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Langley Research Center
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NASA STI Program ... in Profile

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

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

Introduction

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

STAR includes citations to R&D results reported in:

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

The NASA STI Program

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

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

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

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

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

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

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National Technical Information Service (NTIS)

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

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

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

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

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Subject Term Index

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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VOLUME 46, NUMBER 20 OCTOBER 14, 2008

20080037628 Army Research Lab., Adelphi, MD USA

Synchronous Impulse Reconstruction (SIRE) Radar Sensor for Autonomous Navigation

Ressler, Marc A; Nguyen, Lam H; Koening, Francois J; Smith, Gregory; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481640; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481640

The Army Research Laboratory (ARL) has designed and fabricated an impulse-based, ultra-wideband (UWB) imaging radar to examine the utility of using a foliagepenetrating radar with other sensors to support autonomous navigation in robotic vehicles. This radar would also have application in mine detection and through-the-wall sensing. This proof-of-concept radar system employs a physical array of 16 receive antennas to provide the necessary aperture for sufficient crossrange resolution in the forward-looking geometry used in a robotic mission. Each antenna feeds a base-band receiver/digitizer that integrates the data from a number of radar pulses before passing it on to the personal computer (PC) based operator's console and display. The innovative ARL receiver design uses commercially available integrated circuits to provide a low-cost, lightweight digitizing scheme with an effective sampling rate of approximately 8 GHz. The design is extensible to allow for growth in the number of channels used and improvements in integrated circuit performance to eventually meet the expected unmanned ground vehicle combat pace. Using modules based on commercial off the shelf (COTS) components allows for continued expansion of capabilities of the system based on increasing capabilities of these components.

DTIC

Autonomous Navigation; Impulses; Radar Detection; Radar Imagery

20080037629 Oakland Univ., Rochester, MI USA

Ultra-Wideband Methods for UGV Positioning: Experimental and Simulation Results

Cheok, Ka C; Liu, Bo; Hudas, G R; Overholt, J L; Skalny, M; Smid, G E; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481651; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481651

U.S. Army RDECOM-TARDEC, in collaboration with Oakland University and JADI Inc., is currently conducting novel research devoted to obtain fine-grain (centimeter accuracy) indoor positioning for unmanned ground vehicle (UGV) navigation applications using Ultra-Wideband (UWB) technologies. This paper will present recent results from advanced closed-form solutions and analyses for positioning errors, and compare them to experimental results and Cramer-Rao bounds. Agreement among the calculated and experiment standard deviations confirms validity of the techniques and lays a basis for tuning and optimizing solutions for estimating positions of unmanned ground vehicles.

DTIC

Accuracy; Broadband; Simulation

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20080037375 Armstrong Teasdale, LLP, Saint Louis, MO, USA
Multi-Piece Wind Turbine Rotor Blades and Wind Turbines Incorporating Same
Moroz, E. M., Inventor; 30 Sep 04; 8 pp.; In English
Contract(s)/Grant(s): NREL-ZAM-4-31235-01
Patent Info.: Filed Filed 30 Sep 04; US-Patent-Appl-SN-10-955 452
Report No.(s): PB2008-103051; No Copyright; Avail.: CASI: A02, Hardcopy

A multisection blade for a wind turbine includes a hub extender having a pitch bearing at one end, a skirt or fairing having a hole therethrough and configured to mount over the hub extender, and an outboard section configured to couple to the pitch bearing.

NTIS
Patent Applications; Turbine Blades; Wind Turbines; Windpower Utilization

20080037569 NASA Langley Research Center, Hampton, VA, USA
Boundary-Layer-Ingesting Inlet Flow Control
Owens, Lewis R.; Allan, Brian G.; Gorton, Susan A.; [2008]; 31 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07.14.04; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037569

An experimental study was conducted to provide the first demonstration of an active flow control system for a flush-mounted inlet with significant boundary-layer-ingestion in transonic flow conditions. The effectiveness of the flow control in reducing the circumferential distortion at the engine fan-face location was assessed using a 2.5%-scale model of a boundary-layer-ingesting offset diffusing inlet. The inlet was flush mounted to the tunnel wall and ingested a large boundary layer with a boundary-layer-to-inlet height ratio of 35%. Different jet distribution patterns and jet mass flow rates were used in the inlet to control distortion. A vane configuration was also tested. Finally a hybrid vane/jet configuration was tested leveraging strengths of both types of devices. Measurements were made of the onset boundary layer, the duct surface static pressures, and the mass flow rates through the duct and the flow control actuators. The distortion and pressure recovery were measured at the aerodynamic interface plane. The data show that control jets and vanes reduce circumferential distortion to acceptable levels. The point-design vane configuration produced higher distortion levels at off-design settings. The hybrid vane/jet flow control configuration reduced the off-design distortion levels to acceptable ones and used less than 0.5% of the inlet mass flow to supply the jets.

Author
Flow Distribution; Inlet Flow; Jet Flow; Mass Flow Rate; Active Control; Boundary Layers; Transonic Flow; Ingestion (Engines)

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.

20080037621 Army Aviation and Missile Command, Redstone Arsenal, AL USA
MissileLab: An Expert System for Rapid Aerodynamic Trade Studies
Auman, L M; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481911; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481911

An expert system for aerodynamic tradespace analysis has been developed and is being used by several government agencies and industry. Expert systems, like MissileLab, are needed in all areas of the missile/UAV designspace technology

areas and will enable the Army to meet transformation goals of a lighter, rapidly deployable force with increased lethality and survivability, in a cost-effective and timely manner. This paper presents an overview of the functionality and capabilities of MissileLab and briefly discusses enhancements being made by a joint Army/Air Force team on the legacy aerodynamic prediction tool Missile DATCOM.
DTIC
Aerodynamics; Expert Systems; Missile Systems; Missiles

20080037708 Naval Air Warfare Center, Patuxent River, MD, USA
Spray Array Apparatus
Foianini, C. M., Inventor; Hane, T. H., Inventor; Wolfe, J. E., Inventor; 23 Sep 04; 21 pp.; In English
Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-956 525
Report No.(s): PB2008-102086; No Copyright; Avail.: CASI: A03, Hardcopy

Spray array apparatus which includes a plurality of water and air carrying spoke members extending radially from a central fluid distribution assembly. The spoke members are connected to a plurality of water and air carrying strut members. The spoke members are divided into segments and the segments and strut members are detachably joined together by means of manifold joints which have water and air passageways allowing fluid communication between spoke segments and strut members. The apparatus is towed at the end of a boom of a tanker aircraft and is connected to the boom by means of a gimbal allowing two degrees of freedom to reduce bending moments and connection stresses. Selected fluid parameters are transmitted to the tanker aircraft to adjust fluid flow, if necessary.
NTIS
Patent Applications; Spray Nozzles; Sprayers

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.

20080037482 North Dakota State Univ., Fargo, ND USA
Durable Hybrid Coatings
Chisholm, Bret J; Schulz, Douglas L; McCarthy, Gregory J; Battocchi, Dante; Bierwagen, Gordon P; Oct 2007; 134 pp.; In English
Contract(s)/Grant(s): FA8650-04-1-5045; Proj-4347
Report No.(s): AD-A482125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this program is to contribute to the development of the next-generation anti-corrosion and other protective coating systems for USAF aircraft. The initial emphasis of the program was on improvements in NDSU's promising Mg-based primer, which NDSU recently licensed to the major international aircraft coatings manufacturer. Work continued over the last year on improvements in primer binder, additions to NDSU's world-class high-throughput (HT) research and development capabilities that are necessary to work with this class of coatings, and meeting additional Air Force protective coatings needs such as hard surface pretreatments to work with the binder, and development of a methodology for depot-based repair indium tin oxide aircraft canopy coatings. A new effort was initiated late in the year on prognostic measurement techniques to monitor the effectiveness of the magnesium-based primers previously developed. Accomplishments included successful research on a new two component binder system, hybrid organic-inorganic binders, and UV-curable low-VOC binders for Mg-rich primers. The HT approach was instrumental for efficient and effective binder research. Studies of a range of Mg-alloys in the primer have shown that, similar to pure Mg primer, all Mg alloy primers provide cathodic protection to the Al alloy substrate. The composition of the Mg alloy, such as the content of Al and the composition of the third element, can greatly influence performance. Work was largely completed on HT tools needed for development of aerospace coatings: robotic viscous liquid handling, high shear mixing for pigment dispersion, screening methods for characterizing corrosion protection, and HT screening methods for characterizing weatherability.
DTIC
Cathodic Coatings; Corrosion Prevention; Durability; Protective Coatings; Vapor Deposition

20080037783 NASA, Washington, DC, USA; Smithsonian Institution, Washington, DC, USA
America by Air
vanderLinden, F. Robert, Editor; Rugg, Karen L., Editor; Springer, Anthony M., Editor; 2007; 46 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/SP-2007-561; Copyright; Avail.: CASI: A03, Hardcopy

Flying was new and daring in the early years of the 20th century. Airlines, Airliners, airports, air routes -- none of these exited. Yet, within a few decades, Americans could fly to almost anywhere in the country in a matter of hours. How did this revolutionary change happen? How did the U.S. government shape the airline industry? How have the improvements in technology changed air travel? And how has the flying experience changed? The iconic images and artifacts from the National Air and Space Museum's 'America by Air' guide us through the growth of our nation's air transportation system.
Derived from text
Air Transportation; Histories; Commercial Aircraft; Passenger Aircraft

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20080037315 Madson and Austin, Salt Lake City, UT, USA
Programmable Autopilot System for Autonomous Flight of Unmanned Aerial Vehicles
Beard, R. W., Inventor; Johnson, W. H., Inventor; Christiansen, R., Inventor; Hintze, J. M., Inventor; McLain, T. W., Inventor; 14 Sep 04; 29 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0091; F49620-02-C-0094
Patent Info.: Filed Filed 14 Sep 04; US-Patent-Appl-SN-10-940 411
Report No.(s): PB2008-102070; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for providing autonomous control of unmanned aerial vehicles (UAVs) is disclosed. The system includes a ground station in communication with an unmanned aerial vehicle. The method for providing autonomous control of a UAV includes methods for processing communications between the ground station and UAV. The method also includes procedures for processing commands from the ground station. Also included in the method is a process for estimating the attitude of the UAV and autonomously maintaining its altitude within a desired threshold. The method also includes a process for autonomously orbiting about a specified point in space. Combined with these processes, the method also includes a process for an autonomous takeoff and landing of the UAV.
NTIS
Automatic Control; Automatic Pilots; Autonomy; Patent Applications; Pilotless Aircraft

20080037481 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Platform Machining Evaluation
Perillo, Doug; Sep 21, 2006; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W31P4Q-05-D-R003; Proj-06-0095-05
Report No.(s): AD-A482147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Air Methods Corporation, Englewood, CO, manufactures litter pans (platforms) used in the UH-60Q MEDEVAC (Medical Evacuation) variant of the UH-60 Black Hawk interior that are machined aluminum pieces designed to support litter-borne patients. These platforms also serve as attachment points for the ambulatory patient seats. The original platforms were designed to meet civil crash requirements. However, with the pending introduction of the HH-60M, the platforms must meet stricter Army crash requirements, and the loads on the platforms themselves have increased. Air Methods Corporation requested that the National Center for Defense Manufacturing and Machining (NCDMM) review a proposed stiffener design and develop a manufacturing process capable of producing a complex stiffener geometry that will reduce the weight of the platform along with increasing its 'payload' capacity.
DTIC
Air Transportation; Crashes; Design Analysis; Evacuating (Transportation); Machining; Medical Services

20080037491 United Technologies Corp., East Hartford, CT USA

Toward the Expansion of Low-Pressure-Turbine Airfoil Design Space (Postprint)

Praisner, T J; Grover, E A; Knezevici, D C; Popovic, I; Sjolander, S A; Clark, J P; Sondergaard, R; Koch, P J; Apr 2008; 10 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A482053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Future engine requirements, including high-altitude flight of unmanned air vehicles as well as a movement to reduce engine cost and weight, are challenging the current state of the art in low-pressure-turbine airfoil design. These new requirements present low-Reynolds number challenges as well as the need for high-performance high-lift design concepts. Here we report on an effort to expand the relatively well established design space for low-pressure turbine airfoils. Analytical and experimental mid-span performance data and loadings are presented for four new airfoil designs based on the Pack B velocity triangles. The new designs represent a systematic expansion of low-pressure turbine airfoil design space through the application of high-lift design concepts for front- and aft-loaded airfoils. Taken holistically, the results presented here demonstrate accurate transition modeling provides a reliable method to develop optimized, very high-lift airfoil designs.

DTIC

Airfoils; Low Pressure; Turbines

20080037534 JENTEK Sensors, Inc., Waltham, MA, USA

Surface Mounted and Scanning Spatially Periodic Eddy-Current Sensor Arrays

Goldfine, N. J., Inventor; Schlicker, D. E., Inventor; Walrath, K. E., Inventor; Weis, V., Inventor; Washabaugh, A. P., Inventor; 2 Mar 05; 85 pp.; In English

Contract(s)/Grant(s): DTRS57-96-C-00108; N00421-97-C-1120

Patent Info.: Filed Filed 2 Mar 05; US-Patent-Appl-SN-11-071 051

Report No.(s): PB2008-102776; No Copyright; Avail.: CASI: A05, Hardcopy

Inductive sensors measure the near surface properties of conducting and magnetic material. A sensor may have primary windings with parallel extended winding segments to impose a spatially periodic magnetic field in a test material. Those extended portions may be formed by adjacent portions of individual drive coils. Sensing elements provided every other half wavelength may be connected together in series while the sensing elements in adjacent half wavelengths are spatially offset. Certain sensors include circular segments which create a circularly symmetric magnetic field that is periodic in the radial direction. Such sensors are particularly adapted to surround fasteners to detect cracks and can be mounted beneath a fastener head. In another sensor, sensing windings are offset along the length of parallel winding segments to provide material measurements over different locations when the circuit is scanned over the test material. The distance from the sensing elements to the ends of the primary winding may be kept constant as the offset space in between sensing elements is varied. An image of the material properties can be provided as the sensor is scanned across the material.

NTIS

Eddy Currents; Nondestructive Tests; Patent Applications

20080037589 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

CH-53 Gun Mount Adapter

Sep 20, 2004; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-04-0045-06

Report No.(s): AD-A481852; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481852

Lockheed Martin AeroParts, Inc. (LMAPI), Johnstown, Pennsylvania, produces gun turret components for military helicopters, including the Sikorsky CH-53. Machining the 12-inch x 18-inch x 4-inch diamond-shaped aluminum gun mount adapter is challenging because of the intricate ISO grid pattern designed to reduce weight and provide strength. Machining the ISO grid requires the use of high-speed machining techniques. Lockheed Martin has implemented the use of z-axis milling techniques for roughing the component, but sought the help of the National Center for Defense Manufacturing and Machining (NCDMM) to reduce machining time and optimize the finish milling operations, which include an M60 x 1.5 mm 4-inch-deep threaded hole in the component, which currently takes 1.5 hours to complete using a single point-threading tool.

DTIC

Adapters; H-53 Helicopter; Helicopters; Machining; Milling Machines; Supports; Surface Finishing; Threads

20080037594 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
F-35 Aluminum Composite Stack Drilling
Jan 23, 2006; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0042-05
Report No.(s): AD-A481838; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481838

Lockheed Martin Aeronautics Company (LMAC), Fort Worth, Texas, is experiencing issues when drilling advanced aluminum composite stacked skin material for the F-35 Joint Strike fighter (JSF). The current tooling (drill) requires slower feed rates than desired due to the necessity of drilling through air gaps between the composite and aluminum stacks. Chip evacuation during the drilling operation also is an issue; chips can get trapped within the air gap between the two material stacks and erode the composite material on the exit side of the hole. The current tooling also creates higher drilling forces than desired by LMAC. LMAC's demands are increasing for the drilling of the aluminum composite stacked material used in the forward fuselage and wing assemblies on the F-35 JSF aircraft. Therefore, LMAC called upon the National Center for Defense Manufacturing and Machining (NCDMM) to lead a collaborative effort to research various drill geometries that would result in a more efficient solution for drilling these components to the specifications required by LMAC.
DTIC
Aluminum; Composite Materials; Drilling; Fighter Aircraft; Jet Aircraft; Metal Matrix Composites

20080037596 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
F-16 HARM Targeting Pod
Jun 28, 2005; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0035-03
Report No.(s): AD-A481833; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481833

Lockheed Martin Aeroparts, Johnstown, Pennsylvania, received a contract to manufacture 96 weapons pylons for USAF F-16 upgrades. There are expectations of a follow-on order for 198 additional units. The pylon is made from an aluminum casting and requires machining in five different positions. In-process inspection via Non-Destructive Testing (NDT) using Liquid Penetrant (LP) also is required. Because the component has multiple critical features controlled by close tolerances, the part must be NDT inspected while remaining in the fixture to assure that the component does not move. Due to the complex shape of the part, stability and rigidity were of great concern in the tool design process. Problems occurred when attempting to relocate and NDT inspect the component. The operation was very cumbersome and time-consuming. Lockheed Martin asked the National Center for Defense Manufacturing and Machining (NCDMM) to provide or recommend a solution to reduce the setup time and locating effort required.
DTIC
F-16 Aircraft; Fighter Aircraft; Inspection; Jet Aircraft; Machining; Manufacturing; Nondestructive Tests; Pods (External Stores); Pylons; Struts; Weapon Systems

20080037598 Textron Bell Helicopter, Fort Worth, TX USA
Assessment of Attack Reconnaissance Helicopter (ARH) Machining, Cutting and Drilling Operations
Perillo, Doug; Sep 29, 2006; 17 pp.; In English
Contract(s)/Grant(s): W31P4Q-05-D-R003; Proj-05-0069-09
Report No.(s): AD-A481828; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481828

The new Bell Attack Reconnaissance Helicopter (ARH) was developed to meet the Army's need for a fast, agile armed reconnaissance helicopter. Based on the success of this war fighting machine, the Army has proposed an effort to assess the ARH machining, cutting, drilling, and related operations in support of the Aviation and Missile Research Development and Engineering Center (AMRDEC) Manufacturing Science and Technology (MTS) Division as it supports the AMRDEC Aviation System Integration Facility (Comanche Solution/ARH funded) effort.
DTIC
Aerial Reconnaissance; Attack Aircraft; Cutting; Drilling; Helicopters; Machining; Military Helicopters; Reconnaissance

20080037599 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Aircraft Rotor Surface Coating Qualification Testing Aircraft Rotor Surface Coating
Oct 25, 2006; 30 pp.; In English
Contract(s)/Grant(s): W31P4Q-05-D-R003; Proj-NP05007610
Report No.(s): AD-A481802; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481802

Due to the harsh environment and operating conditions of military aircraft rotor blades, the maintenance costs are extensive. Currently the Department of Defense 'DoD' is interested in pursuing a new coating that could be applied to various helicopter rotor blades that would increase the life over the current method. The Aviation and Missile Research, Development and Engineering Center 'AMRDEC' located at Redstone Arsenal, AL selected the NCDMM to coordinate the initial effort to qualify a new aircraft rotor blade coating for AMRDEC's further consideration. The benefit to the DoD would be reduced maintenance costs and potentially safer aircraft operations. This test is only an initial qualification and further qualification and testing will be required before any field applications are tested. The objective of this initiative was to perform particle and rain erosion tests on coated samples from several coating suppliers along side control specimens coated with the current Poly Tape method for DoD aircraft rotor blades. The results from the coated test samples will be compared to those from the control specimens.
DTIC
Coating; Performance Tests; Protective Coatings; Rotors

20080037607 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
CH-53 Gun Yoke
Sep 24, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0036-04
Report No.(s): AD-A481794; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481794

Augustine Die & Mold, Inc., of Somerset, Pennsylvania, is producing gun turret components for various military helicopters, including the Sikorsky CH-53. Machining a 12-inch wide, 18-inch long, 10-inch thick, horseshoe-shaped aluminum gun yoke was a challenge; roughing operations alone were taking over 3-4 hours for each yoke. In addition, existing processes created stresses that distorted the part, requiring straightening operations that consumed about an hour. Augustine sought the help of the National Center for Defense Manufacturing and Machining (NCDMM) to reduce machining time and eliminate residual stress. NCDMM analyzed the operation and applied modal analysis technologies from alliance partners Design & Manufacturing Solutions, Inc. (DMS) and Manufacturing Laboratories, Inc. (MLI). Modal analysis can determine the cutting characteristics of individual tools while they are mounted in the machine tool. The information is used to create stability lobe diagrams revealing the combinations of cutting speeds and feed rates that can best deliver high productivity without chatter. NCDMM's testing resulted in an immediate 85 percent reduction in time required for roughing, elimination of time required for straightening operations, and reductions in finishing operations.
DTIC
Cutters; Gun Turrets; H-53 Helicopter; Helicopters; Machining; Production Engineering; Yokes

20080037614 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
UH-60 BIM Blanket Tap Test Evaluation
Sep 22, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0100-07
Report No.(s): AD-A481923; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481923

Corpus Christi Army Depot (CCAD), Corpus Christi, Texas, inspects the outer mold layer (OML) of the UH-60 Black Hawk helicopter rotor blades for voids and delaminations. This process requires inspection of the blade from fore to aft and from rotor to blade tip. The current inspection process requires a technician to perform a manual 'Tap' test of the blade using a small, specialized hammer. During the tapping of the blade, the technician listens for discontinuities in audible sounds produced as the hammer strikes the blade. This discontinuity normally represents a void or delamination. On average, only 4 to 6 blades can be inspected daily. This method may cause unnecessary repairs and/or missed needed repairs. CCAD requested the National Center for Defense Manufacturing and Machining (NCDMM) to review the current process and propose a nondestructive test (NDT) method of detecting voids and delaminations utilizing available state-of-the-market equipment. Several methods of inspection were evaluated at the NCDMM during the course of the project. The full UH-60

Black Hawk blade used for evaluation contained numerous voids and delaminations mapped out by CCAD technicians utilizing the manual 'Tap' test method. The evaluated methods were two digital tapping hammers, two ultrasonic testing systems, two Laser Shearography systems, and a hand-held ultrasonic tester. The NCDMM recommended the implementation of the Laser Shearography technology developed by Laser Technology, Inc. (LTI). Laser Shearography systems use a common path interferometer to image the out-of-plane deformations of the test part surface.
DTIC
Delaminating; Diagnosis; Lasers; Nondestructive Tests; Rotary Wings; Shearography; Voids

20080037639 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
T55 Compressor Rotor Turn Time Reduction -- Phase I
Apr 20, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0107-08
Report No.(s): AD-A481789; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481789

The T55 jet engine used in the CH-47 Chinook helicopter contains either the T712 or the T714 compressor rotor. After a time, these compressor rotors need to be rebuilt to meet the original equipment manufacturer's (OEM) specifications. Corpus Christi Army Depot's (CCAD) current rebuilding process requires numerous set-ups, which results in a turn-around time of 15 to 16 hours to completely refurbish one compressor rotor. CCAD is in need of a grinding center to reduce the cycle time, and due to a change in compressor rotors from the T712 to the T714, it also is in need of a grinding center that will accommodate the addition of a 17.5-inch shroud that is not present on the T712. The National Center for Defense Manufacturing and Machining (NCDMM) was requested to evaluate the current process and provide a grinding solution for CCAD that would eliminate the multiple set-ups and reduce the current cycle time to allow 4 to 5 assemblies to be ground each day.
DTIC
Compressor Rotors; Helicopter Engines; Machine Tools; Production Engineering

20080037640 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Platform Machining Evaluation
Aug 21, 2006; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0095-05
Report No.(s): AD-A481785; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481785

Air Methods Corporation, Englewood, Colorado, manufactures litter pans (platforms) used in the UH-60Q MEDEVAC (Medical Evacuation) variant of the UH-60 Black Hawk interior that are machined aluminum pieces designed to support litter-borne patients. These platforms also serve as attachment points for the ambulatory patient seats. The original platforms were designed to meet civil crash requirements. However, with the pending introduction of the HH-60M, the platforms must meet stricter Army crash requirements, and the loads on the platforms themselves have increased. Reducing the weight of the medical interior increases the performance margin on the aircraft. This translates into increased 'payload' capacity, better performance, better fuel efficiency, and longer aircraft life. Air Methods Corporation requested that the National Center for Defense Manufacturing and Machining (NCDMM) review a proposed stiffener design and develop a manufacturing process capable of producing a complex stiffener geometry that will reduce the weight of the platform along with increasing its 'payload' capacity.
DTIC
Air Transportation; Crashworthiness; Evacuating (Transportation); Helicopters; Machining; Medical Services; Weight Reduction

20080037688 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Sikorsky Main Rotor Bearing
Dec 21, 2003; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-03-0013-11
Report No.(s): AD-A481956; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481956

Lord Corporation (Dayton, Ohio) manufactures the Main Rotor Bearing for the Sikorsky Black Hawk helicopter. Recently

they were awarded a new contract that increases the requirement for this part from 60 to 80 pieces per week (a 33% increase). Lord Corporation operated a 5 days per week schedule. Meeting the new production requirement would require facility utilization of 7 days per week. This would not increase labor hours, but no time would be available for machine maintenance. Not wanting to work 7 days a week, Lord Corporation requested that the National Center for Defense Manufacturing and Machining (NCDMM) review the complete process and provide a solution to achieve the 80 pieces per week. After reviewing the present part process, it was determined that with the new requirements, a part had to be produced in 75 minutes or less. This was based on 80 pieces at 80% machining efficiency running 24 hours per day and 5 days per week. The longest operation on this part required 100 minutes actual machine time while all others averaged 35-40 minutes. The immediate need was to reduce this operation time to meet the new production requirements. NCDMM recommended 'state-of-the-art' tooling and advanced machining techniques. Specifically, these recommendations consisted of newer drills, solid carbide end mills, face mills, thread mills, and reprogramming with advanced cutting parameters resulting in significantly improved machining times.
DTIC
Machining; Manufacturing; Productivity; Rotary Wings; Rotors; Tooling

20080037709 Renner Otto Boisselle and Sklar, LLP, Cleveland, OH, USA
Inflatable Aerodynamic Wing and Method
Elam, D. B., Inventor; 26 Aug 04; 12 pp.; In English
Patent Info.: Filed Filed 26 Aug 04; US-Patent-Appl-SN-10-927 579
Report No.(s): PB2008-102084; No Copyright; Avail.: CASI: A03, Hardcopy

An inflatable structure constructed of flexible material that can occupy a minimal volume when in a deflated and stored condition as compared to its fully inflated and deployed configuration, has sufficient structural rigidity to function as a wing when deployed. The wing includes an array of inflatable chambers with generally circular cross-sections. The chambers are spaced a particular distance between their centers and held in that spacing by an outer wing skin. For equal cross-sectional diameter chambers this distance is less than the diameter. When the chambers are inflated the close spacing causes tension in the opposing surfaces to create a rigid structure.
NTIS
Aerodynamics; Inflatable Structures; Patent Applications; Pilotless Aircraft; Wings

20080037922 Syracuse Univ., NY USA
Noise Identification in a Hot Transonic Jet Using Low-Dimensional Methods
Hall, Andre M; Pinier, Jeremy T; Glauser, Mark N; Ukeiley, Lawrence; Mar 2008; 63 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0079
Report No.(s): AD-A482048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this effort has been to identify the dominant source of the radiated aero-acoustic noise produced by high-speed, heated jets and develop control strategies to reduce it. To that end, two acoustically matched Mach 0.6 jets, at temperature ratio Tr=O.93 (cold) and Tr=1.7 (hot) are examined. The use of non-intrusive Particle Image Velocimetry (PIV) to sample the flow, allowed a true measure of the velocity field to be realized without fear of corrupting the radiated noise field intrinsic to each jet. The low-order modal dominance of each was determined using Proper Orthogonal Decomposition (POD), highlighting the low-dimensional nature of this highly turbulent flow field.
DTIC
Particle Image Velocimetry; Aeroacoustics; Aerodynamic Noise

20080038088 Pietragallo, Bosick and Gordon, LLP, Pittsburg, PA, USA; Northrop Grumman Corp., Baltimore, MD, USA
System for Detecting Structural Defects and Features Utilizing Blackbody Self-Illumination
Weir, J. D., Inventor; DiMarzio, D., Inventor; Chu, S., Inventor; Silberstein, R. P., Inventor; 22 Oct 04; 21 pp.; In English
Contract(s)/Grant(s): SERDP-DACA 72-99-C-01
Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-971 217
Report No.(s): PB2008-101629; No Copyright; Avail.: CASI: A03, Hardcopy

A system is disclosed which utilizes the substantially steady-state temperature of a coated object, in conjunction with an optical detection system, to selectively view defects and features of the object below the coating without the necessity of transient heating or IR illumination and reflectance imaging. The optical detector, such as an IR camera, may be tailored for the wavelengths at which the coating material is substantially transparent, thereby maximizing the viewing clarity of the defects and features under the coating, and distinguishing them from any spurious features on the top surface of the coating.

