in Zagami and some other shergottites was inherited from the magma, much as is the case of MORBs on Earth. We made Ar-39-Ar-40 age determinations on feldspar and pyroxene separates from both the FG and CG portions of Zagami. If Zagami experienced an evolving fractional crystallization history, including possible crustal contamination of the magma, that might be indicated in differing amounts of Ar-40(sub xs) between mineral phases and between FG and CG portions.
Derived from text
Argon Isotopes; Crystallization; Magma; Shergottites; Meteoritic Composition; Petrogenesis; Geochronology

20070021572 NASA Johnson Space Center, Houston, TX, USA
AR-39-AR-40 'Age' of Basaltic Shergottite NWA-3171
Bogard, Donald D.; Park, Jisun; [2007]; 1 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021572

North-West-Africa 3171 is a 506 g, relatively fresh appearing, basaltic shergottite with similarities to Zagami and Shergotty, but not obviously paired with any of the other known African basaltic shergottites. Its exposure age has the range of 2.5-3.1 Myr , similar to those of Zagami and Shergotty. We made AR-39-AR-40 analyses of a 'plagioclase' (now shock-converted to maskelynite) separate and of a glass hand-picked from a vein connected to shock melt pockets.. Plagioclase was separated using its low magnetic susceptibility and then heavy liquid with density of \h2.85 g/cm(exp 3). The AR-39-AR-40 age spectrum of NWA-3171 plag displays a rise in age over 20-100% of the 39Ar release, from 0.24 Gyr to 0.27 Gy.
Derived from text
Basalt; Meteoritic Composition; Shergottites; Argon Isotopes; Chronology

20070021574 NASA Johnson Space Center, Houston, TX, USA
Cyanobacteria for Human Habitation beyond Earth
Brown, Igor; Jones, Jeff; Bayless, David; Sarkisova, Svetlana; Garrison, Dan; McKay, David S.; [2007]; 1 pp.; In English; 7th European Workshop on Microalgal Biotechnology, 11-13 Jun. 2007, Potsdam, Germany; Copyright; Avail.: Other Sources; Abstract Only

In light of the President s Moon/Mars initiative, lunar exploration has once again become a priority for NASA. In order to establish permanent bases on the Moon and proceed with human exploration of Mars, two key problems will be addressed: first, the production of O2 and second, the production of methane (CH4). While O2 is required for life support systems (LSS), both liquid O2 and CH4 are needed as an oxidizer and a propellant, respectively for the Lunar Surface Access Module (LSAM) and the Crew Exploration Vehicle (CEV). Unlike previous propulsion systems, the new CEV will use liquid oxygen (LO2) as an oxidizer and liquid methane (LCH4) as a propellant. Existing technology (e.g. hydrogen reduction) for the production of liquid oxygen from lunar regolith is very energy intensive and requires high temperature reactors. We propose an alternative approach using iron-tolerant cyanobacteria. We have found that iron-tolerant cyanobacteria (IT CB) are capable of etching iron-bearing minerals, which may lead to bonds breaking between Fe and O of common lunar mare basalt Fe-oxides including ilmenite, pseudobrookite, ferropseudobrookite, and armalcolite with the subsequent release of both Fe, Ti and oxygen as

byproducts. We also propose to use CB biomass for CH4 production as carbon stock and a propellant. Both processes can be accomplished in an energy and cost effective manner because sunlight will be used as an energy source and allows the reactions at ambient temperatures between 10-60 C. Current evaluations include assessing the thermodynamics of such biogenic reactions using a variety of nutrients and atmospheric parameters, as well as assessing the rates and species variation effects of the driving reactions.
Author
Bacteria; Biomass; Oxygen; Methane; Liquid Oxygen; Life Support Systems; Mars Exploration; Propellants; Basalt; Hydrogen Production

20070021775 NASA Johnson Space Center, Houston, TX, USA
Space Shuttle Strategic Planning Status
Norbraten, Gordon L.; Henderson, Edward M.; [2007]; 12 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 8-12 Jul. 2007, Cincinati, OH, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021775

The Space Shuttle Program is aggressively flying the Space Shuttle manifest for assembling the International Space Station and servicing the Hubble Space Telescope. Completing this flight manifest while concurrently transitioning to the Exploration architecture creates formidable challenges; the most notable of which is retaining critical skills within the Shuttle Program workforce. The Program must define a strategy that will allow safe and efficient fly-out of the Shuttle, while smoothly transitioning Shuttle assets (both human and facility) to support early flight demonstrations required in the development of NASA's Crew Exploration Vehicle (Orion) and Crew and Cargo Launch Vehicles (Ares I). The Program must accomplish all of this while maintaining the current level of resources. Therefore, it will be necessary to initiate major changes in operations and contracting. Overcoming these challenges will be essential for NASA to fly the Shuttle safely, accomplish the Vision for Space Exploration, and ultimately meet the national goal of maintaining a robust space program. This paper will address the Space Shuttle Program s strategy and its current status in meeting these challenges.
Author
International Space Station; Management Planning; Space Shuttles; NASA Space Programs; Space Transportation System Flights; Hubble Space Telescope