The present system enables the inspection of small or large areas in real time, without requiring complex image acquisition, storage and image processing equipment and software.
NTIS
Defects; Detection; Optical Measuring Instruments; Patent Applications; Steady State

20080038690 Air War Coll., Maxwell AFB, AL USA
Impact of Foreign Ownership on the Civil Reserve Air Fleet
Schauber, Jr, Donald M; Apr 2008; 34 pp.; In English
Report No.(s): AD-A482220; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482220

Since the beginning of manned flight, the movement of personnel and equipment by air has been critical to U.S. national security. This realization led to the establishment of the Civil Reserve Air Fleet (CRAF) in 1951 to augment the military airlift fleet in times of national emergency. In the 56 years following its inception, the CRAF has proven itself numerous times as a critical enabler to U.S. military strategy. Recent changes within the military and trends toward a globalized economy have placed the Department of Defense and U.S. airlines on diverging paths. The purpose of this paper is to examine these changes and their possible impact on U.S. national security. Following a basic overview of the CRAF and its criticality, the paper examines the conflict of interest between the national economy and national security regarding the push to liberalize airline ownership and control. The paper concludes by examining possible options and recommendations that help address these concerns to ensure that the CRAF program remains a viable and integral part of the U.S. military capability.
DTIC
Civil Aviation; Commercial Aircraft; Emergencies; Military Operations; Security

20080038694 Computelligence, LLC, Indianapolis, IN USA
Cognitive Models for Learning to Control Dynamic Systems
Eberhart, Russ; Hu, Xiaohui; Chen, Yaobin; May 30, 2008; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-07-C-0167
Report No.(s): AD-A482256; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482256

Report developed under STTR contract for topic 'Cognitive models for learning to control dynamic systems' demonstrated a swarm intelligence learning algorithm and its application in unmanned aerial vehicle (UAV) mission planning. A new UAV assignment model was developed that reduces the dimension of the solution space and is easily adapted by computational intelligence algorithms. A version of particle swarm optimization (PSO) was applied to accomplish the mission optimization. Numerical experimental results illustrate that it efficiently achieves the optima and demonstrates the effectiveness of combining the model and PSO to solve complex UAV assignment problems. The time to complete mission plans for operationally realistic scenarios is reduced by 3-4 orders of magnitude compared with the mixed-integer linear programming approach being used by AFRL at WPAFB. A computer game was also developed to investigate how humans interact with swarm intelligence. The game is based on an NK landscape. It is concluded that the combination of a human-swarm team may have advantages in certain environments, such as dynamic decision making tasks.
DTIC
Adaptive Control; Algorithms; Cognition; Control Systems Design; Decision Making; Intelligence; Learning; Linear Programming; Machine Learning; Optimization

20080038747 Air Force Packaging Technology and Engineering Facility, Wright-Patterson AFB, OH USA
Development of the MQ-9 Reaper Wings Container
Bozzuto, Matthew P; Evans, Susan J; Jun 3, 2008; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-O6-P-106
Report No.(s): AD-A482355; AFPTEF-08-R-08; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482355

The Air Force Packaging Technology & Engineering Facility (AFPTEF) was tasked with the design of a new shipping and storage container for the MQ-9 Reaper wings in March of 2006. The previous container did not adequately satisfy user needs and Air Force requirements. A main problem was that it was designed for an MQ-9 Reaper fuselage, wings, and tails combined, which exceeded the 10,000 lb Air Force requirement for available ground support equipment. AFPTEF designed a smaller container for only the wings and tails and a separate container for the fuselage in order to bring container weights

down under the 10,000 lb upper limit. Both containers feature retractable casters for rapid C-130 deployment and easier handling. The wings container features a wire rope isolator mounted cradle system to protect the wings and tails (20G fragility). The design reduces required ground support equipment and eliminates hoisting risk to the wings by allowing wing jack usage for loading/unloading the wings. The new container, CNU-699/E, designed with SAE ARP1967A, is an aluminum, long-life, controlled breathing, reusable shipping and storage container. CNU-699/E protects the MQ-9 Reaper wings and tails mechanically and environmentally and has passed all qualification tests per ASTM D4169.
DTIC
Drone Vehicles; Wings

20080038791 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Simulation Optimization Approach to the Design of Unmanned Aerial Vehicles
Evans, Emily C; Mar 2008; 84 pp.; In English
Report No.(s): AD-A482457; AFIT/GOR/ENS/08-22; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA482457

Military strategy and operations have evolved significantly over the past decade. This evolution has led to a change in the military resources required to carry out missions successfully. In line with these requirements, demand has increased for unmanned aerial vehicles (UAV) with enhanced capability to perform surveillance and to strike targets of interest. This research effort aids in the design of a next generation UAV by employing a simulation optimization approach. The goal of this research is to maximize the number of targets destroyed in a conflict scenario by a newly designed UAV that is subject to size, weight, and budget constraints. The solution approach involves the development of a simulation model representing a conflict scenario, which includes various types and quantities of targets, and weather conditions. The model is used to test the effectiveness of various UAV configurations in detecting and destroying targets. A tabu search meta-heuristic is constructed to optimize the configuration of the UAV, in terms of the number and type of sensors, synthetic aperture radar, and weapons.
DTIC
Drone Vehicles; Optimization; Pilotless Aircraft; Simulation

20080038951 Florida Atlantic Univ., Boca Raton, FL USA
Concepts and Methods of Helicopter Local Stability for Aggressive Maneuvers of Short Duration From Response Data Points
Gaonkar, G H; May 31, 2007; 16 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0523
Report No.(s): AD-A482617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This STTR work presents an exploratory investigation of helicopter stability during unsteady maneuvers on the basis of the finite time Lyapunov exponents(FTLE), These maneuvers represent short duration dynamics that lasts long enough to stall the rotor but not long enough to reach a steady state, they also represent aggressive operations at the extremes of the flight envelope that often represent a design condition. The Floquet approach is not applicable because it requires a periodic orbit, nor is the Lyapunov-exponent approach, which requires long-time response histories. (The Lyapunov exponent reduces to FTLE under asymptotic conditions and to the real part of the Floquet exponent for a periodic orbit). Since these aggressive maneuvers represent unsteady dynamics of short duration, the formulation exploits the largest FTLE to calculate the stability of the least stable mode from experimentally or numerically generated response data. It involves constructing a pseudo-state space by the method of delays, generating a series of Jacobian matrices, and then forming the product of these matrices to generate an Oseledec matrix and its eigenvalues. The ongoing research is still in a developmental stage: it represents the first attempt toward developing a framework for treating the stability of aggressive, short duration maneuvers.
DTIC
Helicopters; Maneuvers; Stability

20080038979 Southwest Research Inst., San Antonio, TX USA
Fuel System Durability--U.S. Coast Guard
Yost, Douglas M; May 2008; 68 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAE07-99-C-L053
Report No.(s): AD-A482669; TFLRF-393; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project attempted to determine the fuel lubricity requirements of the Sulzer 12ZAV40S fuel injection system. Wear rates with F-76 and JP-5 fuels were attempted using radioactive tracer technologies using a fuel injection system test stand.

Within the sensitivity of the resulting activation, and due to detector instabilities, the wear of fuel injection components could not be quantified using on-line in-situ radioactivity monitoring techniques. Off-line monitoring did indicate wear, but only after a catastrophic wear event. The methods did indicate however that the wear with JP-5 fuel was not significantly different than Diesel Fuel Marine (DFM) fuel within the scope of the method with the high durability components. Recommendations were made for future testing.
DTIC
Coasts; Durability; Fuel Systems

20080038993 California Univ., Berkeley, CA USA
Development of Targeting UAVs Using Electric Helicopters and Yamaha RMAX
Shim, David H; CHung, Hoam; Sastry, Shankar; May 17, 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-1-0152
Report No.(s): AD-A482699; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are many situations that airborne platforms need to point a camera or a laser source to a ground target, either stationary or moving. For aerial still-imaging or live-video relaying, the camera should be held consistently pointing to the target regardless of the host vehicle's motion. For target designation, the rolling of the beam is less critical, but the laser beam should be on the target without much deviation over time. Typically, high-precision targeting or image stabilization is achieved by an add-on gimbal system. Secondary actuators cancel out the vehicle's translation and rotation sensed by accelerometers and gyros in the gimbal system. For fixed-wings, due to the nonzero speed of the host vehicle during the flight, maintaining a good lock is usually very difficult or impossible without a help of such devices. For rotary-wing aircraft, however, the pointing task is somewhat achievable if the vehicle is allowed to hover. However, it requires the vehicle to remain stationary with great accuracy, which is not always possible especially when the vehicle is exposed to a significant threat. Even if the vehicle is allowed to do so, it poses a heavy burden on the pilot.
DTIC
Drone Vehicles; Flight Control; Helicopters

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.

20080037524 Carlson Gaskey and Olds, PC, Birmingham, MI, USA
Heat Transfer Augmentation in a Compact Heat Exchange Pedestal Array
Joe, C. R., Inventor; Lutjen, P. M., Inventor; 20 Sep 04; 13 pp.; In English
Contract(s)/Grant(s): F33615-03-D-2354
Patent Info.: Filed Filed 20 Sep 04; US-Patent-Appl-SN-10-945 477
Report No.(s): PB2008-102074; No Copyright; Avail.: CASI: A03, Hardcopy

A compact heat exchanger pedestal array for augmenting heat transfer in a machine is disclosed. The compact heat exchanger pedestal array includes a wall having first and second surfaces. The first surface faces a heated flow path and the second surface partially forms a flow path for cooling fluid. A plurality of pedestals extend from the second surface of the wall. At least one turbulator strip extends between adjacent pedestals. The turbulator strips and pedestals are operable for mixing the cooling fluid to increase heat transfer from the wall to the cooling fluid.
NTIS
Augmentation; Heat Exchangers; Heat Transfer; Patent Applications; Turbine Engines

20080037726 National Energy Technology Lab., Morgantown, WV, USA
Effects of Propane/Natural Gas Blended Fuels on Gas Turbine Pollutant Emissions
Straub, D.; Ferguson, D.; Casleton, K.; Richards, G.; Mar. 2007; 13 pp.; In English
Report No.(s): DE2007-913263; DOE/NETL-IR-2007-101; No Copyright; Avail.: National Technical Information Service (NTIS)

Liquefied natural gas (LNG) imports to the U.S. are expected to grow significantly over the next 10-15 years. Likewise, it is expected that changes to the domestic gas supply may also introduce changes in natural gas composition. As a result of

these anticipated changes, the composition of fuel sources may vary significantly from conventional domestic natural gas supplies. This paper will examine the effects of fuel variability on pollutant emissions for premixed gas turbine conditions. The experimental data presented in this paper have been collected from a pressurized single injector combustion test rig at the National Energy Technology Laboratory (NETL). The tests are conducted at 7.5 atm with a 588 K air preheat. A propane blending facility is used to vary the Wobbe Index of the site natural gas. The results indicate that propane addition of about five (vol.) percent does not lead to a significant change in the observed NOx or CO emissions. These results are different from data collected on some engine applications and potential reasons for these differences will be described.
NTIS
Contaminants; Exhaust Emission; Fuels; Gas Turbines; Natural Gas; Propane

20080037877 Armstrong Teasdale, LLP, Saint Louis, MO, USA
Counter-Rotating Turbine Engine and Method of Assembling Same
Seda, J. F., Inventor; Moniz, T. O., Inventor; Butler, L., Inventor; 29 Oct 04; 15 pp.; In English
Patent Info.: Filed Filed 29 Oct 04; US-Patent-Appl-SN-10-976 496
Report No.(s): PB2008-102820; No Copyright; Avail.: CASI: A03, Hardcopy

A method for assembling a gas turbine engine that includes providing a low-pressure turbine inner rotor configured to rotate in a first direction, providing a low-pressure turbine outer rotor configured to rotate in a second direction that is opposite the first rotational direction, and coupling at least one foil bearing to at least one of the inner and outer rotors to facilitate improving clearance control between a first rotating component and at least one of a second rotating component and a non-rotating component.
NTIS
Counter Rotation; Gas Turbine Engines; Patent Applications; Rotation; Turbine Engines

20080038076 Honeywell International, Inc., Morristown, NJ, USA
Compressor Including an Enhanced Vaned Shroud
Barton, M. T., Inventor; Palmer, D. L., Inventor; Mansour, M. L., Inventor; Durschmidt, D. F., Inventor; Gunaraj, J. A., Inventor; 27 Oct 04; 14 pp.; In English
Contract(s)/Grant(s): DAA-H10-02-2-0003
Patent Info.: Filed Filed 27 Oct 04; US-Patent-Appl-SN-10-976 934
Report No.(s): PB2008-101611; No Copyright; Avail.: CASI: A03, Hardcopy

A compressor includes an enhanced vaned shroud and is configured such that the flow area ratio is equivalent to that of a conventional, non-vaned shroud. The vaned shroud includes a plurality of airfoils that vary in thickness to obtain desired vibrational mode shapes and natural frequencies. A stiffening ring of limited axial extent is coupled to, and between, the airfoils, and the shroud is manufactured with a section of constant radius.
NTIS
Airfoils; Compressors; Patent Applications; Shrouds

20080038652 National Energy Technology Lab., Morgantown, WV, USA; West Virginia Univ., Morgantown, WV, USA
Design Considerations For Remote High-Speed Pressure Measurements Of Dynamic Combustion Phenomena
Straub, D. L.; Ferguson, D. H.; Rohrssen, R.; Perez, E.; January 2007; 11 pp.; In English
Report No.(s): DE2007-917417; DOE/NETL-IR-2007-243; No Copyright; Avail.: National Technical Information Service (NTIS)

As gas turbine combustion systems evolve to achieve ultra-low emission targets, monitoring and controlling dynamic combustion processes becomes increasingly important. These dynamic processes may include flame extinction, combustion-driven instabilities, or other dynamic combustion phenomena. Pressure sensors can be incorporated into the combustor liner design, but this approach is complicated by the harsh operating environment. One practical solution involves locating the sensor in a more remote location, such as outside the pressure casing. The sensor can be connected to the measurement point by small diameter tubing. Although this is a practical approach, the dynamics of the tubing can introduce significant errors into the pressure measurement. This paper addresses measurement errors associated with semi-infinite coil remote sensing setups and proposes an approach to improve the accuracy of these types of measurements.
NTIS
Combustion; Combustion Physics; Gas Turbines; High Speed; Pressure Measurement; Remote Sensing

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20080037771 Forest Service, Portland, OR USA
Monitoring Forests from Space: Quantifying Forest Change by Using Satellite Data. Science Findings, Issue Eighty Nine, January 2007
Jan. 2007; 6 pp.; In English
Report No.(s): PB2008-103249; No Copyright; Avail.: CASI: A02, Hardcopy

Change is the only constant in forest ecosystems. Quantifying regional-scale forest change is increasingly done with remote sensing, which relies on data sent from digital camera-like sensors mounted to Earth-orbiting satellites. Through remote sensing, changes in forests can be studied comprehensively and uniformly across time and space. Scientists at the Laboratory for Applications in Remote Sensing in Ecology (LARSE) have pioneered several applications for mapping forest disturbances using Landsat satellite data.
NTIS
Ecology; Ecosystems; Forests; Remote Sensing

20080038089 Aerospace Corp., El Segundo, CA, USA
Multispectral Selective Reflective Lidar
Gelbwachs, J. A., Inventor; 27 Oct 04; 7 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Patent Info.: Filed Filed 27 Oct 04; US-Patent-Appl-SN-10-974 224
Report No.(s): PB2008-101630; No Copyright; Avail.: CASI: A02, Hardcopy

A multispectral selective reflection Lidar system generates alternating pulses of at least two wavelengths and senses returns for determining the presence of a predetermined material absorbing and reradiating one wavelength as selective reflections, but not the other. A detector can readily determine the presence or absence or an absorbing and reradiating return. The system is for preferred use as an orbiter sensor about a planetary body, such as a Jupiter moon, for determining the presence of organic material and for the relay of information back to earth.
NTIS
Optical Radar; Organic Materials; Patent Applications

13
ASTRODYNAMICS

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

20080036827 NASA Marshall Space Flight Center, Huntsville, AL, USA
A New Maneuver for Efficiently Achieving Escape Trajectories in Space Exploration
Adams, Robert B.; Richardson, Georgia; [2008]; 12 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

A newly developed maneuver to escape the gravitational pull of a central body is described. The maneuver improves efficiency considerably for a wide range of missions of interest in space exploration and scientific investigation. A clear delineation of when the maneuver is more effective is given, as are methods to extract the most advantage when using the maneuver. (Some examples are given of how this maneuver can enable exploration of the outer solar system, near interstellar space, and crewed missions to Mars and beyond).
Author
Spacecraft Maneuvers; Spacecraft Trajectories; Gravitational Fields; Escape

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*.

20080036831 American Inst. of Aeronautics and Astronautics, Washington, DC, USA
Hardware and Programmatic Progress on the Ares I-X Flight Test
Davis, Stephan R.; July 20, 2008; 5 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080036831

In less than two years, the National Aeronautics and Space Administration (NASA) will execute the Ares I-X mission. This will be the first flight of the Ares I crew launch vehicle; which, together with the Ares V cargo launch vehicle (Figure 1), will eventually send humans to the Moon, Mars, and beyond. As the countdown to this first Ares mission continues, personnel from across the Ares I-X Mission Management Office (MMO) are finalizing designs and, in some cases, already fabricating vehicle hardware in preparation for an April 2009 launch. This paper will discuss the hardware and programmatic progress of the Ares I-X mission.
Author
Ares 1 Launch Vehicle; Flight Tests; Spacecraft Design; Astrionics; Hardware; Technology Assessment

20080036835 American Inst. of Aeronautics and Astronautics, Washington, DC, USA
Ares Launch Vehicles Development Awakens Historic Test Stands at NASA's Marshall Space Flight Center
Dumbacher, Daniel L.; Burt, Richard K.; July 21, 2008; 4 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080036835

This paper chronicles the rebirth of two national rocket testing assets located at NASA's Marshall Space Flight Center: the Dynamic Test Stand (also known as the Ground Vibration Test Stand) and the Static Test Stand (also known as the Main Propulsion Test Stand). It will touch on the historical significance of these special facilities, while introducing the requirements driving modifications for testing a new generation space transportation system, which is set to come on line after the Space Shuttle is retired in 2010. In many ways, America's journey to explore the Moon begins at the Marshall Center, which is developing the Ares I crew launch vehicle and the Ares V cargo launch vehicle, along with managing the Lunar Precursor Robotic Program and leading the Lunar Lander descent stage work, among other Constellation Program assignments. An important component of this work is housed in Marshall's Engineering Directorate, which manages more than 40 facilities capable of a full spectrum of rocket and space transportation technology testing - from small components to full-up engine systems. The engineers and technicians who operate these test facilities have more than a thousand years of combined experience in this highly specialized field. Marshall has one of the few government test groups in the USA with responsibility for the overall performance of a test program from conception to completion. The Test Laboratory has facilities dating back to the early 1960s, when the test stands needed for the Apollo Program and other scientific endeavors were commissioned and built along the Marshall Center's southern boundary, with logistics access by air, railroad, and barge or boat on the Tennessee River. NASA and its industry partners are designing and developing a new human-rated system based on the requirements for safe, reliable, and cost-effective transportation solutions. Given below are summaries of the Dynamic Test Stand and the Static Test Stand capabilities, along with an introduction to the new missions that these sleeping giants will be fulfilling as NASA readies the Ares I for service in the 2015 timeframe, and plans the development work for fielding the Ares V late next decade (fig. 1). Validating modern computer design models and techniques requires the sorts of data that can only be generated by these one-of-a-kind facilities.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Dynamic Tests; Static Tests; Test Stands; Rocket Test Facilities; Spacecraft Design; Research and Development; Technology Assessment

20080036836 American Inst. of Aeronautics and Astronautics, Washington, DC, USA

Designing the Ares I Crew Launch Vehicle Upper Stage Element and Integrating the Stack at NASA's Marshall Space Flight Center

Lyles, Garry; Otte, Neil E.; July 21, 2008; 5 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080036836

Fielding an integrated launch vehicle system entails many challenges, not the least of which is the fact that it has been over 30 years since the USA has developed a human-rated vehicle - the venerable Space Shuttle. Over time, whole generations of rocket scientists have passed through the aerospace community without the opportunity to perform such exacting, demanding, and rewarding work. However, with almost 50 years of experience leading the design, development, and end-to-end systems engineering and integration of complex launch vehicles, NASA's Marshall Space Flight Center offers the in-house talent - both junior- and senior-level personnel - to shape a new national asset to meet the requirements for safe, reliable, and affordable space exploration solutions.' These personnel are housed primarily in Marshall's Engineering Directorate and are matrixed into the programs and projects that reside at the rocket center. Fortunately, many Apollo era and Shuttle engineers, as well as those who gained valuable hands-on experience in the 1990s by conducting technology demonstrator projects such as the Delta-Clipper Experimental Advanced, X-33, X-34, and X-37, as well as the short-lived Orbital Space Plane, work closely with industry partners to advance the nation's strategic capability for human access to space. Currently, only three spacefaring nations have this distinction, including the USA, Russia, and, more recently, China. The U.S. National Space Policy of2006 directs that NASA provide the means to travel to space, and the NASA Appropriations Act of2005 provided the initial funding to begin in earnest to replace the Shuttle after the International Space Station construction is complete in 20 IO? These and other strategic goals and objectives are documented in NASA's 2006 Strategic Plan.3 In 2005, a team of NASA aerospace experts conducted the Exploration Systems Architecture Study, which recommended a two-vehicle approach to America's next space transportation system for missions to the International Space Station in the next decade and to explore the Moon and establish an outpost around the 2020 timeframe.4 Based on this extensive study, NASA selected the Ares I crew launch vehicle configuration and the heavy-lift Ares V cargo launch vehicle (fig 1). This paper will give an overview of NASA's approach to integrating the Ares I vehicle stack using capabilities and assets that are resident in Marshall's Engineering Directorate, working in partnership with other NASA Centers and the U.S. aerospace industry. It also will provide top-level details on the progress of the in-house design of the Ares I vehicle's upper stage element.

Author

Ares 1 Launch Vehicle; Launch Vehicle Configurations; Space Transportation System; Ares 5 Cargo Launch Vehicle; Aerospace Industry; Systems Engineering; Systems Integration

20080036839 American Inst. of Aeronautics and Astronautics, Washington, DC, USA

NASA Ares I Launch Vehicle Roll and Reaction Control Systems Overview

Popp, Chris; Butt, Adam; Sharp, David; Pitts, Hank; July 20, 2008; 1 pp.; In English; AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; Copyright; Avail.: Other Sources; Abstract Only

NASA's Ares I launch vehicle, consisting of a five segment solid rocket booster first stage and a liquid bi-propellant J-2X engine upper stage, is the vehicle that's been chosen to return humans to the moon, mars, and beyond. This paper provides an overview of the work that has taken place on the Ares I launch vehicle roll and reaction control systems. Reaction control systems are found on many launch vehicles and provide a vehicle with a three degree of freedom stabilization during the mission. The Ares I baseline configuration currently consists of a first stage roll control system that will provide the vehicle with a method of counteracting the roll torque that is expected during launch. An upper stage reaction control system will allow the upper stage three degrees of freedom control as needed. Design assessments and trade studies are being conducted on the roll and reaction control systems including: propellant selection, thruster arrangement, pressurization system configuration, and system component trades. Other vehicle considerations and issues include thruster plume impingement, thruster module aerothermal and aerodynamic effects, and system integration. This paper concludes by summarizing the process of down selecting to the current baseline configuration for the Ares I roll and reaction control systems.

Author

Ares 1 Launch Vehicle; Spacecraft Control; Systems Engineering; Roll; Reaction Control

20080037556 NASA Marshall Space Flight Center, Huntsville, AL, USA

Progress on Ares First Stage Propulsion

Priskos, Alex S.; Williams, Thomas J.; Brasfield, Fred; Jacobs, Michael; July 20, 2008; 3 pp.; In English; AIAA Joint Propulsion Conference, 20-23 Jul. 2008, Hartford, CT, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037556

The National Aeronautics and Space Administration (NASA) Ares Projects Office (APO) is continuing to make progress toward the final design of the first stage propulsion system for the Ares I crew launch vehicle and the Ares V cargo launch vehicle. Ares I and Ares V will provide the space launch capabilities necessary to fulfill NASA's exploration strategy of sending human beings to the Moon, Mars, and beyond. As primary propulsion for both the Ares I and Ares V, the Space Shuttle-derived Reusable Solid Rocket Motor (RSRM) is one of the first and most important components to be tested. The first flight of Ares I, called Ares I-X, will occur in April 2009. The Ares I-X flight will use a combination of flight and simulation hardware to obtain data on controlling the long and narrow crew launch vehicle configuration.

Author

Ares 1 First Stage; Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Spacecraft Propulsion; Spacecraft Design; Spacecraft Launching; Reusable Rocket Engines; Space Shuttle Boosters

20080037804 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ares V and Future Very Large Launch Vehicles to Enable Major Astronomical Missions

Thronson, Harley; Langhoff, Stephanie; Stahl, H. Philip; Lester, Daniel; Sep. 29, 2008; 1 pp.; In English; 59th International Astronautical Congress 2008, 29 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK; Copyright; Avail.: Other Sources; Abstract Only

The current NASA architecture planned to return humans to the lunar surface includes the Ares V heavy lift launch vehicle designed primarily to carry the Altair lunar lander and to be available before about 2020. However. the capabilities of this system (and its variants) are such that adapting the vehicle to launch very large optical systems could achieve major scientific goals that are not otherwise possible. For example, an 8-m monolith UV/visual/IR telescope appears able to be launched to the Sun-Earth L2 location by an Ares V with a 10-m fairing. Even larger apertures that are deployed or assembled in space seem possible, which may take advantage of other elements of NASA's future human spaceflight architecture. Alternatively. multiple elements of a spatial array or two or three astronomical observatories might he launched simultaneously. That is, Ares V appears to offer the astronomy communities an opportunity to put into orbit extremely capable observatories, in addition to being a key element of NASA's current architecture for human spaceflight. For the past year, a number of scientists and engineers have been eva1uating concepts for astronomical observatories that take advantage of future large launch vehicles, including the science goals of such missions and design modifications to the vehicle to enable the observatories. In parallel, members of the Solar System science communities have likewise been considering what major science goals can be achieved if new, extremely capable launch systems become available.

Author

Astronomical Observatories; Ares 5 Cargo Launch Vehicle; Heavy Lift Launch Vehicles; Space Flight; Astronomy; Ultraviolet Telescopes

20080038921 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Predicting Cost and Schedule Growth for Military and Civil Space Systems

Rusnock, Christina F; Mar 2008; 145 pp.; In English

Report No.(s): AD-A482546; AFIT/GRD/ENC/08M-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research seeks to identify factors contributing to military and civil space system cost and schedule growth, quantify the relative impact of these factors, and establishing a set of models for predicting cost and schedule growth. The analysis consists of logistic and multiple regression to assess 21 Department of Defense and 71 National Aeronautics and Space Administration (NASA) space programs. The study finds that, for military spaces systems, communications missions, ground equipment, firm-fixed price contracts, and increased program manager tenure are all predictive of lower cost growth. For NASA space programs, the study finds that smaller programs (by total cost), more massive spacecraft, microgravity missions, and space physics missions are predictive of higher cost growth. For schedule growth of NASA programs, the study finds that larger programs and those developed by the Jet Propulsion Laboratory, Northrop Grumman, or international developers are predictive of increased schedule growth, whereas those programs developed by Johns Hopkins University are predictive of reduced schedule growth.

DTIC

Aerospace Systems; Cost Estimates; Costs; Models; NASA Programs; Predictions; Schedules; Scheduling

20080038986 General Accounting Office, Washington, DC USA

Environmental Satellites. Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity

May 2008; 54 pp.; In English

Report No.(s): AD-A482677; GAO-08-518; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a triagency acquisition managed by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA) that has experienced escalating costs, schedule delays, and technical difficulties. These factors led to a June 2006 decision to restructure the program by reducing the number of satellites and sensors, increasing estimated costs to $12.5 billion, and delaying the first two satellites by 3 to 5 years. Among other objectives, GAO was asked to evaluate progress in restructuring the acquisition, assess the status of key program components and risks, and assess NASA's, NOAA's, and DOD's plans for obtaining the data originally planned to be collected by NPOESS sensors, but eliminated by the restructuring. To do so, GAO analyzed program and contractor data, attended program reviews, and interviewed agency officials.

DTIC

Climate; Meteorological Satellites

20080038987 General Accounting Office, Washington, DC USA

Environmental Satellites: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity

Jun 19, 2008; 35 pp.; In English

Report No.(s): AD-A482679; GAO-08-899T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a triagency acquisition managed by the Department of Commerce s National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA) which has experienced escalating costs, schedule delays, and technical difficulties. These factors led to a June 2006 decision to restructure the program thereby decreasing its complexity, increasing its estimated cost to $12.5 billion, and delaying the first two satellites by 3 to 5 years. GAO was asked to summarize a report being released today that evaluates progress in restructuring the acquisition, assesses the status of key program components and risks, and assesses the agencies' plans for obtaining the data originally planned to be collected by NPOESS sensors, but eliminated by the restructuring.

DTIC

Climate; Meteorological Satellites

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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*.

20080037984 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Orbit Determination During Spacecraft Emergencies with Sparse Tracking Data - THEMIS and TDRS-3 Lessons Learned

Morinelli, Patrick J.; Ward, Douglas T.; Blizzard, Michael R.; Mendelsohn, Chad R.; August 18, 2008; 7 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA

Contract(s)/Grant(s): NNG04DA01C; Copyright; Avail.: CASI: A02, Hardcopy

This paper provides an overview of the lessons learned from the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center s (GSFC) Flight Dynamics Facility s (FDF) support of the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft emergency in February 2007, and the Tracking and Data Relay Satellite-3 (TDRS-3) spacecraft emergency in March 2006. A successful and timely recovery from both of these spacecraft emergencies depended on accurate knowledge of the orbit. Unfortunately, the combination of each spacecraft emergency with very little tracking data contributed to difficulties in estimating and predicting the orbit and delayed recovery efforts in both cases. In both the THEMIS and TDRS-3 spacecraft emergencies, numerous factors contributed to problems with obtaining nominal tracking data measurements. This paper details the various causative factors and challenges. This paper further enumerates lessons learned from FDF s recovery efforts involving the THEMIS and TDRS-3 spacecraft emergencies

and scant tracking data, as well as recommendations for improvements and corrective actions. In addition, this paper describes the broad range of resources and complex navigation methods employed within the FDF for supporting critical navigation activities during all mission phases, including launch, early orbit, and on-orbit operations.
Author
Lessons Learned; Spacecraft Tracking; Orbit Determination; Aerodynamics; TDR Satellites; Range Resources; Navigation

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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*.

20080037300 NASA Marshall Space Flight Center, Huntsville, AL, USA
Materials, Processes and Manufacturing in Ares 1 Upper Stage: Integration with Systems Design and Development
Bhat, Biliyar N.; June 23, 2008; 46 pp.; In English; National Space and Missile Materials Symposium (NSMMS), 23-26 Jun. 2008, Las Vegas,NV, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037300

Ares I Crew Launch Vehicle Upper Stage is designed and developed based on sound systems engineering principles. Systems Engineering starts with Concept of Operations and Mission requirements, which in turn determine the launch system architecture and its performance requirements. The Ares I-Upper Stage is designed and developed to meet these requirements. Designers depend on the support from materials, processes and manufacturing during the design, development and verification of subsystems and components. The requirements relative to reliability, safety, operability and availability are also dependent on materials availability, characterization, process maturation and vendor support. This paper discusses the roles and responsibilities of materials and manufacturing engineering during the various phases of Ares IUS development, including design and analysis, hardware development, test and verification. Emphasis is placed how materials, processes and manufacturing support is integrated over the Upper Stage Project, both horizontally and vertically. In addition, the paper describes the approach used to ensure compliance with materials, processes, and manufacturing requirements during the project cycle, with focus on hardware systems design and development.
Author
Ares 1 Upper Stage; Systems Engineering; Mission Planning; Design Analysis; Manufacturing; Inertial Upper Stage

20080037553 NASA Marshall Space Flight Center, Huntsville, AL, USA
Extreme Space Weather Events and Charging Hazard Assessments in Lunar Environments
Minow, Joseph; Parker, L.; Blackwell, W., Jr.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly/Committe on Space Research, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

The sunlit lunar surface charges to positive potentials with mean values of a few tens of volts where photoelectron currents dominate the charging process. In contrast, surfaces in darkness may charge to negative potentials on the order of a few hundred volts when the charging process is dominated by hot electron populations in the absence of solar photons. Recently, observations of electron beams measured by instruments on spacecraft in low lunar orbit have been interpreted as evidence for extreme lunar surface potentials exceeding a few kilovolts suggesting that lunar orbital and surface plasma environments may contain charging risks similar to geostationary orbit during extreme space weather conditions. Space system design for successful operation in a wide range of lunar environments will therefore require evaluation of charging hazards during extreme space weather conditions. We present results from a study of space weather environments conducted to obtained credible extreme charging environments for use in charging hazard assessments for lunar missions including extreme conditions encountered when the Moon is in the solar wind, the magnetosheath, and the Earth's magnetotail.
Author
Spacecraft Charging; Space Weather; Lunar Environment; Systems Engineering; Electrical Resistance

20080037558 NASA Marshall Space Flight Center, Huntsville, AL, USA
Estimated Environmental Exposures for MISSE-3 and MISSE-4
Finckenor, Miria M.; Pippin, Gary; Kinard, William H.; June 23, 2008; 23 pp.; In English; National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Describes the estimated environmental exposure for MISSE-2 and MISSE-4. These test beds, attached to the outside of the International Space Station, were planned for 3 years of exposure. This was changed to 1 year after MISSE-1 and -2 were in space for 4 years. MISSE-3 and -4 operate in a low Earth orbit space environment, which exposes them to a variety of assaults including atomic oxygen, ultraviolet radiation, particulate radiation, thermal cycling, and meteoroid/space debris impact, as well as contamination associated with proximity to an active space station. Measurements and determinations of atomic oxygen fluences, solar UV exposure levels, molecular contamination levels, and particulate radiation are included.
CASI
International Space Station; Test Stands; Space Weathering; Earth Orbital Environments; Aerospace Environments; Low Earth Orbits; Atmospheric Effects

20080037809 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Current LISA Spacecraft Design
Merkowitz, Stephen; June 16, 2008; 1 pp.; In English; 7th LISA Symposium, 16-20 Jun. 2008, Barcelona, Spain; No Copyright; Avail.: Other Sources; Abstract Only

The Laser Interferometer Space Antenna (LISA) mission, a space based gravitational wave detector, uses laser metrology to measure distance fluctuations between proof masses aboard three spacecraft. LISA is unique from a mission design perspective in that three spacecraft and their associated operations form one distributed science instrument, unlike more conventional missions where an instrument is a component of an individual spacecraft. The design of the LiSA spacecraft is also tightly coupled to the design and requirements of the scientific payload; for this reason it is often referred to as a 'sciencecraft.' A detailed discussion will be presented that describes the current spacecraft design and mission architecture needed to meet the LISA science requirements.
Author
Gravitational Waves; LISA (Observatory); Space Missions; Spacecraft Design; Metrology; Interferometers

20080038043 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Part Marking and Identification Materials' for MISSE
Roxby, Donald; Finckenor, Miria M.; June 23, 2008; 1 pp.; In English; National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Materials on International Space Station Experiment (MISSE) is being conducted with funding from NASA and the U.S. Department of Defense, in order to evaluate candidate materials and processes for flight hardware. MISSE modules include test specimens used to validate NASA technical standards for part markings exposed to harsh environments in low-Earth orbit and space, including: atomic oxygen, ultraviolet radiation, thermal vacuum cycling, and meteoroid and orbital debris impact. Marked test specimens are evaluated and then mounted in a passive experiment container (PEC) that is affixed to an exterior surface on the International Space Station (ISS). They are exposed to atomic oxygen and/or ultraviolet radiation for a year or more before being retrieved and reevaluated. Criteria include percent contrast, axial uniformity, print growth, error correction, and overall grade. MISSE 1 and 2 (2001-2005), MISSE 3 and 4 (2006-2007), and MISSE 5 (2005-2006) have been completed to date. Acceptable results were found for test specimens marked with Data Matrix(TradeMark) symbols by Intermec Inc. and Robotic Vision Systems Inc using: laser bonding, vacuum arc vapor deposition, gas assisted laser etch, chemical etch, mechanical dot peening, laser shot peening, laser etching, and laser induced surface improvement. MISSE 6 (2008-2009) is exposing specimens marked by DataLase(Registed TradeMark), Chemico technologies Inc., Intermec Inc., and tesa with laser-markable paint, nanocode tags, DataLase and tesa laser markings, and anodized metal labels.
Derived from text
International Space Station; Aerospace Environments; Marking; Materials Tests; Spacecraft Construction Materials; Mechanical Properties; Physical Properties; Spacecraft Design

20080039140 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optimized Heat Interception for Cryogen Tank Support Structure
Canavan, E. R.; Miller, F. K.; July 16, 2007; 1 pp.; In English; Cryogenic Engineering Conference, 16-20 Jul. 2007, Chatanooga, TN, USA; No Copyright; Avail.: Other Sources; Abstract Only

We consider means for using the cooling available in boil-off gas to intercept heat conducted through the support structure

of a cryogen tank. A one-dimensional model of the structure coupled to a gas stream gives an analytical expression for heat leak in terms of flow rate for temperature independent properties and laminar flow. A numerical model has been developed for heat transfer on a thin cylindrical tube with an attached vent line. The model is used to determine the vent path layout that will minimize heat flow into the cryogen tank. The results are useful for a number of applications, but the one of interest in this study is the minimization of the boil-off in large cryopropellant tanks in low Earth and low lunar orbit.
Author
Heat Transfer; Cryogenics; Flow Velocity; Laminar Flow; Cylindrical Bodies; Propellant Tanks

20080039173 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Best Practices for Operations of Satellite Constellations
Howard, Joseph; Oza, Dipak; Smith, Danford S.; June 19, 2006; 10 pp.; In English; Space Ops 2006, 19-23 Jun. 2006, Rome, Italy; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This paper presents the best practices used by several commercial and government operators of satellite constellations. These best practices were identified through a series of seminars and discussions held at NASA Goddard Space Flight Center (GSFC). The best practices are arrived through many years of experience and improvements made in the operations procedures and the operational systems with the primary drivers as mission safety and cost effectiveness. This paper discusses the operational aspects associated with how different organizations manage complexities of constellation operations. For the purposes of this paper, satellite constellations are groups of similar spacecraft with more than one spacecraft needed to fully accomplish the constellation's mission
Author
Satellite Constellations; Safety; Procedures

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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*.

20080036828 NASA Marshall Space Flight Center, Huntsville, AL, USA
In-Situ F2-Region Plasma Density and Temperature Measurements from the International Space Station
Coffey, Victoria; Wright, Kenneth; Minow, Joseph; May 27, 2008; 1 pp.; In English; 2008 American Geophysical Union Joint Assembly, 27-30 May 2008, Fort Lauderdale, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080036828

The International Space Station orbit provides an ideal platform for in-situ studies of space weather effects on the mid and low latitude F-2 region ionosphere. The Floating Potential Measurement Unit (FPMU) operating on the ISS since Aug 2006. is a suite of plasma instruments: a Floating Potential Probe (FPP), a Plasma Impedance Probe (PIP), a Wide-sweep langmuir Probe (WLP), and a Narrow-sweep Langmuir Probe (NLP). This instrument package provides a new opportunity lor collaborative multi-instrument studies of the F-region ionosphere during both quiet and disturbed periods. This presentation first describes the operational parameters for each of the FPMU probes and shOWS examples of an intra-instrument validation. We then show comparisons with the plasma density and temperature measurements derived from the TIMED GUVI ultraviolet imager, the Millstone Hill ground based incoherent scatter radar, and DIAS digisondes, Finally we show one of several observations of night-time equatorial density holes demonstrating the capabilities of the probes lor monitoring mid and low latitude plasma processes.
Author
Instrument Packages; Plasma Density; Space Weather; Temperature Measurement; Plasma Probes; Measuring Instruments; F 2 Region

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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*.

20080036829 NASA Marshall Space Flight Center, Huntsville, AL, USA
Turbine Design and Analysis for the J-2X Engine Turbopumps
Marcu, Bogdan; Tran, Ken; Dorney, Daniel J.; Schmauch, Preston; July 21, 2008; 14 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Pratt and Whitney Rocketdyne and NASA Marshall Space Flight Center are developing the advanced upper stage J-2X engine based on the legacy design of the J-2/J-2S family of engines which powered the Apollo missions. The cryogenic propellant turbopumps have been denoted as Mark72-F and Mark72-0 for the fuel and oxidizer side, respectively. Special attention is focused on preserving the essential flight-proven design features while adapting the design to the new turbopump configuration. Advanced 3-D CFD analysis has been employed to verify turbine aero performance at current flow regime boundary conditions and to mitigate risks associated with stresses. A limited amount of redesign and overall configuration modifications allow for a robust design with performance level matching or exceeding requirement.
Author
Computational Fluid Dynamics; Design Analysis; Turbine Pumps; Cryogenic Rocket Propellants; Rocket Engines

20080036840 American Inst. of Aeronautics and Astronautics, Washington, DC, USA
Laboratory-Model Integrated-System FARAD Thruster
Polzin, K.A.; Best, S.; Miller, R.; Rose, M.F.; Owens, T.; July 20, 2008; 2 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Pulsed inductive plasma accelerators are spacecraft propulsion devices in which energy is stored in a capacitor and then discharged through an inductive coil. The device is electrodeless, inducing a plasma current sheet in propellant located near the face of the coil. The propellant is accelerated and expelled at a high exhaust velocity (order of 10 km/s) through the interaction of the plasma current with an induced magnetic field. The Faraday Accelerator with RF-Assisted Discharge (FARAD) thruster [1,2] is a type of pulsed inductive plasma accelerator in which the plasma is preionized by a mechanism separate from that used to form the current sheet and accelerate the gas. Employing a separate preionization mechanism in this manner allows for the formation of an inductive current sheet at much lower discharge energies and voltages than those found in previous pulsed inductive accelerators like the Pulsed Inductive Thruster (PIT). In a previous paper [3], the authors presented a basic design for a 100 J/pulse FARAD laboratory-version thruster. The design was based upon guidelines and performance scaling parameters presented in Refs. [4, 5]. In this paper, we expand upon the design presented in Ref. [3] by presenting a fully-assembled and operational FARAD laboratory-model thruster and addressing system and subsystem-integration issues (concerning mass injection, preionization, and acceleration) that arose during assembly. Experimental data quantifying the operation of this thruster, including detailed internal plasma measurements, are presented by the authors in a companion paper [6]. The thruster operates by first injecting neutral gas over the face of a flat, inductive acceleration coil and at some later time preionizing the gas. Once the gas is preionized current is passed through the acceleration coil, inducing a plasma current sheet in the propellant that is accelerated away from the coil through electromagnetic interaction with the time-varying magnetic field. Neutral gas is injected over the face of the acceleration coil through a fast-acting valve that feeds a central distribution manifold. The thruster is designed to preionize the gas using an RF-frequency ringing signal produced by a discharging Vector Inversion Generator (VIG). The acceleration stage consists of a multiple-turn, multiple-strand spiral induction coil (see Fig. 1, left panel) and is designed for operation at discharge energies on the order of 100 J/pulse. Several different pulsed power train modules can be used to drive current through the acceleration coil. One such power train is based upon the Bernardes and Merryman circuit topology, which restricts voltage reversal on the capacitor banks and can be clamped to eliminate current reversal in the coil. A second option is a pulse-compression-ring power train (see Fig. 1, right panel), which takesa temporally broad, low current pulse and transforms it into a short, high current pulse.
Author
Electromagnetic Interactions; Faraday Effect; Radio Frequencies; High Current; Pulsed Inductive Thrusters; Spacecraft Propulsion; Plasma Accelerators

20080036841 American Inst. of Aeronautics and Astronautics, Washington, DC, USA

General Purpose Heat Source Simulator

Emrich, Bill; July 20, 2008; 1 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA; No Copyright; Avail.: Other Sources; Abstract Only

The General Purpose Heat Source (GPHS) simulator project is designed to replicate through the use of electrical heaters, the form, fit, and function of actual GPHS modules which generate heat through the radioactive decay of Pu238. The use of electrically heated modules rather than modules containing Pu238 facilitates the testing of spacecraft subsystems and systems without sacrificing the quantity and quality of the test data gathered. Previous GPHS activities are centered around developing robust heater designs with sizes and weights that closely matched those of actual Pu238 fueled GPHS blocks. These efforts were successful, although their maximum temperature capabilities were limited to around 850 C. New designs are being pursued which also replicate the sizes and weights of actual Pu238 fueled GPHS blocks but will allow operation up to 1100 C. Author

Radioisotope Heat Sources; Heaters; Modules; Simulators; Space Power Reactors

20080036842 American Inst. of Aeronautics and Astronautics, Washington, DC, USA

Performance Increase Verification for a Bipropellant Rocket Engine

Alexander, Leslie; Chapman, Jack; Wilson, Reed; Krismer, David; Lu, Frank; Wilson, Kim; Miller, Scott; England, Chris; July 20, 2008; 2 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA

Contract(s)/Grant(s): NNM06AA93C; No Copyright; Avail.: Other Sources; Abstract Only

Component performance assessment testing for a, pressure-fed earth storable bipropellant rocket engine was successfully completed at Aerojet's Redmond test facility. The primary goal of the this development project is to increase the specific impulse of an apogee class bi-propellant engine to greater than 330 seconds with nitrogen tetroxide and monomethylhydrazine propellants and greater than 335 seconds with nitrogen tetroxide and hydrazine. The secondary goal of the project is to take greater advantage of the high temperature capabilities of iridium/rhenium chambers. In order to achieve these goals, the propellant feed pressures were increased to 400 psia, nominal, which in turn increased the chamber pressure and temperature, allowing for higher c*. The tests article used a 24-on-24 unlike doublet injector design coupled with a copper heat sink chamber to simulate a flight configuration combustion chamber. The injector is designed to produce a nominal 200 lbf of thrust with a specific impulse of 335 seconds (using hydrazine fuel). Effect of Chamber length on engine C* performance was evaluated with the use of modular, bolt-together test hardware and removable chamber inserts. Multiple short duration firings were performed to characterize injector performance across a range of thrust levels, 180 to 220 lbf, and mixture ratios, from 1.1 to 1.3. During firing, ignition transient, chamber pressure, and various temperatures were measured in order to evaluate the performance of the engine and characterize the thermal conditions. The tests successfully demonstrated the stable operation and performance potential of a full scale engine with a measured c* of XXXX ft/sec (XXXX m/s) under nominal operational conditions.