20070021777 NASA Johnson Space Center, Houston, TX, USA
Comparison of Synthetic and Natural Nakhlite Pyroxenes: Complexity of Minor Elements
McKay, G.; Le, L.; Mikouchi, T.; June 05, 2007; 1 pp.; In English; 31st Symposium on Antarctic Meteorites, 5-7 June 2007, Tokyo, Japan; Copyright; Avail.: CASI: A01, Hardcopy

Zoning in pyroxenes in martian meteorites contains a rich record of the petrogenesis of these samples. In the clinopyroxene cumulate nakhlite group, major element zoning is generally limited to the outer rims of the pyroxenes. However, minor element zoning, especially of Al, Ti, and Cr, is extensive, complex, and difficult to interpret [e.g., 1-3]. To help mine the rich information about petrogenetic processes from these samples, we have been comparing minor element zoning in synthetic pyroxenes grown under known conditions with zoning observed in natural nakhlite pyroxenes. We have focused on two nakhlites, MIL03346 (MIL), which is one of the most rapidly cooled nakhlites, and Y000593 (Y593), which cooled at a more moderate rate [e.g., 4].
Derived from text
Nakhlites; Petrogenesis; Pyroxenes; Meteoritic Composition

20070021788 NASA Johnson Space Center, Houston, TX, USA, Lockheed Martin Space Mission Systems and Services, Houston, TX, USA
Collaborative Human Engineering Work in Space Exploration Extravehicular Activities (EVA)
DeSantis, Lena; Whitmore, Mihriban; May 15, 2007; 29 pp.; In English; Department of Defense Human Factors Engineering Technical Advisory Group Meeting 57, 14-17 May 2007, Portsmouth, VA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A viewgraph presentation on extravehicular activities in space exploration in collaboration with other NASA centers, industries, and universities is shown. The topics include: 1) Concept of Operations for Future EVA activities; 2) Desert

Research and Technology Studies (RATS); 3) Advanced EVA Walkback Test; 4) Walkback Subjective Results; 5) Integrated Suit Test 1; 6) Portable Life Support Subsystem (PLSS); 7) Flex PLSS Design Process; and 8) EVA Information System.
CASI
Extravehicular Activity; Human Factors Engineering; Space Exploration; Technology Utilization

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SOLAR PHYSICS

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

20070021418 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermal Analysis of Post-eruption Loops from 80,000 to 1.6 million K
Kucera, T.; Landi, E.; [2006]; 1 pp.; In English; Solar Physics Division Meeting, 25-30 Jun. 2006, Durhan, NH, USA
Contract(s)/Grant(s): NNH04AA12I; NASA Order W-10232; NNG04ED07P; No Copyright; Avail.: Other Sources; Abstract Only

We analyze the thermal properties of a set of post eruptive loops which appeared after a prominence eruption on April 30, 2004. The event was observed by TRACE and SOHO/SUMER. The SUMER data was taken from a single slit location with a 90 second cadence and included a number of lines spanning the temperature range 80,000 to 1.6 million K. We perform a differential emission measure analysis of the loops in order to study their thermal evolution.
Author
Thermal Analysis; Thermodynamic Properties; Solar Physics; Atmospheric Temperature

20070021477 NASA Marshall Space Flight Center, Huntsville, AL, USA
An Examination of Selected Geomagnetic Indices in Relation to the Sunspot Cycle
Wilson, Robert M.; Hathaway, David H.; December 2006; 56 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2006-214711; M-1178; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070021477

Previous studies have shown geomagnetic indices to be useful for providing early estimates for the size of the following sunspot cycle several years in advance. Examined this study are various precursor methods for predicting the minimum and maximum amplitude of the following sunspot cycle, these precursors based on the aa and Ap geomagnetic indices and the number of disturbed days (NDD), days when the daily Ap index equaled or exceeded 25. Also examined is the yearly peak of the daily Ap index (Apmax), the number of days when Ap greater than or equal to 100, cyclic averages of sunspot number R, aa, Ap, NDD, and the number of sudden storm commencements (NSSC), as well the cyclic sums of NDD and NSSC. The analysis yields 90-percent prediction intervals for both the minimum and maximum amplitudes for cycle 24, the next sunspot cycle. In terms of yearly averages, the best regressions give Rmin = 9.8+/-2.9 and Rmax = 153.8+/-24.7, equivalent to Rm = 8.8+/-2.8 and RM = 159+/-5.5, based on the 12-mo moving average (or smoothed monthly mean sunspot number). Hence, cycle 24 is expected to be above average in size, similar to cycles 21 and 22, producing more than 300 sudden storm commencements and more than 560 disturbed days, of which about 25 will be Ap greater than or equal to 100. On the basis of annual averages, the sunspot minimum year for cycle 24 will be either 2006 or 2007.
Author
Sunspots; Sunspot Cycle; Geomagnetism; Sudden Storm Commencements