Author

Liquid Rocket Propellants; Rocket Engines; Specific Impulse; Performance Tests; High Temperature; Engine Parts; Combustion Chambers; Component Reliability; Transient Pressures

20080037742 Jacobs Engineering Group, Inc., Huntsville, AL, USA

Scaling of Performance in Liquid Propellant Rocket Engine Combustors

Hulka, James; July 23, 2008; 33 pp.; In English; AIAA/ASME/SAE Joint Propulsion Conference, 21-23 Jul. 2008, Hartford, CT, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNM05AB50C; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037742

The objectives are: a) Re-introduce to you the concept of scaling; b) Describe the scaling research conducted in the 1950s and early 1960s, and present some of their conclusions; c) Narrow the focus to scaling for performance of combustion devices for liquid propellant rocket engines; and d) Present some results of subscale to full-scale performance from historical programs. Scaling is 'The ability to develop new combustion devices with predictable performance on the basis of test experience with old devices.' Scaling can be used to develop combustion devices of any thrust size from any thrust size. Scaling is applied mostly to increase thrust. Objective is to use scaling as a development tool. - Move injector design from an 'art' to a 'science'

Derived from text

Combustion Chambers; Liquid Propellant Rocket Engines; Thrust; Scaling; Combustion

20080039164 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Active Co-Storage of Cryogenic Propellants for Lunar Explortation

Mustafi, S.; Canavan, E. R.; Boyle, R. F.; Panek, J. S.; Riall, S. M.; Miller, F. K.; September 09, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Long-term storage of cryogenic propellants is a critical requirement for NASA's effort to return to the moon. Liquid hydrogen and liquid oxygen provide the highest specific impulse of any practical chemical propulsion system, and thus provides the greatest payload mass per unit of launch mass. Future manned missions will require vehicles with the flexibility to remain in orbit for months, necessitating long-term storage of these cryogenic liquids. For decades cryogenic scientific satellites have used dual cryogens with different temperatures to cool instruments. This technology utilizes a higher temperature cryogen to provide a stage that efficiently intercepts a large fraction of the heat that would otherwise be incident on the lower temperature cryogen. This interception reduces the boil-off of the lower temperature cryogen and increasing the overall life-time of the mission. The Active Co-Storage concept is implemented similarly; the 101 K liquid oxygen thermally shields the 24 K liquid hydrogen. A thermal radiation shield that is linked to the liquid oxygen tank shrouds the liquid hydrogen tank, thereby preventing the liquid hydrogen tank from being directly exposed to the 300 K external environment. Modern cryocooler technology can eliminate the liquid oxygen boil-off and also cool the thermal radiation shield thereby reducing the liquid hydrogen boil-off to a small fraction of the unshielded rate. The thermal radiation shield can be a simple conductive shroud or a more sophisticated but lighter Broad Area Cooling (BAC) shroud. The paper describes the design impact of an active co-storage system for the Altair Descent Vehicle. This paper also compares the spacecraft-level impacts of the conductive shroud and the BAC shroud active co-storage concepts with a passive storage option in the context of the different scales of spacecraft that will be used for the lunar exploration effort - the Altair Ascent and Descent Vehicles, the Orion, and the Ares V Earth Departure Stage. The paper also reports on a subscale test of this active co-storage configuration. The test tank is 0.7 m in diameter, approximately one-third the dimension of tanks that would be needed in a lunar ascent module. A thin-walled fiberglass skirt supports and isolates the tank from a 100 K stage. A similar thin-walled skirt supports the lOOK stage from the ambient temperature structure. An aluminum shield with a heavy MLI blanket surrounds the tank and is attached at the 100 K stage. In this initial phase of the project, there is no tank on the 100 K stage, but it is actively cooled by a single-stage cryocooler similar in design to the one used on the RHESSI mission. The test configuration includes a number of innovative elements, including a helical support heat exchanger and an external thermodynamic vent/heat interception system. To avoid the complexity of an explosive gas handling system, testing will be done with liquid helium and liquid neon as simulant fluids. The properties of these fluids bracket the properties of liquid hydrogen. Instrumentation allows tank temperature and shield temperature profiles, tank liquid levels, and pressure drops through the flow lines, to be measured. Author

Cryogenic Rocket Propellants; Cryogenic Fluid Storage; Lunar Exploration; Cryogenic Tanks; Structural Design

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20080037322 Los Alamos National Lab., NM USA

Enhanced Pinning in Mixed Rare Earth-123 Films

Driscoll, J. L., Inventor; Foltyn, S. R., Inventor; 25 Aug 04; 11 pp.; In English

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

Patent Info.: Filed Filed 25 Aug 04; US-Patent-Appl-SN-10-925 479

Report No.(s): PB2008-102196; No Copyright; Avail.: CASI: A03, Hardcopy

An superconductive article and method of forming such an article is disclosed, the article including a substrate and a layer of a rare earth barium cuprate film upon the substrate, the rare earth barium cuprate film including two or more rare earth metals capable of yielding a superconductive composition where ion size variance between the two or more rare earth metals is characterized as greater than zero and less than about 10 times 10(sup -4), and the rare earth barium cuprate film including two or more rare earth metals is further characterized as having an enhanced critical current density in comparison to a standard YBa(sub 2)Cu(sub 3)O(sub y) composition under identical testing conditions.

NTIS

Pinning; Rare Earth Compounds; Thin Films; Rare Earth Elements; Superconductivity; Superconducting Films

20080037335 Alston and Bird, LLP, Charlotte, NC, USA; North Carolina State Univ., Raleigh, NC USA
Process for Preparing Microrods Using Liquid-Liquid Dispersion
Velev, O. D., Inventor; Alargova, R. G., Inventor; 15 Jun 05; 19 pp.; In English
Contract(s)/Grant(s): CAREER CTS 0238636; NER CTS 0403462
Patent Info.: Filed Filed 15 Jun 05; US-Patent-Appl-SN-11-153 888
Report No.(s): PB2008-101918; No Copyright; Avail.: CASI: A03, Hardcopy

The invention provides a method for forming polymer microrods, the method including the steps of providing a polymer solution comprising a polymer dissolved in a first solvent; providing a dispersion medium comprising a second solvent, wherein the first solvent and the second solvent are miscible or partially soluble in each other, and wherein the polymer is insoluble in the second solvent; adding the polymer solution to the dispersion medium to form a dispersed phase of polymer solution droplets within the dispersion medium; and introducing a shear stress to the dispersion medium and dispersed polymer solution droplets for a time and at a shear rate sufficient to elongate the polymer solution droplets to form microrods and solidify the microrods by attrition of the polymer solvent into the dispersion medium.

NTIS
Patent Applications; Solvents; Polymer Blends; Drops (Liquids)

20080037338 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA
Electronically and Ionically Conductive Porous Material and Method for Manufacture of Resin Wafers Therefrom
Lin, Y. J., Inventor; Henry, M. P., Inventor; Snyder, S. W., Inventor; 17 Mar 05; 9 pp.; In English
Contract(s)/Grant(s): W-31-109-ENG-38
Patent Info.: Filed Filed 17 Mar 05; US-Patent-Appl-SN-11-082 468
Report No.(s): PB2008-101915; No Copyright; Avail.: CASI: A02, Hardcopy

An electrically and ionically conductive porous material including a thermoplastic binder and one or more of anion exchange moieties or cation exchange moieties or mixtures thereof and/or one or more of a protein capture resin and an electrically conductive material. The thermoplastic binder immobilizes the moieties with respect to each other but does not substantially coat the moieties and forms the electrically conductive porous material. A wafer of the material and a method of making the material and wafer are disclosed.

NTIS
Electrical Resistivity; Patent Applications; Porous Materials; Resins; Wafers

20080037351 Dunlap Codding and Rogers, PC, Oklahoma City, OK, USA
Process and Apparatus for Producing Single Walled Carbon Nanotubes
Resasco, D. E., Inventor; Kitiyanan, B., Inventor; Alvarez, W. E., Inventor; Balzano, L., Inventor; 28 Oct 04; 23 pp.; In English
Contract(s)/Grant(s): CTS-9726465
Patent Info.: Filed Filed 28 Oct 04; US-Patent-Appl-SN-10-976 216
Report No.(s): PB2008-101956; No Copyright; Avail.: CASI: A03, Hardcopy

A process and apparatus for catalytic production of single walled carbon nanotubes. Catalytic particles are exposed to different process conditions at successive stages wherein the catalytic particles do not come in contact with reactive (catalytic) gases until preferred process conditions have been attained, thereby controlling the quantity and form of carbon nanotubes produced. The reaction gas is preferably provided at a high space velocity to minimize CO(sub 2) build-up. The process also contemplates processes and apparatus which recycle and reuse the gases and catalytic particulate materials, thereby maximizing cost efficiency, reducing wastes, reducing the need for additional raw materials, and producing the carbon nanotubes, especially SWNTs, in greater quantities and for lower costs.

NTIS
Carbon; Carbon Nanotubes; Patent Applications

20080037363 Thomas, Kayden, Horstemeyer and Risley, LLP, Atlanta, GA, USA
Modified Electrically Conductive Adhesives
Li, Y., Inventor; Moon, K. S., Inventor; Wong, C. P., Inventor; 14 Oct 05; 14 pp.; In English
Contract(s)/Grant(s): EPA-RD-83148901-0

Patent Info.: Filed Filed 14 Oct 05; US-Patent-Appl-SN-11-251 240
Report No.(s): PB2008-102769; No Copyright; Avail.: CASI: A03, Hardcopy

Modified electrically conductive adhesives and methods of preparing thereof, are disclosed.

NTIS

Adhesives; Electrical Resistivity; Patent Applications

20080037364 Thomas, Kayden, Horstemeyer and Risley, LLP, Atlanta, GA, USA

Electrically Conductive Adhesives and Methods of Making

Li, Y., Inventor; Moon, K. S., Inventor; Wong, C. P., Inventor; 18 Oct 05; 19 pp.; In English
Contract(s)/Grant(s): NSF-DMI-0217910; EPA-RD-83148901
Patent Info.: Filed Filed 18 Oct 05; US-Patent-Appl-SN-11-252 371
Report No.(s): PB2008-102770; No Copyright; Avail.: CASI: A03, Hardcopy

Modified electrically conductive adhesives and methods of preparation thereof, are disclosed.Modified electrically conductive adhesives and methods of preparing thereof, are disclosed.

NTIS

Adhesives; Electrical Resistivity; Patent Applications

20080037366 Faegre and Benson, LLP, Minneapolis, MN, USA

Highly Microporous Polymers and Methods for Producing and Using the Same

Beard, K. W., Inventor; 20 Jan 05; 11 pp.; In English
Contract(s)/Grant(s): N00164-04-C-6064
Patent Info.: Filed Filed 20 Jan 05; US-Patent-Appl-SN-11-040 277
Report No.(s): PB2008-102765; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides microporous polymers and methods for producing and using the same. In particular, microporous polymers of the present invention are highly porous as indicated by a Gurley air permeability flow rate of about 4 seconds or less per mL of air flow per 25 micron of microporous polymer thickness per square inch.

NTIS

Microporosity; Patent Applications; Polymers

20080037504 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Reduce Manufacturing Costs of Ultra-High Temperature Rhenium Pintle/Throat Combinations

Jun 28, 2006; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-05-0073-10
Report No.(s): AD-A482156; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Controllable thrust propulsion for the next generation of tactical missiles (NLOS PAM) is providing significant mission flexibility and increasing the system's capability in terms of precision performance. Thrust propulsion within a tactical missile is controlled by a pintle/throat configuration. The purpose of the pintle/throat configuration is to maximize the thrust within the rocket motor to successfully propel the missile. Rhenium, due to its high thermal and mechanical properties, is the best acceptable high-temperature and corrosion resistant material for managed-energy tactical propulsion systems. The NCDMM, along with Plasma Processes, Inc. (PPI), and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), have been requested to optimize the manufacturing process to reduce the cost of the pintle/throat combinations. This will be accomplished by replacing solid rhenium with rhenium coatings fabricated by Plasma Processes' El-Form electrodeposition process. In a previous effort, PPI had successfully machined the pintles and throats from lightweight graphite substrates. Utilizing their El-Form rhenium deposition process, PPI successfully coated these graphite pintles and throats with a rhenium coating in several thicknesses for testing. During previous 'Hot Fire' testing (several iterations of boost and sustain cycles) of the pintle/throat combinations, a minimum thickness of rhenium coating for the throat was established. However, a minimum thickness of rhenium coating for the pintle was not. The NCDMM, PPI, and AMRDEC were successful in optimizing the processes to achieve the goal of producing lightweight rhenium coated pintle/throat combinations with a 90% reduction in costs.

DTIC

Coating; Cost Reduction; Manufacturing; Pintles; Refractory Coatings; Rhenium; Rocket Engine Control; Rocket Engines; Throats; Thrust Control

20080037517 Hoffman, Warnick, and D'Alessandro, LLC, Albany, NY, USA

Method and Materials for Reducing Production of Aberrant Products during RNA Synthesis

McAllister, W. T., Inventor; Kukarin, A., Inventor; 10 Dec 03; 11 pp.; In English

Contract(s)/Grant(s): 10009175; GM38147

Patent Info.: Filed Filed 10 Dec 03; US-Patent-Appl-SN-10-537 956

Report No.(s): PB2008-100713; No Copyright; Avail.: CASI: A03, Hardcopy

Improved materials and methods for reducing the production of aberrant products during RNA synthesis and protein production are provided.

NTIS

Abnormalities; Patent Applications; Ribonucleic Acids

20080037530 Westinghouse Savannah River Co., Aiken, SC, USA

Modifications to, and Vibration Analysis of, Tank 7 Slurry Pumps, F and H Tank Farms

Leishear, R. A.; Stefanko, D. B.; January 2007; 14 pp.; In English

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

Report No.(s): PB2008-100998; WSRC-RP-2001-00605; No Copyright; Avail.: CASI: A03, Hardcopy

Slurry pumps have demonstrated short life spans when operated in nuclear waste tanks. Their life approximates one thousand hours or 42 days of continuous operation, evidenced by past performance in H-Area and F-Area at the Savannah River Site (SRS). Several investigations over the past six years have isolated the most significant reliability problems. These problems are seal and bearing failures caused by the vibrations of the long drive shafts in the pump, manufacturing tolerance accumulations, failures caused by material incompatibility between the waste and the lowest process bearing that is exposed to the waste, and vibrations which occur when the pump operates at critical speeds. Only vibration and material problems were corrected. Potential bearing and seal degradation still exists for those pumps with a critical speed near the operating speed. Bearing damage can be expected below 700 rpm. The pumps are used to mix or slurry nuclear waste products contained in waste storage tanks prior to transferring the tank contents for further processing. In particular, Lawrence Pumps, Inc. slurry pumps are installed on Tank 7 in F Tank Farm. Appendix A provides the initial recommendations, and further states that this follow up report would provide detailed descriptions of the pump components, failure mechanisms, and corrective actions which include tilt pad bearings, a Stellite process bearing, and modified split shaft retainers. By testing the pumps in a non-radioactive test facility, these corrections have been shown to significantly decrease the vibrations associated with bearing and seal failures, and consequently are expected to improve reliability.

NTIS

Dynamic Structural Analysis; Pumps; Radioactive Wastes; Slurries; Waste Management

20080037538 Xerox Corp., Rochester, NY, USA

Gelable Composition

Wu, Y., Inventor; Liu, P., Inventor; Ong, B. S., Inventor; Murti, D. K., Inventor; 29 Nov 05; 12 pp.; In English

Contract(s)/Grant(s): NIST-70NANBOH3033

Patent Info.: Filed Filed 29 Nov 05; US-Patent-Appl-SN-11-288 480

Report No.(s): PB2008-102772; No Copyright; Avail.: CASI: A03, Hardcopy

A composition including a polymer and a liquid, wherein the polymer exhibits lower solubility in the liquid at room temperature but exhibits greater solubility in the liquid at an elevated temperature, wherein the composition gels when the elevated temperature is lowered to a first lower temperature without agitation, wherein the viscosity of the composition results from a process comprising (a) dissolving at the elevated temperature at least a portion of the polymer in the liquid; (b) lowering the temperature of the composition from the elevated temperature to the first lower temperature; and (c) agitating the composition to disrupt any gelling, wherein the agitating commences at any time prior to, simultaneous with, or subsequent to the lowering the elevated temperature of the composition to the first lower temperature, wherein the amount of the polymer dissolved in the liquid at the elevated temperature ranges from about 0.2% to about 5% based on the total weight of the polymer and the liquid.

NTIS

Gels; Patent Applications; High Temperature; Solubility; Room Temperature; Polymers

20080037759 Sandia National Labs., Albuquerque, NM USA

Simulations on Non-Uniform Embossing: The Effect of Asymmetric Neighbor Cavities on Polymer Flow During Nanoimprint Lithography

Rowland, H. D.; King, W. P.; Sun, A. C.; Schunk, P. R.; Aug. 2007; 22 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-913532; SAND2007-4121; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents continuum simulations of viscous polymer flow during nanoimprint lithography (NIL) for embossing tools having irregular spacings and sizes. Simulations varied non-uniform embossing tool geometry to distinguish geometric quantities governing cavity filling order, polymer peak deformation, and global mold filling times. A characteristic NIL velocity predicts cavity filling order. In general, small cavities fill more quickly than large cavities, while cavity spacing modulates polymer deformation mode. Individual cavity size, not total filling volume, dominates replication time, with large differences in individual cavity size resulting in non-uniform, squeeze flow filling. High density features can be modeled as a solid indenter in squeeze flow to accurately predict polymer flow and allow for optimization of wafer-scale replication. The present simulations make it possible to design imprint templates capable of distributing pressure evenly across the mold surface and facilitating symmetric polymer flow over large areas to prevent mold deformation and non-uniform residual layer thickness.

NTIS

Asymmetry; Cavities; Lithography; Nonuniformity; Simulation

20080037767 Foley and Lardner, LLP, Madison, WI, USA

Proton Conducting Membrane for Fuel Cells

Colombo, D. G., Inventor; Krumpelt, M., Inventor; Myers, D. J., Inventor; Kopasz, J. P., Inventor; 1 Dec 05; 10 pp.; In English

Contract(s)/Grant(s): DE-W-31-109-ENG-38

Patent Info.: Filed Filed 1 Dec 05; US-Patent-Appl-SN-11-291 254

Report No.(s): PB2008-103482; No Copyright; Avail.: CASI: A02, Hardcopy

An ion conducting membrane comprising dendrimeric polymers covalently linked into a network structure. The dendrimeric polymers have acid functional terminal groups and may be covalently linked via linking compounds, cross-coupling reactions, or copolymerization reactions. The ion conducting membranes may be produced by various methods and used in feul cells.

NTIS

Fuel Cells; Membranes; Patent Applications; Protons

20080037772 Morrison and Foerster LLP, Palo Alto, CA, USA

Controlling Peel Strength of Micron-Scale Structures

Fearing, R. S., Inventor; Autumn, K., Inventor; 1 Jun 05; 25 pp.; In English

Contract(s)/Grant(s): N66001-00-C-8047; NIRT EEC 0304730

Patent Info.: Filed Filed 1 Jun 05; US-Patent-Appl-SN-11-143 372

Report No.(s): PB2008-103101; No Copyright; Avail.: CASI: A03, Hardcopy

A fabricated microstructure includes a base and one or more nano-structures disposed on one or more portions of the base to adhere to a contact surface. The one or more portions of the base with the one or more nano-structures are located on the base such that, when the one or more nano-structures adhere to the contact surface and an external force is applied to peel the base from the contact surface, the one or more nano-structures in the one or more portions of the base facilitate or resist peeling of the nano-structures from the contact surface.

NTIS

Fabrication; Mechanical Properties; Microstructure; Patent Applications; Peeling

20080037773 Army Soldier Systems Command, Natick, MA, USA

Assembled Hematin, Method for Forming Same and Method for Polymerizing Aromatic Monomers Using Same

Bruno, F., Inventor; Samuelson, L. A., Inventor; Nagarajan, R., Inventor; Kumar, J., Inventor; Sennett, M., Inventor; 9 Feb 04; 21 pp.; In English

Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-775 579
Report No.(s): PB2008-103098; No Copyright; Avail.: CASI: A03, Hardcopy

An assembled hematin is formed by depositing hematin on an electrically charged substrate in one or more layers alternating with one or more layers of polyelectrolyte, preferably a cationic polymer. In a method for polymerizing an aromatic monomer, the assembled hematin is contacted with the monomer and a template, preferably an anionic polymer. In a method for polymerizing aniline, the aniline, sulfonated multi walled carbon nano tubes, PEG hematin and a reaction initiator are dispersed in water.

NTIS

Monomers; Patent Applications; Polymerization

20080037813 Battelle Memorial Inst., Richland, WA, USA

High Strength Insulating Metal-to-Metal Joints for Solid Oxide Fuel Cells and Other High Temperature Applications and Method of Making

Weil, K. S., Inventor; Chick, L. A., Inventor; Coyle, C. A., Inventor; Hardy, J. S., Inventor; Xia, G., Inventor; 22 Sep 04; 9 pp.; In English
Contract(s)/Grant(s): DE-FC26-02NT41246
Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10-948 359
Report No.(s): PB2008-100707; No Copyright; Avail.: CASI: A02, Hardcopy

A seal formed between a metal part and a second part that will remain gas tight in high temperature operating environments which experience frequent thermal cycling, which is particularly useful as an insulating joint in solid oxide fuel cells. A first metal part is attached to a reinforcing material. A glass forming material is positioned between the first metal part and the second part, and a seal is formed between the first metal part and the second part by heating the glass to a temperature suitable to melt the glass forming materials. The glass encapsulates and bonds at least a portion of the reinforcing material, thereby adding tremendous strength to the overall seal. A ceramic material may be added to the glass forming materials, to assist in forming an insulating barrier between the first metal part and the second part and to regulate the viscosity of the glass during the heating step.

NTIS

High Strength; High Temperature; Insulation; Metal Joints; Metal-Metal Bonding; Patent Applications; Solid Oxide Fuel Cells; Thermal Cycling Tests

20080037867 Chandler Law Firm, PLLC., Potomac, MD, USA

Polysaccharide-Based Polymers and Methods of Making the Same

Chen, T., Inventor; Embree, H. D., Inventor; Brown, E. M., Inventor; Taylor, M. M., Inventor; Payne, G. F., Inventor; 26 Sep 03; 19 pp.; In English
Contract(s)/Grant(s): BES-0114790
Patent Info.: Filed Filed 26 Sep 03; US-Patent-Appl-SN-10-529 012
Report No.(s): PB2008-103076; No Copyright; Avail.: CASI: A03, Hardcopy

Gels and polymers comprising a polypeptide bound to a polysaccharide are disclosed. Specific polypeptides include, but are not limited to, polypeptides that comprise glutamine or tyrosine residues. Specific polysaccharides include, but are not limited to, chitosan. Gels and polymers of the invention can be used for the in vitro and in situ formation of protein-polysaccharide conjugates. Methods of making polypeptide/polysaccharide gels and polymers are also disclosed.

NTIS

Conjugates; Patent Applications; Polypeptides; Polysaccharides; Proteins

20080038087 Nanomat, Inc., North Huntingdon, PA, USA

Organic Solvent Dispersed Nano-Talc Slurry

He, J., Inventor; Zhong, Q., Inventor; 21 Dec 04; 14 pp.; In English
Contract(s)/Grant(s): W911NF-04-2-0025
Patent Info.: Filed Filed 21 Dec 04; US-Patent-Appl-SN-11-018 946
Report No.(s): PB2008-101628; No Copyright; Avail.: CASI: A03, Hardcopy

The invention provides high surface area talc compositions by a novel hybrid milling method or soaking method. The hybrid milling method comprises dry milling talc powder followed by mixing with water and wet milling to provide a nano-talc slurry with high surface area, also of the invention. The soaking method comprises dry milling talc powder followed

by mixing with water and soaking to provide high surface area nano-talc slurry. The slurry may be dewatered and dried to provide dry nano-talc powder. The nano-talc powder provided by the invention is a novel hydrophilic talc composition. Further embodiments of the invention include organic solvent dispersed nano-talc slurries and methods for providing the same. These slurries can be used to provide polymer nano-talc composites in the form of coatings, sealing and gasketing materials, foams, extruded thermoplastic and thermoset sheets and films, thermoplastic pellets, thermoplastic and thermoset molded polymer composite articles. Another embodiment is a polyurethane nano-talc composite article derived from the organic solvent dispersed slurries.
NTIS
Patent Applications; Slurries; Solvents; Talc

20080038796 Naval Research Lab., Washington, DC USA
Incorporating Fluorescent Dyes and Quantum Dots into Magnetic Microbeads for Immunoassays
Mulvaney, Shawn P; Mattoussi, Hedi; Whitman, Lloyd J; Apr 2004; 7 pp.; In English
Report No.(s): AD-A482467; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482467

Microbeads that are both paramagnetic and fluorescently labeled are commercially available in colors spanning the visible spectrum. Although these commercial beads can be bright, polydispersity in both size and fluorescent intensity limit their use in quantitative assays. Very recently, more monodisperse beads have become available, but their large size and surface properties make them less than ideal for some bioassay applications. Here we describe methods to customize commercial nonfluorescent magnetic microparticles with fluorescent dyes and quantum dots (QDs) without affecting their magnetic or surface chemical properties. Fluorescent dyes and 3.3-nm diameter CdSe/ZnS QDs were sequestered within 0.8-micrometers diameter magnetic beads by swelling the polystyrene matrix of the bead in organic solvent, letting the chromophores partition, and then collapsing the matrix in polar solvents. Chromophore incorporation has been characterized using both UV-visible absorption spectroscopy and fluorescence microscopy, with an average of 3 10(exp 8) rhodamine 6G molecules/bead and 6 10(exp 4) QDs/bead. The modified beads are uniform in size and intensity, with optical properties comparable to currently available commercial beads. Immunoassay results obtained with our custom fluorescent magnetic microbeads are consistent with those obtained using conventional magnetic microbeads.
DTIC
Beads; Dyes; Fluorescence; Immunoassay; Magnetic Properties; Quantum Dots

20080038864 California Univ., Santa Barbara, CA USA
Characterization of AlSb/InAs Surfaces and Resonant Tunneling Devices
Nosho, B Z; Weinberg, W H; Barvosa-Carter, W; Bracker, A S; Magno, R; Bennett, B R; Culbertson, J C; Shanabrook, B V; Whitman, L J; May 1999; 6 pp.; In English
Report No.(s): AD-A482469; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have studied the evolution of AlSb-on-InAs(001) surfaces and interfaces grown by molecular-beam epitaxy using in situ scanning tunneling microscopy. We find that forming InSb-like interfacial bonds on an InAs(001)-(2*4) surface creates surface roughness because the surface In coverage inherent to the (2*4) reconstruction is insufficient to form a complete InSb(001)-(133)-like surface layer. This morphological roughness can be eliminated by depositing additional In to compensate for the different compositions of the reconstructions. We have also grown three different 5-monolayer-thick films of AlSb on the InSb-like interface to study the effect of growth conditions on the film surface morphology. The AlSb surface can be improved by either raising the growth temperature or by growing the film using migration-enhanced epitaxy. Finally, we present electrical characterization of InAs/AlSb/GaSb resonant interband tunneling devices fabricated with different growth procedures. The possible effects of various growth procedures on interfacial quality and device properties are discussed.
DTIC
Aluminum Arsenides; Cavity Resonators; Epitaxy; Indium Arsenides; Molecular Beam Epitaxy; Resonant Tunneling; Resonators

20080038866 Naval Research Lab., Washington, DC USA
Chemical Structure and Orientation of Ethylene on Si(114)-(2x1)/c(2x2)
Barlow, D E; Erwin, S C; Laracuente, A R; Whitman, L J; Russel, Jr, J N; Jan 23, 2006; 8 pp.; In English
Report No.(s): AD-A482471; XB-NRL/MR/6100; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The basic chemical structure and orientation of ethylene chemisorbed on Si(114)-(2 1) at submonolayer coverage is

characterized in ultrahigh vacuum using transmission Fourier transform infrared (FTIR) spectroscopy. The spectra are consistent with di-sigma bonding of ethylene to the surface with a preferential molecular orientation over macroscopic lengths. These results are supported by density functional theory (DFT) calculations of vibrational frequencies for optimized ethylene-Si(114) structures occupying the dimer and rebonded atom surface sites. A detailed analysis of the strong angular and polarization dependence of the C-H stretching mode intensities is also consistent with the adsorption structures identified by DFT, indicating that ethylene chemisorbs with the C-C bond axis parallel to the structural rows oriented along the [1h10] direction on the Si(114)-(2 1) surface. The results indicate that the unique structure of this surface makes it an excellent template for elucidating relationships between surface structure and organic reaction mechanisms on silicon.
DTIC
Chemical Composition; Chemical Properties; Ethylene; Fourier Transformation

20080038871 Maryland Univ., College Park, MD USA
Alkanethiols on Platinum: Multicomponent Self-Assembled Monolayers
Petrovykh, Dmitri Y; Kimura-Suda, Hiromi; Opdahl, Aric; Richter, Lee J; Tarlov, Michael J; Whitman, Lloyd J; Jan 2006; 11 pp.; In English
Report No.(s): AD-A482476; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have studied the formation of self-assembled monolayers (SAMs) of n-alkanethiols on platinum thin films using X-ray photoelectron spectroscopy (XPS), reflection-absorption infrared spectroscopy (RAIRS), spectroscopic ellipsometry (SE), and contact angle (CA) measurements. Specifically, SAMs of 1-hexanethiol, 1-dodecanethiol, and 1-octadecanethiol were grown on polycrystalline Pt films, and the effects of Pt surface preparation, deposition conditions, and solvent treatments on the initial quality and stability of the monolayer in air were investigated. The SAMs prepared under ambient conditions on piranha-cleaned and UV/ozone-cleaned substrates were compared to monolayers formed on template-stripped Pt in an inert atmosphere. We found that alkanethiols deposited from 1 mM ethanolic solutions on piranha-cleaned Pt formed densely packed monolayers in which alkyl chains were oriented close to the surface normal. Stored in the laboratory ambient, these monolayers were unchanged over about 1 week but were largely oxidized in about 1 month. No evidence was found of molecules being weakly bound within the monolayer or having undergone C-S bond scission; however, three distinct sulfur states were observed for all samples in the XPS of the S 2p region. The lowest- and highest-binding-energy components are assigned to alkylthiolate and partially oxidized alkylthiolate species, respectively. The remaining S 2p component (approximately one-third of the sulfur layer), intermediate in binding energy between the other two components, is attributed to a chemisorbed species with a S binding configuration distinct from the majority alkylthiolate: for example, S bound to Pt bound to O, S with a different Pt coordination number, or S in an adsorbed disulfide.
DTIC
Alkyl Compounds; Infrared Spectroscopy; Photoelectron Spectroscopy; Platinum; X Ray Spectroscopy

20080038876 Naval Academy, Annapolis, MD USA
Solubility of 2,4-Dinitrotoluene and 2,4,6-Trinitrotoluene in Seawater
Luning Prak, Dianne J; O'Sullivan, Daniel W; Jan 2006; 5 pp.; In English
Contract(s)/Grant(s): Proj-ER-1431
Report No.(s): AD-A482483; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The solubility of 2,4-dinitrotoluene (2,4-DNT) and 2,4,6-trinitrotoluene (2,4,6-TNT) in seawater with ionic strength = (0.3352, 0.5071, and 0.68220) mol/L and pure water was measured at 4 C, 20 C, 30 C, and 40 C. The pure water solubility values compare well with values reported previously. The solubility in seawater was lower than that in pure water. The average salting-out coefficients for 2,4-DNT and 2,4,6-TNT were (0.11 and 0.12) L/mol, respectively, which are consistent with measurements for other nitroaromatic compounds. The salting-out coefficients did not show any significant variation with temperature over the range examined.
DTIC
Explosives; Sea Water; Solubility; Trinitrotoluene; Water

20080038918 California Univ., Los Angeles, CA USA
Exploratory Experiments in the Tribological Behavior of Engineering Surfaces with Nano-Coating Using a Tribo-Rheometer
Kavehpour, H P; May 30, 2008; 13 pp.; In English
Contract(s)/Grant(s): FA9550-07-1-0324
Report No.(s): AD-A482540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Funding was provided by the Air Force Office of Scientific Research in order to support exploratory experiments for

probing the tribological behavior of nano-coatings on real surfaces. Recent experiments have shown desirable tribological properties for these materials. However, most of these experiments are performed on coated surfaces which are not used in the real life application. We explored the tribological properties of these solid-liquid-solid systems by the triborheometry fixture that can be utilized with a commercial torsional rheometer in order to explore the coupled rheological and tribological properties of complex fluids and solid-liquid systems. Using this new triborheometer fixture it is possible to obtain tribological information over a wider range of sliding velocities than is typically possible using conventional devices such as pin-and-disk systems. We seek to expand the detailed understanding of tribological systems when nano-coating is used on real surfaces. In particular, generating Stribeck curves provides a road map for the designer of such systems for a range of velocities, temperatures and other environmental factors.
DTIC
Coating; Coatings; Liquids; Measuring Instruments; Nanostructures (Devices); Rheology; Rheometers; Tribology

20080038948 RAND Corp., Santa Monica, CA USA
The Thin Green Line: An Assessment of DoD's Readiness and Environmental Protection Initiative to Buffer Installation Encroachment
Lachman, Beth E; Wong, Anny; Resetar, Susan A; Jan 2007; 256 pp.; In English
Contract(s)/Grant(s): W74V8H-06-C-0002
Report No.(s): AD-A482607; No Copyright; Avail.: Defense Technical Information Center (DTIC)

When first established decades ago, most U.S. military installations were far from major cities and towns. That is no longer true. A growing population and changing land development patterns over the past several decades have led to lands vital to military readiness being surrounded by urban, suburban, and other types of development. Such development, especially large residential tracts, can limit the installation's operational capability. Complaints about noise, dust, and smoke from aircraft, weapons, and vehicles force commanders to curtail training of certain types or during certain hours. As development destroys or displaces native species of plants and animals, military posts become their critical refuge, and their presence further restricts military operations. These constraints have been so severe in some cases that installations have had to close. Such pressures are called encroachment. Encroachment can be defined as issues external to military operations that affect military installation testing, training, and other operations and overall military readiness. Recognizing the gravity of the problem, Congress provided legislative authority to allow military departments to partner with government or private organizations to establish buffer areas near training and testing areas. The Office of the Secretary of Defense(OSD) created the Conservation Partnering Program (now known as the Readiness and Environmental Protection Initiative (REPI)2) to implement this authority.
DTIC
Combat; Environment Protection; Installing; Military Technology

20080038960 Clarkson Univ., Potsdam, NY USA
pH-Responsive Thin Film Membranes from Poly(2-vinylpyridine): Water Vapor-Induced Formation of a Microporous Structure
Orlov, Maxim; Tokarev, Ihor; Scholl, Andreas; Doran, Andrew; Minko, Sergiy; Mar 30, 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0339
Report No.(s): AD-A482630; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report the fabrication of microporous thin film membranes with two-dimensionally arranged submicron pores whose size can be varied by changing pH of aqueous medium. A solution containing poly(2-vinylpyridine) partially quaternized with 1,4-dilodobutane (qP2VP) and unreacted 1,4-diodobutane (DIB) was used for the formation and deposition of the membranes on solid substrates. The membranes were spin-coated on to solid substrates in a controlled humid environment. The presence of water vapor in air was found to be a necessary condition for the pore formation. We studied the influence of relative humidity on the membrane morphology and proposed a mechanism of pore formation. Cross-linking the qP2VP membranes with DIB made them insoluble (stable) in organic solvents and acidic water. The cross-linked membranes demonstrated pH-dependent swelling, which had a strong influence on the pore size.
DTIC
Membranes; Microporosity; pH; Porous Materials; Pyridines; Thin Films; Water Vapor

20080039149 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Precise Measurement of Carbon Dioxide Column by Passive Ground Based Sensor

Heaps, William S.; Wilson, Emily L.; Georgieva, Elena; December 10, 2007; 1 pp.; In English; 2007 American Geophysical Union Fall Meeting, 10-14 Dec. 2007, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Over the past four years we have developed a family of differential radiometers based upon the Fabry-Perot interferometers that exhibit very great sensitivity to changes in the atmospheric column of carbon dioxide, oxygen, and water vapor. Our instruments employ a solid Fabry-Perot etalon that is tuned to the proper wavelength by changing its temperature. The thickness of the etalon has been selected so that its multiple pass bands align with regularly space absorption features of the molecule under investigation. Using multiple absorption features improves the optical throughput of the instrument and improves the stability of the instrument response with respect to environmental changes. We are presently working to extend this technique to the carbon 13 isotope of carbon dioxide and to methane. Our instruments are intrinsically rugged and can be fabricated in a small package at relatively low cost.. As such they hold promise for widespread use in ground based networks for calibration and validation of satellite instruments such as OCO and GOSAT. Results will be presented for long term ground based operations of these systems. The effects of atmospheric scattering, pointing errors, pressure broadening and temperature effects will be discussed with regard to achieving precision better than .5% required for validation of carbon dioxide column measured from space. Finally we will outline the approach for extension of this methodology to additional molecular species of interest.

Author

Carbon Dioxide Concentration; Atmospheric Composition; Atmospheric Chemistry; Temperature Effects; Molecular Gases; Fabry-Perot Interferometers; Carbon 13; Water Vapor

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COMPOSITE MATERIALS

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

20080036847 NASA Langley Research Center, Hampton, VA, USA

Double-Vacuum-Bag Technology for Volatile Management in Composite Fabrication

Hou, Ttan-Hung; Jensen, Brian J.; August 2008; 16 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 23-762-55-MH

Report No.(s): LAR-16877; No Copyright; Avail.: Other Sources

A non-autoclave vacuum bag process using atmospheric pressure alone that eliminates the need for external pressure supplied normally by an autoclave or a press is an attractive method for composite fabrication. This type of process does not require large capital expenditures for tooling and processing equipment. The traditional single-vacuum-bag (SVB) process is best suited for molding epoxy matrix based composites because of their superior flow and the absence of reaction by-products or other volatiles. This is not the case for other classes of materials such as polyimides and phenolics. Polyimides and phenolics are cured by condensation reactions which generate water as a reaction byproduct. In addition, these materials are commonly synthesized as oligomers using solvents to facilitate processability. Volatiles (solvents and reaction by-products) management therefore becomes a critical issue. SVB molding, without additional pressure, normally fails to yield void-free quality composites for these classes of resin systems. A double-vacuum-bag (DVB) process for volatile management in composite fabrication using common molding equipment was designed and built at the NASA Langley Research Center. This experimental DVB process affords superior volatiles management compared to the traditional SVB process. Void-free composites are consistently fabricated as measured by C-scan and optical photomicroscopy for high performance polyimide and phenolic resins.

Author

Autoclaves; Epoxy Matrix Composites; Polyimide Resins; Solvents; Atmospheric Pressure

20080037336 Burns (Greer) and Crain, Chicago, IL, USA

Transparent Composites and Laminates and Methods for Making

Khanna, S. K., Inventor; 17 Sep 04; 9 pp.; In English

Contract(s)/Grant(s): NSF-0196428

Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943 335

Report No.(s): PB2008-101917; No Copyright; Avail.: CASI: A02, Hardcopy

An exemplary method for making a transparent composite includes steps of combining a refractive index modifier with

a precursor solution, combining glass with the precursor solution, and curing the precursor solution to create a transparent glass reinforced polymer composite. An exemplary transparent composite comprises a glass reinforced thermosetting polymer composite layer sandwiched between glass layers.
NTIS
Laminates; Patent Applications; Transparence

20080037354 Steptoe and Johnson LLP, Washington, DC, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Composite Material Including Nanocrystals and Methods of Making
Bawendi, M. G., Inventor; Sundar, V. C., Inventor; 16 May 05; 9 pp.; In English
Contract(s)/Grant(s): F33615-98-C-3012; NSF DMR98-08941
Patent Info.: Filed Filed 16 May 05; US-Patent-Appl-SN-11-129 329
Report No.(s): PB2008-101951; No Copyright; Avail.: CASI: A02, Hardcopy

Temperature-sensing compositions can include an inorganic material, such as a semiconductor nanocrystal. The nanocrystal can be a dependable and accurate indicator of temperature. The intensity of emission of the nanocrystal varies with temperature and can be highly sensitive to surface temperature. The nanocrystals can be processed with a binder to form a matrix, which can be varied by altering the chemical nature of the surface of the nanocrystal. A nanocrystal with a compatibilizing outer layer can be incorporated into a coating formulation and retain its temperature sensitive emissive properties.
NTIS
Composite Materials; Nanocrystals; Nanostructures (Devices); Patent Applications

20080037587 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Paper Composite Panel
Dec 18, 2003; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-03-0012-10
Report No.(s): AD-A481961; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Letterkenny Army Depot (LEAD) in Chambersburg, Pennsylvania, repairs or replaces wall panels on Humvee mounted Chem/Bio units. The material used on these panels consists of two very thin aluminum sheets. Between the aluminum sheets is paper honeycomb bonded together with epoxy resin. This thin sandwich structure does not provide the support required for mounting brackets or other attachments. The process was to drill 0.25-inch to 0.36-inch diameter holes, remove an additional 0.5-inch radius of paper honeycomb material by hand from around the hole, and fill the resulting cavity with resin and a threaded fastener. Approximately 200 holes are drilled per unit. The problem occurred when attempting to remove the paper particles after the initial hole had been drilled. This was a very cumbersome and time-consuming operation. LEAD asked if the National Center for Defense Manufacturing and Machining (NCDMM) could provide or recommend a solution to reduce the time required to remove of the paper honeycomb particles. NCDMM experimented with various tooling similar to that which LEAD was using. To eliminate the use of tweezers to remove the paper particles from the hole, a process was developed to turn the paper remains into very small particles or dust that could be vacuumed from the cavity. A hand held high-speed (25,000 revolutions per minute [rpm]) spindle type tool and a special cutter were tested. These proved to form a viable solution. The paper was cut into dust and was vacuumed out with little effort. This eliminated the hand removal of additional paper prior to resin application.
DTIC
Composite Structures; Drilling; Honeycomb Cores; Panels; Sandwich Structures

20080037631 Michigan Univ., Ann Arbor, MI USA
Function-Oriented Material Design for Innovative Composite Structures Against Land Explosives
Ma, Zheng-Dong; Jiang, Dongying; Liu, Yuanyuan; Raju, Basavaraju; Bryzik, Walter; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481664; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481664

The objective of this research is to develop an advanced design methodology for innovative composite structure concepts which can be used in the Army's future ground vehicle systems (FCS, FTTS, LTV) to protect vehicle and occupants against various explosives, including landmines. A multi-level and multi-scenario blast simulation and design system is being developed, which integrates three major technologies: a newly developed landmine-soil-composite interaction model; an

advanced design methodology called Function-Oriented Material Design (FOMD); and a novel patent pending composite material concept called BTR (Biomimetic Tendon-Reinforced) material. A novel blast-protective composite structure (BTR-Bl) is being developed with the new design tool, which can be fabricated and tested against land explosives for use in military vehicles.
DTIC
Composite Materials; Composite Structures; Explosives; Graphical User Interface; Simulation

20080037635 NextGen Aeronautics, Inc., Torrance, CA USA
Multifunctional Self-Healing and Morphing Composites
Duenas, T; Bolanos, E; Murphy, E; Mal, A; Wudl, F; Schaffner, C; Wang, Y; Hahn, H T; Ooi, T K; Jha, A; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W31P4Q-06-C-0176
Report No.(s): AD-A481595; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481595

Highly innovative work towards development of a new class of materials called 'Multifunctional Composites (MCs)' for multi-role structural aircraft skin applications possessing both self-healing and morphing functionality has been achieved. Proof of concept was demonstrated showing that a low volume-fraction (5-10%) of magnetic particles is sufficient for enabling self-healing of an approximate 150 micron x 5000 micron crack in a mendomer polymer using inductive heating. It was also demonstrated that a carbon-fiber-composites can be fabricated to morph using an apparent shape memory effect of the same mendomer that was used to demonstrate the self-healing. Studies of particle composition and mendomer were performed to determine the relative optimal material components for self-healing and morphing functionality. Department of Defense applications of the technology were articulated in collaboration with a major ballistic missile defense integrator. Future work is also briefly discussed.
DTIC
Carbon Fibers; Composite Materials; Fiber Composites; Healing; Magnetic Materials; Polymers

20080037766 O'Keefe, Egan and Peterman, LLP, Austin, TX, USA
Ultraviolet Light Curing Compositions for Composite Repair
Bulluck, J. W., Inventor; Rix, B. A., Inventor; 6 Dec 05; 11 pp.; In English
Contract(s)/Grant(s): F33615-02-C-5605
Patent Info.: Filed Filed 6 Dec 05; US-Patent-Appl-SN-11-294 795
Report No.(s): PB2008-103483; No Copyright; Avail.: CASI: A03, Hardcopy

An ultraviolet (UV) light curable formulation useful for repairing composite materials, comprising: an acrylic oligomer, an acrylic monomer, and a photoinitiator. This formulation may include fiberglass. The photoinitiator can be a combination of a bis-acylphosphine oxide and an alpha hydroxy ketone. The formulation can cure rapidly, such as in about 20 minutes. The cured formulation can have a T(sub g) above 150 degrees C.
NTIS
Composite Materials; Curing; Patent Applications; Ultraviolet Radiation

20080037865 Goldstein (Powell), LLP, Washington, DC, USA
Carbon Nanotube Fiber-Reinforced Composite Structures for EM and Lightning Strike Protection
Glatkowski, P. J., Inventor; Landis, D. H., Inventor; Piche, J. W., Inventor; Conroy, J. L., Inventor; 7 Jun 05; 4 pp.; In English
Patent Info.: Filed Filed 7 Jun 05; US-Patent-Appl-SN-11-146 150
Report No.(s): PB2008-103077; No Copyright; Avail.: CASI: A01, Hardcopy

A method for repairing fiber-reinforced composite structures while maintaining original EM and lightning protection using carbon nanotubes, fibers, and thermoset resins is disclosed. According to one embodiment of the invention, the method comprises preparing a damaged area for repair; preparing a repair patch for the damaged area, the repair patch comprising nanotubes; applying the repair patch to the damaged area; and curing the repair patch. A repair patch for a composite structure having a conductive layer is disclosed. According to one embodiment of the present invention, the repair patch includes a binder and nanotubes. A repair resin for repairing a composite structure having a conductive layer is disclosed. According to one embodiment of the present invention, the repair layer includes a resin and nanotubes. A putty for repairing a composite

structure having a conductive layer is disclosed. According to one embodiment of the present invention, the putty includes a base and electrically conductive carbon nanotubes.
NTIS
Carbon Nanotubes; Composite Structures; Fiber Composites; Lightning; Patent Applications; Protection

20080037868 Virginia Univ. Patent Foundation, Charlottesville, VA, USA
Methods for Manufacture of Multilayered Multifunctional Truss Structures and Related Structures There From
Kooistra, G. W., Inventor; Wadley, H. N. S., Inventor; 17 Feb 04; 22 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0281
Patent Info.: Filed Filed 17 Feb 04; US-Patent-Appl-SN-10-545 042
Report No.(s): PB2008-102792; No Copyright; Avail.: CASI: A03, Hardcopy

A method for manufacturing multilayered truss cores, which solves, among other things, key issues of bonding monolayered truss cores to one another. A multilayered truss core may be created from a single planar perform of an appropriate geometric pattern. Once the desired preform is manufactured it is then deformed into a three-dimensional (3D) truss network. This approach bypasses the need to stack and join monolayer truss cores, eliminating the additional tooling, lay-up, and interlayer bonding process steps. These multilayered cores may then be attached to facesheets or the like to form multilayered truss core panels or other multifunctional structures.
NTIS
Cores; Manufacturing; Patent Applications; Trusses

20080038072 Honeywell International, Inc., Morristown, NJ, USA
Ternary Carbide and Nitride Materials Having Tribological Applications and Methods of Making Same
Gupta, S., Inventor; Palanisamy, T. G., Inventor; Barsoum, M., Inventor; Li, C. W., Inventor; 10 May 05; 10 pp.; In English
Contract(s)/Grant(s): N00421-03-C-0085
Patent Info.: Filed Filed 10 May 05; US-Patent-Appl-SN-11-127 522
Report No.(s): PB2008-101608; No Copyright; Avail.: CASI: A02, Hardcopy

A turbomachinery component includes a substrate having a surface, the surface being a material consisting essentially of at least one compound having the chemical formula M(sub n+1)AX(sub n), wherein M is at least one early transition metal selected from groups IIIB, IVB, VB, and VIB, A is at least one element selected from groups IIIA, IVA, VA, VIA, and VIIA, X is one or both of carbon and nitrogen, and n is an integer between 1 and 3. The component is made by forming a compact and sintered substrate with the material, or by coating a substrate with the material.
NTIS
Carbides; Nitrides; Patent Applications; Tribology

20080038727 Texas A&M Univ., College Station, TX USA
A New Computational Methodology for Structural Dynamics Problems
Reddy, J N; Apr 2008; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0122
Report No.(s): AD-A482330; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482330

Most structural components encountered in army vehicles and armor can be classified as beams, plates, or shells for analysis purposes. While these structural elements are designed to function properly under thermo-mechanical loads encountered in their use, they do develop high stresses and experience high vibration frequencies that may make them non-functional in actual service conditions. The objective of this research is to develop consistent plate and shell theories and associated computational framework for linear and non-linear problems of structural dynamics: (1) develop accurate and consistent structural theories and associated finite element models of plates and shells that account for transverse shear deformation and illustrate the accuracy using benchmark plate and shell problems. (2) Develop mixed and least-squares finite element models of the refined theories for the analysis of plates and shells.
DTIC
Deformation; Dynamic Response; Dynamic Structural Analysis; Finite Element Method; Functionally Gradient Materials; Least Squares Method; Vibration

20080038745 California Inst. of Tech., Pasadena, CA USA

Modeling Plastic Shocks in Periodic Laminates with Gradient Plasticity Theories

Ravichandran, G; Molinari, A; Aug 26, 2007; 53 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0568

Report No.(s): AD-A482353; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482353

Steady plastic shocks generated by planar impact on metal-polymer laminate composites, are analyzed in the framework of gradient plasticity theories. The laminate material has a periodic structure with unit cell composed of two layers of different materials. First and second order gradient plasticity theories are used to model the structure of steady plastic shocks. In both theories, the effect of the internal structure is accounted for at the microscopic level by two material parameters depending upon the layer's thickness and the properties of constituents. Those two structure-parameters are shown to be uniquely determined from experimental data.

DTIC

Gradients; Laminates; Plastic Properties; Polymers; Solid Mechanics

20080038770 City Coll. of the City Univ. of New York, NY USA

Hybrid Carbon-Glass Fiber/Toughened Epoxy Thick Composite Joints Subject to Drop-Weight and Ballistic Impacts

Liaw, Benjamin; Delale, Feridun; Dec 2007; 78 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0086

Report No.(s): AD-A482383; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482383

This ARO project from City College of City University of New York (CCNY of CUNY) was submitted in response to ARO's FY 2002 DoD Instrumentation and Research Support for Hispanic Serving Institutions (HSIs), BAA No. DAAD19-02-R-0010 to conduct research on hybrid carbon-S2 glass fiber/toughened epoxy thick-section, hybrid interwoven composite joints subject to drop-weight and ballistic impacts. Dr. Basavaraju B. Raju of U.S. Army TACOM-TARDEC was the research collaborator and Dr. Bruce LaMattina of ARO was the program manager. The main objectives of this project are (1) to conduct tensile, drop-weight impact and ballistic impact tests of monolithic S2 glass fiber/toughened epoxy composites and hybrid carbon-S2 glass fiber/toughened epoxy composites, (2) to verify the experimental results using damage-mechanics based, 3-D dynamic nonlinear finite element method embedded in a commercial software package, LS-DYNA, (i.e., a combined experimental-numerical approach was used in the research), (3) to provide data of research results to supplement Army's current missions in the FCS, (4) to enhance the proposers' research capabilities on composites at their institute through interaction with Army researchers and facilities so that they may participate in Army's mainstream research in the future, and (5) to involve graduate and undergraduate students, especially those from underrepresented minorities, actively in the research so that they can gain meaningful research experience and may develop interest in pursuing advanced degrees in engineering. It is believed that results obtained in this study could benefit several Army missions and current interests in the development and implementation of Future Combat Systems (FCS), such as damage tolerance and ballistic impact study of composite integral armors (CIAs) for composite armored vehicles (CAVs) demonstrator, rotary-wing structures technology (RWST) for RAH-66 Comanche's lower forward fuselage demonstrator, etc.