20070021568 NASA Johnson Space Center, Houston, TX, USA
Measurement of Damage Profiles from Solar Wind Implantation
McNamara, K. M.; Synowicki, R. A.; Tiwald, T. E.; April 13, 2007; 1 pp.; In English; 4th International Conference on Spectroscopic Ellipsometry, 11-15 Jun. 2007, Stockholm, Sweden; Copyright; Avail.: Other Sources; Abstract Only

NASA's Genesis Mission launched from Cape Canaveral in August of 2001 with the goal of collecting solar wind in ultra-pure materials. The samples were returned to Earth more than three years later for subsequent analysis. Although the solar wind is comprised primarily of protons, it also contains ionized species representing the entire periodic table. The Genesis mission took advantage of the natural momentum of these ionized species to implant themselves in specialized collectors including single crystal Si and SiC. The collectors trapped the solar wind species of interest and sustained significant damage to the surface crystal structure as a result of the ion bombardment. In this work, spectroscopic ellipsometry has been used to evaluate the extent of this damage in Si and SiC samples. These results and models are compared for artificially implanted samples and pristine non-flight material. In addition, the flown samples had accumulated a thin film of molecular

contamination as a result of outgassing in flight, and we demonstrate that this layer can be differentiated from the material damage. In addition to collecting bulk solar wind samples (continuous exposure), the Genesis mission actually returned silicon exposed to four different solar wind regimes: bulk, high speed, low speed, and coronal mass ejections. Each of these solar wind regimes varies in energy, but may vary in composition as well. While determining the composition is a primary goal of the mission, we are also interested in the variation in depth and extent of the damage layer as a function of solar wind regime. Here, we examine flight Si from the bulk solar wind regime and compare the results to both pristine and artificially implanted Si. Finally, there were four samples which were mounted in an electrostatic 'concentrator' designed to reject a large fraction (\g85%) of incoming protons while enhancing the concentration of ions mass 4-28 amu by a factor of at least 20. Two of these samples were single crystal 6H silicon carbide. (The others were polycrystalline CVD diamond and amorphous carbon that were not examined in the work.) The ion damaged SiC samples from the concentrator were studied in comparison to the flight Si from the bulk array to understand differences in the extent of the damage.
Author
Solar Wind; Genesis Mission; Ion Irradiation; Protons; Silicon; Silicon Carbides; Coronal Mass Ejection; Thin Films; Polycrystals; Damage

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20070021282 Stanford Linear Accelerator Center, Stanford, CA, USA, Houston Univ., TX, USA, European Nuclear Energy Agency, Frascati, Italy
Hadronic Models for Cosmic Ray Physics: The FLUKA Code Solutions
Battistoni, G.; Garzelli, M. V.; Gadioli, E.; Muraro, S.; Sala, P. R.; Jan. 01, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-898876; SLAC-PUB-12333; No Copyright; Avail.: National Technical Information Service (NTIS)
FLUKA is a general purpose Monte Carlo transport and interaction code used for fundamental physics and for a wide range of applications. These include Cosmic Ray Physics (muons, neutrinos, EAS, underground physics), both for basic research and applied studies in space and atmospheric flight dosimetry and radiation damage. A review of the hadronic models available in FLUKA and relevant for the description of cosmic ray air showers is presented in this paper. Recent updates concerning these models are discussed. The FLUKA capabilities in the simulation of the formation and propagation of EM and hadronic showers in the Earth's atmosphere are shown.
NTIS
Cosmic Rays; Hadrons

20070021567 NASA Johnson Space Center, Houston, TX, USA
Special Issue: 4th International Workshop on Space Radiation (IWSRR)
Cucinotta, Francis A.; [2007]; 4 pp.; In English; Copyright; Avail.: CASI: A01, Hardcopy
This special issue of the journal 'Radiation and Environmental Biophysics' contains 20 peer-reviewed papers contributed by leading space radiation researcher's world-wide attending the 4th IWSRR. Manuscripts cover a broad range of topics ranging from radiation environments and transport in shielding and planetary surfaces to new results in understanding the biological effects of protons and high-charge and energy (HZE) nuclei on the risk of cancer, and degenerative diseases such as central nervous system effects, heart disease, and cataracts. The issue provides a snapshot of the state-of-the-art of the research in this field, demonstrating both the important results gathered in the past few years with experiments at accelerators, and the need for more research to quantify the risk and develop countermeasures.
Derived from text
Biological Effects; Countermeasures; Extraterrestrial Radiation; Radiation Transport

Subject Term Index

Personal Author Index