DTIC

Carbon Fibers; Damage; Epoxy Matrix Composites; Fiber Composites; Glass Fiber Reinforced Plastics; Impact; Impact Tests; Terminal Ballistics

20080038785 Syracuse Univ., NY USA

Effects of Subzero Temperatures and Seawater Immersion on Damage Initiation and Growth in Sandwich Composites

Davidson, Barry D; Jun 16, 2008; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0418

Report No.(s): AD-A482447; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482447

Progress during the past six months is described. Efforts during this period have focused on (1) immersion studies of core and sandwich laminates, (2) the effects of environment on impact damage and fatigue response, and (3) debonding test development and toughness assessments. Ongoing studies in the first area indicate that there is no appreciable difference in the sea water absorption rate or saturation level for samples immersed at room temperature versus immersion at 0 C. In the second focus area, approximately 50% of the proposed test program has been completed, allowing a number of preliminary conclusions to be drawn about the effects of temperature, sea water saturation, and damage on the static strength, stiffness,

fatigue life and fatigue strength of sandwich laminates. In the third focus area, work on validating a new, highly accurate debonding test is nearly complete. Specimens have also been manufactured and sea water conditioned in preparation for subsequent use of this test method to study the effect of temperature and sea water immersion on toughness.
DTIC
Crack Initiation; Crack Propagation; Freezing; Growth; Initiation; Laminates; Sea Water; Submerging; Subzero Temperature; Temperature Effects

20080038790 Army Research Lab., Aberdeen Proving Ground, MD USA
Design and Analysis of a Composite Tailcone for the XM-1002 Training Round
Sands, James M; Garner, James; Dehmer, Peter; Vaidya, Uday; Villalobos, Adolfo; Serrano, Juan; Husman, George; Brannon, Robert; Apr 2008; 84 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-2-0018
Report No.(s): AD-A482455; ARL-TR-4428; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482455

A long-fiber thermoplastic (LFT) composite XM-1002 tailcone has been designed and fabricated to explore the technical feasibility of substituting aluminum-machined tailcones with low-cost, fiber-reinforced polymer tailcones. The design phase of the project involved developing a material model and numerically evaluating the stresses on the projectile using a simulated launch environment. A detailed ANSYS-based finite element analysis (FEA) was undertaken to investigate the behavior of the LFT tailcone compared to the existing aluminum version for various fiber loading. In the analysis, the tailcone was subjected to a variety of mechanical- and thermal-loading conditions. This report summarizes the detailed design and FEA of two versions of the XM-1002 composite tailcone. These are referred to as hollow-back and filled-back. For the hollow-back geometry, the objective was to mimic the external geometry of the presently used aluminum tailcone. The hollow-back tailcone was further investigated for two metal insert geometries, beaded and threaded. Weight reduction with respect to the all-metal (aluminum) version of the tailcone is not desirable; hence a metal insert was used in conjunction with the LFT material. Three conditions with respect to the firing of a projectile have also been discussed in-bore, transition, and out-of-bore. The response of the LFT composite tailcone to pressure, gravitational load, and temperature has been evaluated. The testing trial held at Aberdeen Proving Ground, MD, demonstrated that the LFT filled-back glass/nylon tailcone with 40% glass loading successfully passed the firing conditions. By implementing the proposed LFT composite tailcone, significant cost savings are projected compared to the existing aluminum version.
DTIC
Aluminum; Ammunition; Composite Materials; Design Analysis; Education; Fiber Composites; Projectiles; Thermal Analysis

20080038891 Teledyne Scientific and Imaging, LLC, Thousand Oaks, CA USA
Test and Material Specifications for Dynamic Delamination Studies of Z-Pinned Laminates
Cox, Brian; Lundsgaard-Larsen, Christian; Massabo, Roberta; Aug 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-C-0073
Report No.(s): AD-A482509; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We specify tests by which we expect to demonstrate inference from test data of a mixed mode dynamic cohesive law that represents the crack-shielding effects of through-thickness reinforcement (e.g., z-pins) in a laminate.
DTIC
Delaminating; Laminates; Reinforcing Fibers; Specifications

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20080037316 UT-Battelle, LLC, Oak Ridge, TN, USA; Battelle Columbus Labs., OH USA
Coupled Spring System for Measuring Molecular Forces
Doktycz, M. J., Inventor; Allison, D. P., Inventor; 23 Sep 04; 9 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-947 799
Report No.(s): PB2008-102071; No Copyright; Avail.: CASI: A02, Hardcopy

A coupled spring system is applied to dynamic force spectroscopy measurements. A microcantilever-mounted probe acts as a first spring, and a supported micromachined membrane acts as a second spring. The coupled spring system provides a system spring constant that is lower than either spring individually. By probing different regions of the membrane, the spring constant of the system can be varied.

NTIS

Molecules; Patent Applications

20080037323 Birch Stewart Kolasch and Birch, Falls Church, VA, USA

Charge Neutral Complexes of Paramagnetic Metals as Intracellular Magnetic Resonance Imaging Contrast Agents

Dewanjee, M. K., Inventor; 4 Oct 05; 11 pp.; In English
Patent Info.: Filed Filed 4 Oct 05; US-Patent-Appl-SN-11-242 064
Report No.(s): PB2008-102193; No Copyright; Avail.: CASI: A03, Hardcopy

A contrast agent for magnetic resonance imaging comprising a complex of a paramagnetic cation, preferably Gd(sup +3), Dy(sup +3), and Fe(sup +3) with three equivalents of a charge neutralizing chelator that provides a lipid soluble complex of the paramagnetic cation is described. The complex is retained intracellularly when introduced into a mammalian cell. A method of providing an image of an internal pathology of a patient by magnetic resonance imaging (MRI) by administering the MRI contrast agent or tagged cells to the patient and scanning the patient using magnetic resonance imaging to obtain visible images of the internal pathology of the patient is also set forth.

NTIS

Imaging Techniques; Magnetic Resonance; Metals; Magnetic Properties

20080037339 Fish and Richardson, P.C., Minneapolis, MN, USA

Substituted Adamantanes and Methods of Making the Same

Frangioni, J. V., Inventor; Maison, W., Inventor; Kemp, D. S., Inventor; 9 Sep 05; 14 pp.; In English
Contract(s)/Grant(s): R21 CA-88870; R21/33 CA-88245
Patent Info.: Filed Filed 9 Sep 05; US-Patent-Appl-SN-11-222 951
Report No.(s): PB2008-101912; No Copyright; Avail.: CASI: A03, Hardcopy

Adamantane derivatives, and methods of making and using the same are disclosed.

NTIS

Cyclic Hydrocarbons; Derivation; Patent Applications; Synthesis (Chemistry)

20080037341 Washburn (Woodcodk), LLP, Philadelphia, PA, USA

Microfluidic Microarray Systems and Methods Thereof

West, J. A. A., Inventor; Hukari, K. W., Inventor; Hux, G. A., Inventor; 22 Sep 04; 23 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10-946 920
Report No.(s): PB2008-100714; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed are systems that include a manifold in fluid communication with a microfluidic chip having a microarray, an illuminator, and a detector in optical communication with the microarray. Methods for using these systems for biological detection are also disclosed.

NTIS

Chips; Microfluidic Devices; Patent Applications

20080037343 Gifford Krass Groh Sprinkel and Citkowski, PC, Troy, MI, USA

Surface Enhanced Raman Spectroscopy (SERS) Substrates Exhibiting Uniform High Enhancement and Stability

Dwight, D. W., Inventor; Allara, D. L., Inventor; 20 Sep 05; 25 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0226
Patent Info.: Filed Filed 20 Sep 05; US-Patent-Appl-SN-11-231 177
Report No.(s): PB2008-101973; No Copyright; Avail.: CASI: A03, Hardcopy

An improved substrate for Raman spectroscopy of an analyte comprises a porous metal film. Enhancement factors and

uniformity of the substrate can be enhanced by electrochemical roughening of the film. Improved sensors and spectrometers using such substrates are also described.
NTIS
Augmentation; Chemical Reactions; Patent Applications; Raman Spectroscopy; Substrates; Surface Reactions

20080037357 Sparkman (Klarquist), LLP, Portland, OR, USA
Scaffold-Organized Clusters and Electronic Devices Made Using Such Clusters
Hutchinson, J. E., Inventor; Reed, S. M., Inventor; Wybourne, M. N., Inventor; 29 Mar 05; 36 pp.; In English
Contract(s)/Grant(s): N00014-93-0618; N00014-93-1-1120
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-094 049
Report No.(s): PB2008-101942; No Copyright; Avail.: CASI: A03, Hardcopy

A method for forming arrays of metal, alloy, semiconductor or magnetic clusters is described. The method comprises placing a scaffold on a substrate, the scaffold comprising, for example, polynucleotides and/or polypeptides, and coupling the clusters to the scaffold. Methods of producing arrays in predetermined patterns and electronic devices that incorporate such patterned arrays are also described.
NTIS
Patent Applications; Semiconductors (Materials); Arrays; Metal Clusters

20080037369 Hodgson Russ LLP, Buffalo, NY, USA
D-Isomers of Antimicrobial Peptide
Bobek, L. A., Inventor; 26 Aug 05; 26 pp.; In English
Contract(s)/Grant(s): NIDCR-DE09820
Patent Info.: Filed Filed 26 Aug 05; US-Patent-Appl-SN-11-213 245
Report No.(s): PB2008-102842; No Copyright; Avail.: CASI: A03, Hardcopy

This invention provides D-isomers of MUC7-12-mer peptide of human saliva MUC7. The isomers have antimicrobial activity comparable to that of the L-isomers and are resistant to proteolysis. These peptides can be used as antifungal and antimicrobial agents.
NTIS
Antibiotics; Antiinfectives and Antibacterials; Isomers; Microorganisms; Patent Applications; Peptides

20080037537 California Univ., Berkeley, CA, USA
Molehole Embedded 3-D Crossbar Architecture Used in Electrochemical Molecular Memory Device
Kuhr, W. G., Inventor; Bocian, D. F., Inventor; Liu, Z., Inventor; Yasseri, A., Inventor; 22 Apr 05; 21 pp.; In English
Contract(s)/Grant(s): ONR-N00014-99-0357
Patent Info.: Filed Filed 22 Apr 05; US-Patent-Appl-SN-11-112 359
Report No.(s): PB2008-102773; No Copyright; Avail.: CASI: A03, Hardcopy

This invention provides a new design and fabrication for a three-dimensional crossbar architecture embedding a sub-micron or nanometer sized hole (called a molehole) in each cross-region. Each molehole is an electrochemical cell consisting of two or more sectional surfaces separated by a non-conductor (e.g., a dielectric layer and solid electrolyte). When used in electrochemical molecular memory device (EMMD), the architecture provides unique features such as a nano-scale electroactive surface, no interaction between memory elements, and easier miniaturization and integration.
NTIS
Computer Storage Devices; Electrochemical Cells; Embedding; Patent Applications

20080037545 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Development of Advanced Carbide for Nickel-Based Alloy Machining for Turbine Engines
Jun 20, 2006; 2 pp.; In English
Contract(s)/Grant(s): Proj-05-0078-10
Report No.(s): AD-A482030; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Modern gas turbine engines (Figure 1) used in military fighter jets depend on nickel-based super alloys for their critical components due to their ability to withstand high combustion temperatures. However, the very characteristics providing good

high temperature strength in these alloys make them difficult to machine efficiently by limiting the speed capability of the cutting tools. A joint effort between the NCDMM and alliance partner Kennametal, Inc. involved developing an advanced coated carbide cutting tool for turning nickel-based alloys such as Inconel 718 with 40% higher machining productivity.
DTIC
Carbides; Gas Turbines; Machining; Nickel Alloys; Turbine Engines

20080037595 Hunter Mfg. Co., Solon, OH USA
Activated Carbon Fiber Cloth Adsorber
Kessler, Ken; Mar 2008; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8651-05-C-0302; Proj-4918
Report No.(s): AD-A481834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481834

Regenerative filtration based upon activated carbon cloth (ACFC) and direct ohmic heating is being investigated for both environmental and military applications. Although these Electrothermal Swing Adsorption (ESA) systems have been demonstrated at the bench and pilot scale, further development is needed for scale up and manufacturability. This project consisted of the design, manufacture and testing of a tenth scale Vapor Phase Removal and Recovery System (VaPRRS) filter prototype. The adsorption filter created during this project would function as the primary adsorption filter in a VaPRRS used during the painting of USA Air Force aircraft wheel wells. The VaPRRS is expected to replace the single use filters currently used in this application and provide performance and overall system cost benefits.
DTIC
Activated Carbon; Adsorbents; Adsorption; Carbon Fibers; Fabrics; Protection; Vapor Phases

20080037651 Florida Agricultural and Mechanical Univ., Tallahassee, FL USA
DFT Modeling of SWCNT Growth on Iron Catalyst
Gutsev, G L; Mochena, M D; Bauschlicher, Jr, C W; Nov 2006; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0014
Report No.(s): AD-A481949; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481949

We performed simulations of initial stages of a carbon nanotube growth catalyzed by iron particles using all-electron density functional theory with generalized gradient approximation for the exchange-correlation functional. The systems studied are Fe4 + Cn for n=7-25, Fe10 + C15, and Fe10C15 + 10C. In addition, we performed a detailed study of development of different isomers in the Cn series, n=7-25.
DTIC
Carbon Nanotubes; Catalysts; Iron; Nucleation

20080037757 Lawrence Livermore National Lab., Livermore, CA USA
Enhanced Corrosion Resistance of Iron-Based Amorphous Alloys
Rebak, R. B.; Day, S. D.; Lian, T.; Aprigliano, L. F.; Haliey, P. D.; Apr. 16, 2007; 11 pp.; In English
Report No.(s): DE2007-913546; UCRL-PROC-229951; No Copyright; Avail.: Department of Energy Information Bridge

Iron-based amorphous alloys possess enhanced hardness and are highly resistant to corrosion, which make them desirable for wear applications in corrosive environments. It was of interest to examine the behavior of amorphous alloys during anodic polarization in concentrated salt solutions and in the salt-fog testing. Results from the testing of one amorphous material (SAM2X5) both in ribbon form and as an applied coating are reported here. Cyclic polarization tests were performed on SAM2X5 ribbon as well as on other nuclear engineering materials. SAM2X5 showed the highest resistance to localized corrosion in 5 M CaCl2 solution at 105DGC. Salt fog tests of 316L SS and Alloy 22 coupons coated with amorphous SAM2X5 powder showed resistance to rusting. Partial devitrification may be responsible for isolated pinpoint rust spots in some coatings.
NTIS
Alloys; Amorphous Materials; Corrosion Resistance; Iron Alloys

20080037774 Jang (Bor Z.), Fargo, ND, USA
Nano-Structured Ion-Conducting Inorganic Membranes for Fuel Cell Applications
Yang, L., Inventor; Guo, J., Inventor; Jang, B. Z., Inventor; 12 Oct 04; 12 pp.; In English
Contract(s)/Grant(s): SBIR-STTR
Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-962 556
Report No.(s): PB2008-103097; No Copyright; Avail.: CASI: A03, Hardcopy

An inorganic proton-conducting membrane and a fuel cell comprising this membrane. The fuel cell comprises a fuel anode, an oxidant cathode, and an inorganic proton-conducting membrane disposed between the anode and the cathode. The membrane is composed of a nano-structured network of proton-exchange inorganic particles. The particles form a sufficiently high density of proton-conducting nanometer-scaled channels with at least one dimension smaller than 100 nanometers so that ionic conductivity of the membrane is no less than 10(sup -6)S/cm (mostly greater than 10(sup -4)S/cm) at 25 degrees C. or no less than 10(sup -4)S/cm (mostly greater than 10(sup -2) S/cm) at 200 degrees C. This inorganic membrane allows a hydrogen-oxygen fuel cell to operate at a higher temperature without the need (or with a reduced need) to maintain the membrane in a highly hydrated state. A higher operating temperature also implies a fast electro-catalytic reaction of a fuel (e.g., mixture of methanol and water) at the anode permitting a lesser amount of fuel to cross-over the membrane and, hence, a higher fuel utilization efficiency.
NTIS
Fuel Cells; Membranes; Patent Applications; Protons

20080037780 California Univ., Lawrence Livermore Lab., Livermore, CA, USA
Methanol-Tolerant Cathode Catalyst Composite for Direct Methanol Fuel Cells
Zhu, Y., Inventor; Zelenay, P., Inventor; 12 Dec 02; 9 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-36
Patent Info.: Filed Filed 12 Dec 02; US-Patent-Appl-SN-10-317 654
Report No.(s): PB2008-100710; No Copyright; Avail.: CASI: A02, Hardcopy

A direct methanol fuel cell (DMFC) having a methanol fuel supply, oxidant supply, and its membrane electrode assembly (MEA) formed of an anode electrode and a cathode electrode with a membrane there between, a methanol oxidation catalyst adjacent the anode electrode and the membrane, an oxidant reduction catalyst adjacent the cathode electrode and the membrane, comprises an oxidant reduction catalyst layer of a platinum-chromium alloy so that oxidation at the cathode of methanol that crosses from the anode through the membrane to the cathode is reduced with a concomitant increase of net electrical potential at the cathode electrode.
NTIS
Catalysts; Cathodes; Fuel Cells; Methyl Alcohol; Oxidizers; Patent Applications

20080037782 Quarles and Brady, LLP., Milwaukee, WI, USA
Design and Synthesis of Guest-Host Nanostructures to Enhance Ionic Conductivity Across Nanocomposite Membranes
Hu, M. Z., Inventor; Kosacki, I., Inventor; 23 Sep 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-947 836
Report No.(s): PB2008-100708; No Copyright; Avail.: CASI: A03, Hardcopy

An ion conducting membrane has a matrix including an ordered array of hollow channels and a nanocrystalline electrolyte contained within at least some or all of the channels. The channels have opposed open ends, and a channel width of 1000 nanometers or less, preferably 60 nanometers or less, and most preferably 10 nanometers or less. The channels may be aligned perpendicular to the matrix surface, and the length of the channels may be 10 nanometers to 1000 micrometers. The electrolyte has grain sizes of 100 nanometers or less, and preferably grain sizes of 1 to 50 nanometers. The electrolyte may include grains with a part of the grain boundaries aligned with inner walls of the channels to form a straight oriented grain-wall interface or the electrolyte may be a single crystal. In one form, the electrolyte conducts oxygen ions, the matrix is silica, and the electrolyte is yttrium doped zirconia.
NTIS
Ion Currents; Nanostructures (Devices); Patent Applications

20080037816 Hoag (Foley), LLP, Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Carbon-Polymer Electrochemical Systems and Methods of Fabricating Them Using Layer-By-Layer Technology
Cunningham, P. T. H., Inventor; Farhat, T. R., Inventor; 17 Sep 04; 37 pp.; In English
Contract(s)/Grant(s): CTS-0136029
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-944 455
Report No.(s): PB2008-100703; No Copyright; Avail.: CASI: A03, Hardcopy

One aspect of the invention provides ion-exchange and gas-diffusion membranes, fabricated by a layer-by-layer approach, for use, e.g., in electrochemical cells; a process for making membrane electrode assemblies fabricated using porous frameworks, LBL composite membranes and LBL carbon-Polymer electrodes; and the application of the membrane and electrode assemblies to a variety of devices, both electrochemical and otherwise.

NTIS
Carbon; Electrochemical Cells; Fabrication; Gaseous Diffusion; Patent Applications

20080037859 Brookhaven National Lab., Upton, NY USA
Methods of Controlling Hydrogen Fluoride Pressure During Chemical Fabrication Processes
Solovyov, V., Inventor; Wiesmann, H., Inventor; 6 Oct 05; 11 pp.; In English
Contract(s)/Grant(s): DE AC02-98CH10886
Patent Info.: Filed Filed 6 Oct 05; US-Patent-Appl-SN-11-245 138
Report No.(s): PB2008-103066; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a method for producing a crystalline end-product. The method comprising exposing a fluoride-containing precursor to a hydrogen fluoride absorber under conditions suitable for the conversion of the precursor into the crystalline end-product.

NTIS
Chemical Reactions; Crystallinity; Fabrication; Hydrofluoric Acid; Patent Applications

20080038080 Royland, Abrams, Berdo and Goodman, LLP, Washington, DC, USA; George Washington Univ., Washington, DC, USA
In-Situ Droplet Monitorng for Self-Tuning Spectrometers
Montaser, A., Inventor; Jorabchi, K., Inventor; Kahen, K., Inventor; 3 Oct 05; 18 pp.; In English
Contract(s)/Grant(s): DE-DE-FG02-93ER14320; NSF-CHE-9505726
Patent Info.: Filed Filed 3 Oct 05; US-Patent-Appl-SN-11-240 642
Report No.(s): PB2008-101617; No Copyright; Avail.: CASI: A03, Hardcopy

A laser scattering based imaging technique is utilized in order to visualize the aerosol droplets in an inductively coupled plasma (ICP) torch from an aerosol source to the site of analytical measurements. The resulting snapshots provide key information about the spatial distribution of the aerosol introduced by direct and indirect injection devices: (1) a direct injection high efficiency nebulizer (DIHEN); (2) a large-bore DIHEN (LB-DIHEN); and (3) a PFA microflow nebulizer with a PFA Scott-type spray chamber. Moreover, particle image velocimetry (PUV) is used to study the in-situ behavior of the aerosol before interaction with, for example, plasma, while the individual surviving droplets are explored by particle tracking velocimetry (PTV). Further, the velocity distribution of the surviving droplets demonstrates the importance of the initial droplet velocities in complete desolvation of the aerosol for optimum analytical performance in ICP spectrometries. These new observations are important in the design of the next-generation direct injection devices for lower sample consumption, higher sensitivity, lower noise levels, suppressed matrix effects, and for developing smart spectrometers. For example, a controller can be provided to control the output of the aerosol source by controlling the configuration of the source or the gas flow rate via feedback information concerning the aerosol.

NTIS
Aerosols; Drops (Liquids); Imaging Techniques; Laser Outputs; Light Scattering; Patent Applications; Plasmas (Physics); Spectrometers; Tuning

20080038090 Kushman (Brooks), P.C., Southfield, MI, USA

Liquid Feed Flame Spray Modification of Nanoparticles

Laine, R. M., Inventor; Marchal, J., Inventor; Azurdia, J., Inventor; Rennesund, R., Inventor; 25 Feb 05; 8 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0389

Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-066 822

Report No.(s): PB2008-101631; No Copyright; Avail.: CASI: A02, Hardcopy

Nano- and micron sized metal oxide and mixed metal oxide particles are injected into a high temperature region wherein the temperature is between about 400 degrees C. and less than 2000 degrees C., and collected as particles or as coatings wherein a particulate nature is substantially maintained. The particles are altered in at least one of phase, morphology, composition, and particle size distribution, and may achieve further changes in these characteristics by coinjection of metal oxide precursor in liquid form.

NTIS

Flames; Metal Oxides; Microparticles; Nanoparticles; Patent Applications; Sprayers

20080038647 Idaho National Engineering Lab., Idaho Falls, ID, USA

NHI-Acid Concentration Membranes-Membrane Recommendations for the S-I Cycle

Stewart, F. F.; Mar. 01, 2007; 6 pp.; In English

Contract(s)/Grant(s): DE-AC07-05ID14517

Report No.(s): DE2007-915523; INL/EXT-07-12353; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this draft report is to make recommendations concerning the applicability of specific membrane materials for acid concentration processes to the Sulfur-Iodine (S-I) thermochemical cycle integrated laboratory scale (ILS) demonstration. Introduction Acid concentration membrane processes have been studied for possible inclusion in the Sulfur-Iodine integrated laboratory scale (S-I ILS) demonstration. The need for this technology is driven by the chemical processes required for economical water splitting using the S-I cycle. Of the chemical processes inherent to the S-I cycle that have been identified as targets for deployment of membrane technology, three have been studied during the past three fiscal years as a part of the DOE Nuclear Hydrogen Initiative. First, the ability to concentrate hydriodic acid (HI) and iodine mixtures was sought as a method for aiding in the isolation of HI away from water and iodine. Isolated HI would then be delivered to the HI decomposition process for liberation of product hydrogen. Second, an extension of this technology to sulfuric acid was proposed to benefit sulfuric acid decomposition recycle. Third, decomposition of HI to form hydrogen is equilibrium limited. Removal of hydrogen, utilizing Le Chateliers principle, will increase to overall conversion and thus increasing the efficiency of the S-I cycle.

NTIS

Hydrogen; Iodine; Membranes; Sulfur

20080038730 University of Central Florida, Orlando, FL USA

Foveated Wide Field-of-View Imaging for Missile Warning/Tracking using Adaptive Optics

Wu, Shin-Tson; Nov 30, 2007; 10 pp.; In English

Contract(s)/Grant(s): W911NF04C0048

Report No.(s): AD-A482335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482335

For adaptive foveated imaging using a high resolution spatial light modulator (SLM), high birefringence and low viscosity LC mixtures are highly desirable. A higher birefringence enables a thinner liquid crystal layer to be used which results in a faster response time. Low viscosity is always favorable as it helps to reduce the SLM response time. For the thin-film-transistor (TFT)-addressed SLM, high resistivity is an extra requirement. In this report we review our development on the single compounds syntheses and mixtures with required high birefringence and relatively low viscosity within the time of the project.

DTIC

Adaptive Optics; Birefringence; Field of View; Imaging Techniques; Lenses; Liquid Crystals; Missile Tracking

20080038740 Oklahoma Univ., Norman, OK USA

Development of In Situ Infrared Spectroelectrochemical Techniques: Application to Lithium Intercalation Reactions in Electrode Materials

Frech, Roger; Oct 9, 2007; 10 pp.; In English

Contract(s)/Grant(s): W911NF-04-1-0322

Report No.(s): AD-A482348; OK-125-4283; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482348

We developed an in situ IR transmission electrochemical cell, which was initially used to study lithium intercalation in a phospho-olivine LixFePO4 cathode. We had previously characterized vibrational spectrum of this material as part of a preliminary study. The transition between LiFePO4 and FePO4 could easily be followed in the in situ spectra. An industrially available coin cell was modified to facilitate routine in situ Raman measurements of lithium batteries. Available in situ Raman cells are usually designed to optimize optical throughput, resulting in cell geometries significantly different from those used in 'normal' electrochemical investigations. The charge/discharge curves of our cell were very similar to those of unmodified coin cells. This cell was used to study lithium intercalation in a lithium vanadium pentoxide cathode.

DTIC

Electrochemistry; Electrode Materials; Electrodes; In Situ Measurement; Infrared Instruments; Infrared Radiation; Intercalation; Lithium; Vibrational Spectra

20080038741 Arizona State Univ., Tempe, AZ USA

Synthesis, Characterization, Properties and Performance of Novel Direct Band Gap Semiconductors

Kouvetakis, John; May 8, 2007; 3 pp.; In English

Contract(s)/Grant(s): W911NF-04-1-0256

Report No.(s): AD-A482349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482349

The work performed using support from this grant has focused on the following: (1) the development of ZrB2 buffer layers and Si-Ge-Sn compliant templates grown directly upon Si (100), and (2) the demonstration of these systems in mismatched heteroepitaxy of tetrahedral semiconductors including III-V compounds and group IV materials with Si substrates.

DTIC

Energy Gaps (Solid State); Semiconductors (Materials)

20080038743 North Carolina State Univ., Raleigh, NC USA

Strain and Quantum Dots Manipulation in Nitride Compounds for Opto-electronic Devices

Bedair, S M; El-Masry, N A; Feb 15, 2008; 8 pp.; In English

Contract(s)/Grant(s): W911NF-04-1-0297

Report No.(s): AD-A482351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482351

Activities during the project period can be divided into two main areas. The first dealt with quantum structure and optical properties of light sources based on GaInN/AlInGaN quantum well structures. The second area covered research in the room temperature ferromagnetic properties of GaMnN dilute magnetic semiconductors.

DTIC

Electro-Optics; Nitrides; Optical Properties; Optoelectronic Devices; Quantum Dots; Quantum Wells; Semiconductors (Materials)

20080038750 Army Research Lab., Adelphi, MD USA

Deposition of Selected Airborne Particles into a Microfluidic Flow Cytometer for Bioanalysis

Huang, Hermes; Pan, Yong-Le; Hill, Steven C; Chang, Richard K; May 2008; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482360; ARL-TR-4446; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482360

In a proof-of-concept experiment, we demonstrate how selected airborne bacteria, detected in air by light scattering, can be deflected aerodynamically into the input well of a microfluidic flow cytometer and analyzed using fluorescein-labeled antibodies. This experiment demonstrates a new method for introducing airborne samples into a microfluidic cell. The results

suggest that by deflecting only those airborne particles having the fluorescence spectra of bioaerosols and by depositing the individual bioaerosols into the smallest volume of reagent required for analysis, it should be possible to achieve a system that can continuously monitor the air for certain bioaerosols while minimizing reagent usage.
DTIC
Aerosols; Air Pollution; Cytology; Cytometry; Deposition; Light Scattering; Microfluidic Devices; Particles

20080038758 Stanford Univ., Stanford, CA USA
Shock Tube Measurements of Ignition Processes and Spray-Shock Wave Interactions
Hanson, Ronald K; Davidson, David F; Apr 6, 2008; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0138
Report No.(s): AD-A482369; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482369

We report results of high-temperature shock tube research aimed at improving knowledge of the combustion behavior of diesel, jet and related fuels. Research was conducted in four Stanford shock tube facilities and focused on the following topics: (1) development of the aerosol shock tube; (2) ignition delay time measurements of gaseous jet fuels (JP-8 and Jet-A) and surrogate components at high pressures and low temperatures; (3) laser absorption measurements of species time-histories for OH radicals and alkanes; (4) ignition delay times of n-dodecane, jet fuel and diesel using the aerosol shock tube technique; and (5) improving shock tube performance and modeling.
DTIC
Ignition; Jet Engine Fuels; Shock Tubes; Shock Wave Interaction; Sprayers

20080038761 Pennsylvania State Univ., University Park, PA USA
Plasma-Propellant Interaction Studies
Thynell, Stefan T; Litzinger, Thomas A; Dec 20, 2007; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0340
Report No.(s): AD-A482372; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482372

This report describes research focused on the interactions between a plasma and a solid propellant. The specific issues addressed include the effects of radical and neutral species as well as radiative heat transfer on the ignition and combustion of double-base propellants. A wide variety of measurements have been conducted using a broad range of diagnostic tools, such as a triple-quadrupole mass spectrometer, special heat flux gages, high-speed cameras, as well as SEM and X-ray facilities. Species measurements show that both neutrals/radicals and ions from the capillary arrive at the propellant surface and provide a pool of species that readily interact with pyrolysis products from the propellant. It is also evident that metal particles from trigger wire and nozzle arrive at the propellant surface to enhance the pyrolysis. The magnitudes of the radiative heat transfer are extremely high and depend on the capillary and trigger wire material used. The radiation produces measurable pyrolysis and in-depth heating of transparent JA2. The ultra-violet component is very strong, but it is believed to inhibit ignition when the propellant is directly exposed to the plasma. The pyrolysis species, including NO2, N2O, HONO and aldehydes are uv-photolyzed, to produce CO, CO2, NO and CH4.
DTIC
Burning Rate; Plasmas (Physics); Propellants; Pyrolysis; Solid Propellants

20080038765 Illinois Univ., Chicago, IL USA
Surface Structure and Chemistry in the Epitaxial Growth of Cadmium Telluride on Silicon
Trenary, Michael; Apr 21, 2008; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-02-2-0029
Report No.(s): AD-A482376; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482376

The goal of this project was to obtain an atomic-scale understanding of the surface processes that underlie the growth by molecular beam epitaxy (MBE) of HgCdTe on As-passivated Si surfaces. It is generally recognized that in MBE the first few monolayers determine the quality and structure of the final crystalline film. In principle, the methods of surface science can provide the critically needed information about the initial stages of film growth. However, because of the volatile and toxic nature of As and CdTe, special equipment had to be constructed before the deposition processes could be studied. The resulting unique apparatus allowed us to deposit As and CdTe onto Si substrates in a separate preparation chamber with subsequent

transfer under vacuum into the main analysis chamber. We used the apparatus to characterize As on several different Si surfaces with the techniques of scanning tunneling microscopy (STM), X-ray photoelectron spectroscopy (XPS), and Low Energy Electron Diffraction (LEED). The surface analyses were performed with instrumentation that was nearly twenty years old, which slowed progress due to the need for frequent and difficult repairs. Unanticipated budget cuts also impeded progress. Nevertheless, several conference presentations and publications resulted from this work.
DTIC
Cadmium Tellurides; Chemical Reactions; Epitaxy; Silicon; Surface Reactions

20080038780 Army Research Lab., Aberdeen Proving Ground, MD USA
Heterogeneous Deformation and Spall of an Extruded Tungsten Alloy: Plate Impact Experiments and Crystal Plasticity Modeling
Vogler, T J; Clayton, J D; Apr 2008; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-WHPR01B
Report No.(s): AD-A482414; ARL-RP-206; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482414

The role of microstructure in the dynamic deformation and fracture of a dual phase, polycrystalline tungsten alloy under highrate impact loading is investigated via experiments and modeling. The material studied consists of pure tungsten crystals embedded in a ductile binder alloy comprised of tungsten, nickel, and iron. The tungsten crystals are elongated in a preferred direction of extrusion during processing. Plate impact tests were conducted on samples oriented either perpendicular or parallel to the extrusion direction. Spatially resolved interferometric data from these tests were used to extract wave propagation behavior and spall strength dependent upon position in the sample microstructure. Finite element simulations of impact and spall in digitally reproduced microstructural geometries were conducted in parallel with the experiments. Finite deformation crystal plasticity theory describes the behavior of the pure tungsten and binder phases, and a stress- and temperature-based cohesive zone model captures fracture at grain and phase boundaries in the microstructure. In results from both experiments and modeling, the grain orientations affect the free-surface velocity profile and spall behavior. Some aspects of distributions of free-surface velocity and spall strength among different microstructure configurations are qualitatively similar between experimental and numerical results, while others are not as a result of differing scales of resolution and modeling assumptions. Following a comparison of experimental and numerical results for different microstructures, intergranular fracture is identified as an important mechanism underlying the spall event.
DTIC
Crystals; Deformation; Extruding; Heterogeneity; Microstructure; Plastic Properties; Tungsten

20080038792 Triosyn Corp., Williston, VT USA
Individual and Collective Protection Program
Franzot, Sarah; Gendron, Anne-Marie; Staffa, Alfredo; Ohayon, David; SansCartier, Marie-Eve; St-Denis, Chantal; Low, Kathy; Nov 30, 2007; 218 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-C-0042
Report No.(s): AD-A482460; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482460

The FY06-07 goal was to advance the development of the Triosyn Super HEPA (TSH) media as an enhanced filtration material to be included in individual protection and collective protection end-use applications. Work was also done to pursue the development of the Triosyn T-series respirators. The objectives were achieved and resulted in a mature Triosyn Super HEPA filter material. A manufacturing process to incorporate Triosyn particles to glass fiber HEPA was developed to produce a material which maintains standard HEPA performance but also displays enhanced antimicrobial and chemical protection properties due to the presence of Triosyn. The antimicrobial performance of this media was demonstrated under a variety of testing conditions and following exposure to different microbial challenges. The Triosynated material's safety profile was also well-defined as measured by the iodine levels released in the effluent air under several exposure conditions. The chemical protection capability of the TSH was demonstrated following exposure of the media to surrogates of chemical warfare agents and potential incompatibilities originating from adverse interactions between iodine and the ASZM-TEDA carbon were investigated. This advanced TSH filter material is now ready for the next research steps which involve prototype designing for insertion into various individual and collective protection applications.
DTIC
Filtration; Protection; Protectors; Respirators

20080038793 Naval Research Lab., Washington, DC USA

Cross-Sectional Scanning Tunneling Microscopy of Mn-Doped GaAs: Theory and Experiment

Sullivan, J M; Boishin, G I; Whitman, L J; Hanbicki, A T; Jonker, B T; Erwin, S C; Dec 23, 2003; 7 pp.; In English

Report No.(s): AD-A482464; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482464

We report first-principles calculations of the energetics and simulated scanning tunneling microscopy (STM) images for Mn dopants near the GaAs (110) surface, and compare the results with cross-sectional STM images. The Mn configurations considered here include substitutionals, interstitials, and complexes of substitutionals and interstitials in the first three layers near the surface. Based on detailed comparisons of the simulated and experimental images, we identify three types of Mn configurations imaged at the surface: (1) single Mn substitutionals, (2) pairs of Mn substitutionals, and (3) complexes of Mn substitutionals and interstitials.

DTIC

Doped Crystals; Electron Microscopy; Manganese; Scanning Tunneling Microscopy

20080038794 Naval Research Lab., Washington, DC USA

Influence of Substrate Surface Reconstruction on the Growth and Magnetic Properties of Fe on GaAs(001)

Kneedler, E M; Jonker, B T; Thibado, P M; Wagner, R J; Shanabrook, B V; Whitman, L J; Mar 13, 1997; 7 pp.; In English

Report No.(s): AD-A482465; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482465

We have studied the magnetic and structural properties of epitaxial bcc Fe(001) films grown at 175 C on molecular-beam epitaxy-prepared GaAs(001)-2*4 and -c(4*4) reconstructed surfaces, with film thicknesses ranging up to ~30 ML (~43). We present measurements of the thickness-dependent evolution of the magnetic properties of the Fe films as determined by in situ magneto-optic Kerr effect. We find that the magnetic properties and growth mode are similar for both 234 and c(434) reconstructions, although the initial adsorption sites and island nucleation as measured by scanning tunneling microscopy are clearly dominated by the substrate surface reconstruction. The onset of room-temperature ferromagnetism occurs at 6 ML for growth on both GaAs surface reconstructions. At this coverage, the measured Curie temperature (100 C) is significantly reduced from that of bulk alpha-Fe (770 C). The anisotropy is dominated by a uniaxial component such that the two (110) axes are inequivalent for all coverages studied. Shape anisotropy does not appear to play a significant role.

DTIC

Epitaxy; Ferromagnetism; Gallium Arsenides; Magnetic Properties; Molecular Beam Epitaxy; Substrates

20080038795 Houston Univ., TX USA

Optical and Structural Properties of InAs/GaSb Nanostructures

Stokes, D W; Li, J H; Forrest, R L; Ammu, S L; Lenzi, J C; Moss, S C; Nosho, B Z; Aifer, E H; Bennett, B R; Whitman, L J; Jan 2004; 7 pp.; In English

Contract(s)/Grant(s): DNR-0099573; DMR-0237811

Report No.(s): AD-A482466; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482466

The nanostructures self-organized via lateral composition modulation in 140 period (InAs)13/(GaSb)13 superlattices grown by molecular beam epitaxy have been studied by high-resolution x-ray diffraction and infrared absorption. Three samples were analyzed in this study; two with lateral composition modulation and one without. X-ray reciprocal space map scans were taken to determine the average morphology of the modulated structures. Both vertical and lateral satellite peaks were observed for the samples with composition modulation, indicating the formation of two-dimensional nanowire arrays. The vertical wavelength measured for the two samples was twice the period intended by the growers. This is due to the face-centered cubic type stacking of the nanowires. Infrared absorption spectra of these two samples were compared to the spectra of the sample with no lateral composition modulation. Transitions involving the heavy- and light-hole bands in the GaSb hole quantum well and the electron subbands of the InAs electron quantum well were not evident for the samples with lateral composition modulation, indicating that the nanostructure of the lateral composition modulation affects the optical response of the sample, which is important for optoelectronic device applications.

DTIC

Gallium Antimonides; Indium Arsenides; Molecular Beam Epitaxy; Nanostructures (Devices); Optical Properties; X Ray Diffraction

20080038868 Johns Hopkins Univ., Baltimore, MD USA

Toward the Development of Aluminum Cluster-Containing Materials for Propulsion Applications

Bowen, Kit H; May 22, 2005; 11 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0206

Report No.(s): AD-A482473; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of his AFOSR research program was to work toward developing aluminum cluster-containing materials for propulsion applications. His efforts focused on four distinct approaches: (1) studying covalent aluminum-containing molecules/clusters, especially novel aluminum hydride clusters/molecules, (2) investigating the reactivity of aluminum cluster anions, (3) exploring the possible synthesis of derivatives of aluminum hydride clusters/molecules, and (4) investigating the prospects of making ionic 'molecules' composed of cations and aluminum containing cluster anions. The experimental methods included the use of unique sources, mass spectrometry, anion photoelectron spectroscopy, ion cyclotron resonance spectrometry, and bench-top synthesis. He was able to discover whole new categories of previously unknown aluminum hydrides, to show that the reactivity of aluminum cluster anions were governed by spin conservation rules, to synthesize small quantities of aluminum hydride derivatives, and to generate and characterize beams of several novel ionic 'molecules'

DTIC

Aluminum; Aluminum Compounds; Aluminum Hydrides; Anions; Cyclotron Resonance; Hydrides; Molecules; Photoelectron Spectroscopy; Propulsion

20080038870 Naval Research Lab., Washington, DC USA

Optical Characterization of Lateral Epitaxial Overgrown GaN Layers

Freitas, Jr, Jaime A; Nam, Ok-Hyun; Davis, Robert F; Saparin, Gennadi V; Obyden, Sergey K; Jan 1998; 6 pp.; In English

Report No.(s): AD-A482475; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The optical properties of homoepitaxial GaN layers deposited by organometallic vapor phase epitaxy on stripe-patterned GaN films on 6H-SiC substrates have been investigated. Analysis of the spatially resolved Raman scattering spectra indicate an improvement in material quality of the overgrown region. Room-temperature color cathodoluminescence imaging and low-temperature photoluminescence measurements indicate that a donor and an acceptor, different from those detected in the underlying GaN/AlN/SiC substrate, have been incorporated in the epitaxial layer. Detailed photoluminescence studies of the near band-edge emission strongly suggest that Si is the additional donor detected in the homoepitaxial GaN layer. Its occurrence, along with that of an acceptor-related defect which is primarily found in the laterally overgrown region, is discussed.

DTIC

Epitaxy; Gallium Nitrides; Optical Properties

20080038885 Virginia Commonwealth Univ., Richmond, VA USA

The Structure of Si(112):Ga-(N x 1) Reconstructions

Baski, A A; Erwin, S C; Whitman, L J; Jan 1999; 7 pp.; In English

Report No.(s): AD-A482500; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have studied the structure of Si(112):Ga-(N*1) reconstructions using atomic-resolution scanning tunneling microscopy and first-principles calculations. The nanofaceted clean Si(112) surface becomes planar following the adsorption of Ga, which forms long chains on the surface interrupted by isolated quasi-periodic defects. The defects create a mixture of (N*1) structures (N~4-7) with 5 1 and 6 1 unit cells most common. We demonstrate that this structure consists of a chain of Ga atoms adsorbed at the (111)-like step edge within the (112) unit cell, and that the defects are Ga vacancies where the exposed step edge Si atoms form a dimer bond. Calculations performed as a function of vacancy period confirm that the surface energy is minimized at N=5-6, when compressive strain associated with the Si-Ga bonds is effectively minimized.

DTIC

Gallium; Scanning Tunneling Microscopy; Silicon; Surface Energy

20080038887 Naval Research Lab., Washington, DC USA

Effects of As(2) Versus As(4) on InAs/GaSb Heterostructures: As-for-Sb Exchange and Film Stability

Nosho, B Z; Bennett, B R; Whitman, L J; Goldenberg, M; Aug 2001; 6 pp.; In English

Report No.(s): AD-A482505; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have used cross-sectional scanning tunneling microscopy and x-ray diffraction to characterize and compare the effects of As2 versus As4 on the growth of InAs/GaSb heterostructures by molecular beam epitaxy. When GaSb surfaces are exposed

to an As2 flux, the As exchanges with the surface Sb in an anion exchange reaction that creates layers of GaAs. In contrast, when GaSb surfaces are exposed to As4 fluxes, there is no evidence of the As-for-Sb exchange reaction. When comparing the use of As2 and As4 in periodic InAs/GaSb superlattices, the differences in the As incorporation rate into GaSb is further evident in x-ray diffraction spectra as a shift in the average lattice constant of the epilayer due to GaAs bond formation. Although inhibiting the exchange reaction would be useful in the minimization of the cross incorporation of As in the GaSb layers, the growth of InAs/GaSb heterostructures using As4 can be complicated by the introduction of film instabilities that have not been observed in growths using As2.
DTIC
Arsenic Compounds; Electron Microscopy; Gallium Antimonides; Gallium Arsenides; Molecular Beam Epitaxy; Stability; X Ray Diffraction

20080038888 Naval Research Lab., Washington, DC USA
Absolutely Calibrated Vacuum Ultraviolet Spectra in the 150 nm to 250 nm Range from Plasmas Generated by the NIKE KrF Laser
Seely, J F; Feldman, Uri; Holland, G E; Weaver, J L; Mostovych, A N; Obenschain, S P; Schmitt, A J; Lehmberg, R; Kjornarattanawanich, Benjawan; Back, C A; Mar 25, 2005; 31 pp.; In English
Report No.(s): AD-A482506; No Copyright; Avail.: Defense Technical Information Center (DTIC)
High resolution vacuum ultraviolet (VUV) spectra were recorded from plasmas generated by the NIKE KrF laser for the purpose of observing emission from the two-plasmon decay instability (TPDI) at 2/3 the NIKE wavelength (165 nm). The targets were irradiated by up to 43 overlapping beams with intensity up to ≈1014 W/sq cm and with beam smoothing by induced spatial incoherence (ISI). The targets consisted of planar foils of CH, BN, Al, Si, S, Ti, Pd, and Au. Titanium-doped silica aerogels in pyrex cylinders were also irradiated. Spectra of the target elements were observed from charge states ranging from the neutral atoms to 5 times ionized. The spectrometer was absolutely calibrated using synchrotron radiation, and absolute VUV plasma emission intensities were determined. Emission from the TPDI at 165 nm wavelength was not observed from any of the irradiated targets. An upper bound on the possible TPDI emission was less than 4x10-8 the incident NIKE laser energy. The NIKE laser radiation backscattered from the silica aerogel targets at 248 nm was typically 6x10-6 the incident NIKE laser energy, and the spectral broadening corresponded to the 1 THz bandwidth of the ISI smoothing. The spectra from the moderately charged plasma ions (up to 5 times ionized), spectral line widths, absolute continuum emission level, and slope of the continuum were consistent with plasma temperatures in the 100 eV to 300 eV range.
DTIC
Calibrating; Far Ultraviolet Radiation; Fluorides; Lasers; Plasmas (Physics); Silicon Dioxide; Ultraviolet Spectra

20080038889 Naval Research Lab., Washington, DC USA
Near-Field Nonuniformities in Angularly-Multiplexed KrF Fusion Lasers with Induced Spatial Incoherence
Lehmberg, R H; Chan, Y; Jan 2005; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482507; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Induced Spatial Incoherence (ISI) has been proposed for KrF laser drivers to achieve the high degree of spatial beam uniformity required for direct-drive inertial confinement fusion. Although ISI provides ultrasmooth illumination at the far-field of the laser, where the target is located, it can still allow the beams in the quasi near-field to develop time-averaged spatial structure. This speckle, which arises primarily from random phase aberration, builds up as the laser beams propagate away from the pupil plane located at the final amplifier stage; it is distinct from any structure imposed by gain nonuniformities in the amplifiers. Because of the spatial incoherence, the speckle is significantly smaller than that experienced by coherent beams; nevertheless, it remains a damage issue, especially for the long beam delay paths required in angularly-multiplexed KrF lasers. This paper develops a novel algorithm for calculating the time-integrated intensities, compares simulations and measurements of the near-field speckle in the Nike KrF laser, and explores options, such as aberration reduction and optical relaying, for controlling the problem in future angularly-multiplexed KrF drivers.
DTIC
Fluorides; Incoherence; Krypton; Krypton Fluoride Lasers; Laser Beams; Laser Fusion; Lasers; Multiplexing; Near Fields; Smoothing

20080038895 California Univ., Santa Barbara, CA USA

Structure of InAs/AlSb/InAs Resonant Tunneling Diode Interfaces

Noshoa, B Z; Weinberg, W H; Zinck, J J; Shanabrook, V; Bennett, B R; Whitman, L J; Aug 1998; 7 pp.; In English

Contract(s)/Grant(s): DMS-9615854; DMR91-20007

Report No.(s): AD-A482513; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have used in situ plan-view scanning tunneling microscopy to study the surfaces and interfaces within an InAs/AlSb/InAs resonant tunneling diodelike structure grown by molecular beam epitaxy. The nanometer and atomic-scale morphologies of the surfaces have been characterized following a number of different growth procedures. When InAs(001)-(234) is exposed to Sb2 a bilayer surface is produced, with 1 monolayer (ML) deep (3) vacancy islands covering approximately 25% of the surface. Both layers exhibit a (1*3)-like reconstruction characteristic of an InSb-like surface terminated with .1 ML Sb, indicating that there is a significant amount of Sb on the surface. When 5 ML of AlSb is deposited on an Sb-terminated InAs surface, the number of layers observed on each terrace increases to three. Growth of an additional 22 ML of InAs onto the AlSb layer, followed by a 30's interrupt under Sb2, further increases the number of surface layers observed. The root-mean-square roughness is found to increase at each subsequent interface; however, on all the surfaces the roughness is <2 . The surface roughness is attributed to a combination of factors, including reconstruction-related stoichiometry differences, kinetically limited diffusion during growth, and lattice-mismatch strain. Possible methods to reduce the roughness are discussed.

DTIC

Antimony; Diodes; Indium Arsenides; Molecular Beam Epitaxy; Resonant Tunneling

20080038896 Naval Research Lab., Washington, DC USA

Hydrogen Termination Following Cu Deposition on Si(001)

Baker, L A; Laracuente, A R; Whitman, L J; Apr 8, 2005; 5 pp.; In English

Report No.(s): AD-A482514; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe the surface structures following submonolayer Cu deposition on Si(001) and subsequent hydrogen termination as characterized by scanning tunneling microscopy. Cu adsorption at 870 K results in a characteristic (2*8) island+vacancy structure, as previously reported. In addition, occasional structures are observed attributed to Cu in surface interstitial sites. After H termination, the dominant features of the island+vacancy structure remain, but the size and distribution of the structures are significantly altered. Based on the atomic-scale appearance of both the clean and H-terminated structures, we propose that within the (2*8) island+vacancy structure all surface atoms are Si, with all Cu subsurface, contrary to previous structural models.

DTIC

Copper; Deposition; Hydrogen; Silicon

20080038897 Naval Research Lab., Washington, DC USA

The Structure of Sb-Terminated GaAs(001) Surfaces

Whitman, L J; Bennett, B R; Kneedler, E M; Jonker, B T; Shanabrook, B V; Jan 1999; 9 pp.; In English

Report No.(s): AD-A482515; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have studied the structure of Sb-terminated GaAs(001) surfaces using reflection high energy electron diffraction, X-ray photoelectron spectroscopy, and scanning tunneling microscopy (STM). Clean, As-terminated (2*4) surfaces were prepared by molecular beam epitaxy and then exposed to Sb4 at 490 C, producing a (2*8)-reconstructed surface terminated with ~1 ML of Sb. Re-heating such a surface to 460 C in vacuum returns the surface to a (2*4) reconstruction with approximately 0.5 ML Sb remaining. STM reveals a complex, but well-ordered structure on the (2*8) surface for which a tentative model is proposed. On the (2*4) surface, our results clearly show that each unit cell is terminated by three dimers, with two-thirds Sb dimers and one-third As dimers. These results contrast with previous proposals that the Sb-induced (2*4) surface is terminated solely by one or two Sb dimers.

DTIC

Antimony; Gallium Arsenides; Molecular Beam Epitaxy; Photoelectron Spectroscopy; X Ray Diffraction; X Ray Spectroscopy

20080038910 Maryland Univ., College Park, MD USA

Quantification of Discrete Oxide and Sulfur Layers on Sulfur-Passivated InAs by XPS

Petrovykh, D Y; Sullivan, J M; Whitman, L J; Jan 2005; 11 pp.; In English

Report No.(s): AD-A482529; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The initial quality and stability in air of InAs(001) surfaces passivated by a weakly-basic solution of thioacetamide

(CH3CSNH2) is examined by XPS. The S-passivated InAs(001) surface can be modeled as a sulfur-indium-arsenic layer-cake structure, such that characterization requires quantification of both arsenic oxide and sulfur layers that are at most a few monolayers thick. This thickness range complicates the quantitative analysis because neither standard submonolayer nor thick-film models are applicable. Therefore, we develop a discrete-layer model and validate it with angle-resolved XPS data and electron attenuation length (EAL) calculations. We then apply this model to empirically quantify the arsenic oxide and sulfur coverage on the basis of the corresponding XPS intensity ratios.
DTIC
Amides; Indium Arsenides; Oxides; Photoelectron Spectroscopy; Quantitative Analysis; Sulfur; Sulfur Compounds; X Ray Spectroscopy

20080038929 Princeton Univ., NJ USA
Gasification Characterization of Ionic Liquids as Propellants
Law, Chung K; May 25, 2008; 18 pp.; In English
Contract(s)/Grant(s): FA9550-07-1-0417
Report No.(s): AD-A482567; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the program was to understand and quantify the gasification and oxidation characteristics of droplets of ionic liquids (ILs) in environments of various temperatures and oxygen concentrations. Using 1-ethyl-3- methylimidazolium dicyanamide as a surrogate IL, extensive experiments were performed on suspended and freely falling droplets, and on relating the droplet combustion behavior to the evolution of its internal temperature. Results show that, because of the extreme low volatility of the IL, surface gasification is minimal while internal heating of the droplet is the dominant mode of heat transfer. Furthermore, substantial liquid-phase pyrolytic reaction is nitiated when the droplet is heated to 400 deg C. This state of heating and pyrolysis continues, leading to the formation of a solid mass. The presence of gas-phase reaction leads to self-sustained combustion of this mass in a high-oxygen environment until complete burnout, while the combustion cannot be self sustained in a low-oxygen environment. The formation of the solid mass and its slow rate of gasification are believed to be a major problem with the utilization of ionic liquids as propellants.
DTIC
Carbonization; Combustion; Drops (Liquids); Gasification; Heat Transfer; Liquid Phases; Liquids; Oxidation; Propellants; Pyrolysis

20080038958 University of South Florida, Tampa, FL USA
Real-Time Detection of Trace Contaminants and Bio/Chemical Agents in ROWPU Processed Drinking Water Using Reagentless UV Laser-Induced-Fluorescence
Killinger, Dennis K; Apr 30, 2007; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0431
Report No.(s): AD-A482626; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The sensitivity and detection capability of a deep-UV laser-induced-fluorescence system for detection of trace species in water was investigated and studied. Dissolved Organic Compounds (DOCs) and other related trace species were measured for the first time in drinking water and in Reverse Osmosis Processed water. The portable LIF system was used to analyze in real time the input water and the output water from a laboratory Reverse Osmosis water unit. The input water (obtained from surface wells and used for irrigation purposes) had a large spectral signature near 450 nm due to DOCs in the water. The RO output water has a much reduced level of DOCs and was an effective monitor of the filter membrane condition. It was found that the fluorescence spectrum is different for 266 run excitation than for 355 ran excitation, with 266 nm appearing to produce greater DOC fluorescence. Preliminary LIF spectra of the weak vinegar (0.01M) acid wash water used to clean a ROWPU were obtained. We also studied similar spectra for other trace and toxic chemical species related to the RO process and eventually related to toxic and chemical agent contamination. We studied and demonstrated the first use of deep-uv LEDs for LIF type detection of DOCs and trace species in water. The initial results were very promising, and the LIF type signal was found to be on the same order of magnitude as that using the UV laser source. We plan to extend these results and develop a compact LED based LIP system for water monitoring in real-time.
DTIC
Contaminants; Detection; Laser Induced Fluorescence; Potable Water; Real Time Operation; Trace Contaminants; Ultraviolet Lasers

20080038984 State Univ. of New York, Stony Brook, NY USA

Investigation of Quantum Computing With Laughlin Quasiparticles

Goldman, V J; Dec 31, 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0126

Report No.(s): AD-A482675; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Laughlin quasiparticles of a gapped fractional quantum Hall (FQH) fluid, have been demonstrated to have fractional electric charge and anyonic braiding statistics. Topological computation with anyons has been proposed as the physical implementation of intrinsically fault-tolerant quantum computation (QC). Topological computation employs the statistical Berry phase created by the transfer of one anyon of the system around another to perform quantum logic. Since this phase is determined by the topological properties of the macroscopic FQH wave function, it is not sensitive to environment-induced decoherence and to spread of device parameters. The most thoroughly studied and realistic proposals involve the ground state adiabatic transport of anyons localized on quantum antidots and in anyon interferometers defined in GaAs/AlGaAs heterostructures. The device fabrication techniques and 2D architectures are similar to those commonly used in semiconductor industry, and thus are inherently scalable.

DTIC

Elementary Excitations; Quantum Computation; Quantum Theory

20080038994 Rensselaer Polytechnic Inst., Troy, NY USA

Carbon Nanotube Arrays for Thermal Management Applications

Ajayan, Pulickel M; Feb 4, 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-06-1-0108; Proj-PE611102

Report No.(s): AD-A482701; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The work was designed towards creating aligned multiwalled carbon nanotube arrays by chemical vapor deposition (CVD) of xylene hydrocarbon precursor and simultaneous vapor phase delivery of catalyst particles. Low density nanotube arrays as well as highly dense pyrolitic carbon coated nanotube arrays were produced. The nanotube arrays could be grown to several hundreds of microns long. The simultaneous growth of nanotubes and densification of the aligned carbon nanotube (ACNT) films by carbon infiltration in the interstitial spaces between nanotubes were accomplished in a single step by the combination of the chemical vapor deposition and chemical vapor infiltration processes.

DTIC

Carbon Nanotubes; Temperature Control

20080038999 Colorado Univ., Boulder, CO USA

Molecular Grid Membranes

Michl, Josef; Magnera, Thomas; Mar 11, 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0535

Report No.(s): AD-A482708; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Regular two-dimensional covalent grids of monolayer thickness with molecular-size openings, reminiscent of a tennis net or chickenwire, will have many useful applications, among others as selective barrier materials and efficient passive or active separation membranes. We propose to synthesize a grid whose basic unit is Zn(II) porphyrin triply linked in the meso-meso, and both beta-beta positions four times by carbon-carbon bonds to each of its neighbors to form porphite sheets a grid-type material that would be an analog of graphene. The resulting grid would be conducting, have an electronic band structure and well-defined pores. We report the development of protocols for the meso-meso linking of Zn(II) porphyrin at the air-water interface using Langmuir-Blodgett methods with a resulting polymer net whose MW weight exceeds 10,000 daltons and methods for assaying the extent of the interfacial polymerization. Towards the goal of full synthesis of porphite, we report the meso-meso linking of Zn(II) porphyrin at the air-water interface using Langmuir-Blodgett methods with a resulting polymer net whose MW exceeds 10,000 daltons.

DTIC

Carbon; Membranes

26
METALS AND METALLIC MATERIALS

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

20080037483 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Excalibur Armament Actuator
Sep 13, 2005; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0034-03
Report No.(s): AD-A482116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Picatinny Arsenal's Armament Research, Development and Engineering Center's (ARDEC) Prototype Manufacturing Team was tasked with producing prototype parts and a representative production process for the Excalibur 155mm Artillery Projectile. ARDEC personnel started producing the components with existing equipment at their facility. Their initial run time for the bottom plate was 7.5 hours with six different setups and unacceptable variations in part dimensional tolerances. ARDEC personnel called upon the National Center for Defense Manufacturing and Machining (NCDMM) for their assistance in establishing a more efficient manufacturing process for both the initial prototype parts and to gain insight into the production cycle times and processing methods for higher rate part quantities. After reviewing the process and machine tools available, the NCDMM recommended the JUMPED (trademark) (Joint Ultimate Manufacturing Process Evolution and Development) process. The JUMPED process is a collaborative initiative that leverages the use of the NCDMM Testing and Development Lab for the performance of complete turnkey projects. Through JUMPED, comprehensive manufacturing processes are completely developed and verified in the NCDMM Lab by integrating advanced manufacturing technologies. NCDMM reviewed the component design and determined that because of required tolerances and complex features, 5-axis machining technologies would be required to process these parts efficiently. Modular fixturing was designed to reduce setups. Tailored form tooling with through coolant was designed to effectively machine special features. CNC programs were developed and optimized to minimize cycle times.
DTIC
Actuators; Lathes; Machining; Milling Machines; Projectiles

20080037484 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Improved Buttress Thread Machining for the Excalibur and Extended Range Guided Munitions
Apr 21, 2006; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-05-0077-10
Report No.(s): AD-A482114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Raytheon Missile Systems (Raytheon) of Tucson, Arizona, manufacturer of the Excalibur and Extended Range Guided Munitions (ERGM) have consistently received critical components containing Class III, 7 degree/45 degree buttress threads out-of-tolerance from their suppliers. These out-of-tolerance conditions have caused failures of the components at the buttress thread joints. The Rockwell hardness of the 4340 steel (Rc53) being used for the components is a major contributor to the out-of-tolerance condition. The National Center for Defense Manufacturing and Machining (NCDMM) was requested to evaluate and optimize the machining of these Class III buttress threads to eliminate the failures. After reviewing the supplied material and current processes, the NCDMM developed a plan to optimize cutting of both the internal and external threads using advanced technologies and methodologies. After completing numerous detailed designs of experiments (DOE), the NCDMM was successful in consistently machining the internal and external buttress threads in the 4340 material. These new machining parameters ensure that the threads meet the required tolerances specified in ANSI B1.9 - 1992.
DTIC
Machining; Optimization; Production Engineering; Screws; Threads; Titanium Alloys

20080037485 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Intelligent Machining Optimization
Jan 17, 2007; 2 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-NCDMM-07-0147-07
Report No.(s): AD-A482111; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The selection of machining parameters for cutting tool / material combinations is generally based on experience or static databases. In general, these parameters tend to cause the cutting tool and the machine tool to be grossly under utilized. The National Center for Defense Manufacturing and Machining (NCDMM), in conjunction with TechSolve Cincinnati, OH, and

General Dynamics Land Systems (GDLS), Lima, OH, have worked together to optimize the machining parameters of three (3) materials chosen by GDLS. These materials are Titanium 6-4, Steel Mil-A-12560, and Aluminum 2519. The optimization database developed by TechSolve, through the efforts of this project, will potentially provide GDLS with a 3-fold increase in machining performance for the M1 tank and other related components.
DTIC
Data Bases; Machining; Optimization

20080037492 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Paperless Machining - PIF
May 10, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0097-06
Report No.(s): AD-A482052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Aviation and Missiles Research, Development and Engineering Center (AMRDEC) Prototype Integration Facility (PIF) at Redstone Arsenal, AL is designated the prototype development facility to meet the quick turnaround requirements for Aviation and Missile Command (AMCOM). The PIF requested the National Center for Defense Manufacturing and Machining (NCDMM) to review the current processing of the IR Beacon Strobe. The main objective was to implement a new paperless machining process. Paperless machining is a term used to describe the use of the digital 3-D CAD models transferred to Computer Aided Machining (CAM) to manufacture the component. The 4.50' dia., 1.125'-thick Beacon Ring, made of 7075-T6 Aluminum Rod, requires machining from many sides. The current process in use by the PIF required 4 setups and two machines.
DTIC
Computer Techniques; Machining

20080037493 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Maraging Steel Machining Improvements
Apr 23, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-06-0114-09
Report No.(s): AD-A482049; No Copyright; Avail.: Defense Technical Information Center (DTIC)

McNally Industries, Inc. of Grantsburg, WI, a worldclass leading manufacturer of defense related products, is one of the world's leading consumers of cobalt-strengthened maraging steel. An increase in production requires them to reduce the machining time of certain operations producing parts for land combat weapon systems. The National Center for Defense Manufacturing and Machining (NCDMM) was requested to evaluate the identified operations for overall improvements in processes, tooling, and part quality. This will be accomplished by applying state-of-the-art tooling and programming technologies.
DTIC
Cobalt; Machining; Maraging Steels

20080037521 UT-Battelle, LLC, Oak Ridge, TN, USA
Nano-Scale Nitride-Particle-Strengthened High-Temperature Wrough Ferritic and Martensitic Steels
Klueh, R. L., Inventor; Hashimoto, N., Inventor; Maziasz, P. J., Inventor; 22 Sep 04; 49 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10-947 119
Report No.(s): PB2008-102078; No Copyright; Avail.: CASI: A03, Hardcopy

A method of making a steel composition includes the steps of: (1) providing a steel composition that includes up to 15% Cr, up to 3% Mo, up to 4% W, 0.05-1% V, up to 2% Si, up to 3% Mn, up to 10% Co, up to 3% Cu, up to 5% Ni, up to 0.3% C, 0.02-0.3% N, balance iron, wherein the percentages are by total weight of the composition; (2) austenitizing the composition at a temperature in the range of 1000 degrees C to 1400 degree C; (3) cooling the composition of steel to a selected hot-working temperature in the range 500 degree C to 1000 degree C; (4) hot-working the composition at the selected hot-working temperature; (5) annealing the composition for a time period of up to 10 hours at a temperature in the range of 500 degree C to 1000 degree C; and (6) cooling the composition to ambient temperature to transform the steel composition to martensite, bainite, ferrite, or a combination of those microstructures.
NTIS
High Temperature; Martensite; Nitrides; Patent Applications; Steels

20080037573 NASA Langley Research Center, Hampton, VA, USA

Addressing the Limit of Detectability of Residual Oxide Discontinuities in Friction Stir Butt Welds of Aluminum using Phased Array Ultrasound

Johnston, P. H.; July 20, 2008; 8 pp.; In English; 35th Annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE), 20-25 Jul. 2008, Chicago, IL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 645846.02.07.07.02; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037573

This activity seeks to estimate a theoretical upper bound of detectability for a layer of oxide embedded in a friction stir weld in aluminum. The oxide is theoretically modeled as an ideal planar layer of aluminum oxide, oriented normal to an interrogating ultrasound beam. Experimentally-measured grain scattering level is used to represent the practical noise floor. Echoes from naturally-occurring oxides will necessarily fall below this theoretical limit, and must be above the measurement noise to be potentially detectable.

Author

Friction Stir Welding; Ultrasonics; Detection; Aluminum Oxides; Discontinuity; Phased Arrays

20080037581 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

ISO Grid 155 mm Howitzer

Feb 10, 2004; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-03-0008-09

Report No.(s): AD-A482025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Army's Armament Research, Development, and Engineering Center (ARDEC) at Picatinny Arsenal in Rockaway Township, New Jersey, was commissioned to reduce the weight of the 155mm howitzer. Their efforts included replacing an approximately 4-foot x 10-foot x 1-inch steel ISO grid support panel with one made of titanium 6AL-4V. Titanium weighs 45 percent less than steel, is stronger and more resilient, and doesn't rust. However, its unique properties also make it difficult to machine productively. ARDEC was spending excessive time milling a pattern of 2.25-inch-wide triangular pockets into the grid to further reduce its weight. ARDEC presented this problem to the National Center for Defense Manufacturing and Machining (NCDMM) and requested their assistance. High chip loads are required to mill titanium productively. In light cuts, the alloy's resilience will cause a cutting tool to rub instead of cut, generating heat, high pressures, and short tool life. But heavy cuts require high torque and can also generate heat, so a balance of parameters is required. NCDMM's alliance partner, Kennametal Inc., recommended a combination of advanced tooling and manufacturing techniques to boost productivity. Solid-carbide center-cutting end mills were tested using trichoidal programming techniques. These machining methods employ radial movement of the cutter to maintain constant feed rates and keep the end mill continuously in the cut, maximizing milling efficiency.

DTIC

Carbides; Howitzers; Machining; Milling Machines; Panels; Titanium; Weight Reduction

20080037582 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Increased Range/Mini-Cruise Missile

Mar 21, 2006; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-05-0071-09

Report No.(s): AD-A482024; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Technical Directions Inc. (TDI), Ortonville, Michigan, was asked by the U.S. Army and the U.S. Air Force to improve the efficiency of their J-45 missile engine for the NLOS-LS LAM Loitering Attack Missile. The ultimate goal is to improve the overall engine efficiency by 8 percent, thereby reducing fuel consumption for the propulsion system, allowing for both increased vehicle payload and/or increased vehicle range. The newly designed compressor wheel requires very thin blades and a higher blade complement for optimum flow guidance with minimal flow losses. These requirements eliminate the investment casting of the compressor wheel, replacing it with the fully machined compressor wheel. The complex passages within the wheel require tolerances within .001 inch, and blade thicknesses in the .010 inch range. Realizing this challenge, TDI requested the help of the National Center for Defense Manufacturing and Machining (NCDMM) to meet these heightened manufacturing goals. The NCDMM reviewed the drawings along with solid model files and determined that due to the time constraint and part complexity, specialized programming software would be needed to produce machine code for machining the compressor wheel. The NCDMM contacted Moore Tool Co., to assist with this project. Moore Tool recommended that the firm, Concepts NREC, program the finish machining paths of the compressor wheel. CNC Software/MasterCam was utilized to program the rough machining paths. Due to price and availability of the requested material, TDI and NCDMM decided to

manufacture the test wheels from two types of aluminum material. The results would then be used to determine justification of cost. Moore Tool machined the compressor wheels using their FSP-300X 5-axis machine utilizing high-speed 5-axis machining technology. The cooperative effort between TDI and NCDMM resulted in an increase of up to 5% in vehicle efficiency with additional efficiency gains expected with further development.
DTIC
Compressors; Cruise Missiles; Engine Parts; Machining; Missiles; Turbojet Engines; Wheels

20080037583 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Inconel Tube Sheet Drilling
Jul 15, 2005; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-NQ05-0059-06
Report No.(s): AD-A482023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hamill Manufacturing Company, Trafford, Pennsylvania, was contracted to drill several hundred close-tolerance through-holes in an Inconel tube sheet component approximately 4 inches thick. Hamill Manufacturing had experience drilling Inconel as thick as 2 inches, but the added depth, large number of holes, and close tolerances involved presented a new challenge. Hamill Manufacturing considered drilling and reaming the holes using the same parameters employed when drilling thinner Inconel work pieces. In that case, experience indicated that each component would require over 200 hours to produce. Additionally, if even a single hole was drilled out of specification, the part would have to be scrapped and the process started over again. Prior to commencing production, Hamill asked the National Center for Defense Manufacturing and Machining (NCDMM) to suggest ways to reduce drilling time, meet required tolerances, and ensure consistent quality. Through existing process evaluation, the NCDMM determined that increased productivity and top quality could be achieved by applying advanced gun drilling methods. Gun drills are specialized hole making tools designed to produce deep, straight, and accurate holes. Analysis of test results determined the best gun drill (Star Cutter) and drill diameter for the application. The best results occurred when the gun drill entered the pilot hole rotating counterclockwise then changed to clockwise rotation when the actual drilling began. Retracting the drill from the hole with the machine spindle off also was beneficial. The tests additionally determined the best coolant concentration and pressure level for the gun drill's internal through-coolant system.
DTIC
Cost Reduction; Drilling; Drills; Inconel (Trademark); Nickel Alloys; Production Engineering

20080037584 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Inconel 713 Turbine Nozzle
Apr 18, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-03-0011-10
Report No.(s): AD-A482022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Technical Directions Inc. (TDI) in Ortonville, Michigan, was commissioned to produce a small jet engine for the Loitering Attack Missile (LAM). This system is currently being reviewed by the Army at Redstone Arsenal for use in the NLOS-LS (Non-Line of Site Launch System) system. TDI in turn enlisted Extreme Precision Screw Products of Flint, Michigan, to machine key engine components. The high-temperature materials used in jet engines present machining challenges that include limited metal removal rates and frequent tool failure. For a turbine nozzle made of Inconel 713 nickel-base alloy, Extreme Precision sought ways to increase productivity in drilling and turning operations and also overcome problems encountered when using taps to thread small-diameter holes.
DTIC
Drilling; Gas Turbines; Inconel (Trademark); Machining; Milling Machines; Nozzle Flow; Productivity; Turbines

20080037586 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Inconel Pump Casing
Apr 23, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-03-0015-12
Report No.(s): AD-A482021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hamill Manufacturing Company, Trafford Pennsylvania, won a contract to complete eight pump casings destined for use on aircraft carriers. The 4-foot-long, 4-foot-diameter casings were made of Inconel 600 alloy. The casing flange featured 24 threaded holes, 2.375 inches wide by 5.75 inches deep. Drilling and tapping Inconel, a tough nickel-based material with high tensile strength, is time-consuming and requires high torque. Hamill determined the need to optimize the process to control

manufacturing costs, and asked the National Center for Defense Manufacturing and Machining (NCDMM) for assistance.
DTIC
Drills; Inconel (Trademark); Inserts; Milling Machines; Nickel Alloys; Production Engineering; Screws; Threads

20080037590 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Humvee Mobile Antenna Mount
Mar 14, 2005; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0048-08
Report No.(s): AD-A481853; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481853

Comtech Mobile Datacom, Fort Hood, Texas, has been contracted to install satellite phone antennas and Global Positioning Systems (GPS) in military vehicles, replacing the aging older technology. Most of this retrofit work is conducted in the field with limited access to machining equipment normally used during installation. The technicians use whatever tools are available to drill holes in a variety of materials such as aluminum, thin sheet metal, and armor plate. Drilling the armor plate is a difficult task. The crews use mostly high-speed steel (HSS) drill bits with rechargeable hand-held drills. It could take as many as 5-8 HSS drills to penetrate one hole in the armor. This is very time consuming and costly. Comtech Mobile Datacom contacted the National Center for Defense Manufacturing and Machining (NCDMM) to provide a solution for their situation. NCDMM witnessed the procedure, techniques, and tooling used to do the installs. NCDMM analyzed the process and tooling and concluded that HSS tooling was not the answer for drilling through the different material types. NCDMM tested a variety of carbide drills that could penetrate the tough armor and found solutions for this issue. Rigidity for the carbide drills was supported with a mobile magnetic base drill press. A durable mobile tooling kit containing the tooling and equipment was assembled and can be shipped anywhere in the world for Comtech crews to install the communications hardware more efficiently.
DTIC
Antennas; Armor; Global Positioning System; Kits; Military Vehicles; Retrofitting; Satellite Antennas; Supports

20080037611 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Humvee Armor Plate Drilling
Dec 7, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0051-10
Report No.(s): AD-A481854; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481854

When drilling holes in hard steel plate used in up-armor kits for Humvee light trucks, the Anniston Army Depot, Anniston, Alabama, requested the assistance of the National Center for Defense Manufacturing and Machining (NCDMM) to find ways to speed up operations and reduce tooling and machining costs. A Humvee up-armor kit consists of flat plates ranging in size from 4 feet x 6 feet to 3 feet x 6 feet. Hole sizes range from 0.3125 inches to 0.750 inches in diameter, and each diameter requires 4 to 14 holes. Some holes are simple through-holes, while others are tapped with threads for fasteners. After drilling, the plates are formed and shaped for installation. Anniston Depot had been using cobalt-high-speed-steel (HSS) drills while performing the drilling on a number of different machine tools. The NCDMM performed drilling tests on material meeting the armor's specifications and determined that the key to improving the operation was the application of high-performance solid carbide drills, accompanied by through-spindle coolant to control and clear chips and enhance tool life.
DTIC
Armor; Carbides; Drilling; Drills; Kits; Military Vehicles; Retrofitting

20080037616 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Titanium Socket for 120 mm Mortar Base
Apr 22, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0031-02
Report No.(s): AD-A481938; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481938

The U.S. Army's Armament Research, Development, and Engineering Center (ARDEC) at Picatinny Arsenal in Rockaway Township, New Jersey, was commissioned to reduce the weight of the base for the 120mm mortar. Their efforts included replacing an approximately 5.5-inch-diameter steel base support with one made of titanium 6AL-4V. Titanium

weighs 45 percent less than steel, is stronger and more resilient, and doesn't rust. However, its unique properties also make it difficult to machine productively. ARDEC was spending excessive time turning a profile of a ball socket into the component that supports the mortar tube. ARDEC requested the assistance of the National Center for Defense Manufacturing and Machining (NCDMM). NCDMM analyzed the operation and recommended new tooling for both turning and drilling aspects of the base machining process. High performance PVD-coated carbide cutting insert material was introduced for the profile turning operation, and upgraded indexable insert drills were employed for roughing out the bore. Both turning speed and depth of cut increased, producing a metal removal rate 10 times greater than achieved previously. Drilling speeds also increased by 40 percent.
DTIC
Carbides; Drilling; Joints (Junctions); Lathes; Supports; Titanium; Weight Reduction

20080037686 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
NAVSEA Aircraft Carrier Filter Housing
Jan 28, 2004; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-04-0030-01
Report No.(s): AD-A481960; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481960

During the production of a filter housing for the Naval Sea Systems Command (NAVSEA), Hamill Manufacturing Company, Trafford, Pennsylvania, was required to drill a 5.5-inch-diameter, 21.5-inch-deep hole in a block of 1020 steel. The operation consumed excessive time and tooling. It took 63 minutes and four drills -- in spot, 3.0-inch, 5.0-inch, and 5.5-inch diameters -- to complete the hole. Chip control was an additional problem, frequently making it necessary to retract the drills in mid-cut to clear out the unwieldy steel chips. NAVSEA asked if the National Center for Defense Manufacturing and Machining (NCDMM) could provide a solution to reduce machining time and improve chip control. NCDMM suggested application of a 5.5-inch-diameter deephole drilling system that featured a coated carbide pilot drill flanked by two flutes tooled with a total of four indexable carbide cutting inserts. The inserts had titanium-nitride coating for wear resistance, and an advanced chip control geometry. Internal passages in the drill body delivered coolant directly to the cutting edge/workpiece interface.
DTIC
Carbides; Drills; Housings; Machining; Steels

20080037743 NASA Marshall Space Flight Center, Huntsville, AL, USA
Transient Effects in Planar Solidification of Dilute Binary Alloys
Mazuruk, Konstantin; Volz, Martin P.; June 08, 2008; 10 pp.; In English; 21st Conference on Crystal Growth and Epitaxy-West, 8-11 Jun. 2008, Fallen Leaf Lake, CA, USA; Original contains color illustrations; No Copyright; Avail.:
CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037743

The initial transient during planar solidification of dilute binary alloys is studied in the framework of the boundary integral method that leads to the non-linear Volterra integral governing equation. An analytical solution of this equation is obtained for the case of a constant growth rate which constitutes the well-known Tiller's formula for the solute transient. The more physically relevant, constant ramping down temperature case has been studied both numerically and analytically. In particular, an asymptotic analytical solution is obtained for the initial transient behavior. A numerical technique to solve the non-linear Volterra equation is developed and the solution is obtained for a family of the governing parameters. For the rapid solidification condition, growth rate spikes have been observed even for the infinite kinetics model. When recirculating fluid flow is included into the analysis, the spike feature is dramatically diminished. Finally, we have investigated planar solidification with a fluctuating temperature field as a possible mechanism for frequently observed solute trapping bands.
Author
Binary Alloys; Solidification; Dilution; Boundary Integral Method

20080037751 Lawrence Livermore National Lab., Livermore, CA USA
Long-Term Immersion Testing of Alloy 22 and Titanium Grace 7 Double U-bend Specimens
Evans, K. J.; Stuart, M. L.; Hailey, P. D.; Rebak, R. B.; Feb. 13, 2007; 10 pp.; In English
Report No.(s): DE2007-913551; UCRL-PROC-228000; No Copyright; Avail.: National Technical Information Service (NTIS)

Double U-bend specimens of Alloy 22 (N06022) and Titanium Grade 7 (R52400) were exposed to a naturally aerated

concentrated Basic Saturated Water (BSW) electrolyte at 105 degrees C for over six years. Different type of discoloration of the Ti Gr 7 and Alloy 22 specimens was observed. General Corrosion was minimal and not distinguishable under a scanning electron microscope. None of the tested specimens suffered environmentally assisted cracking (EAC) or localized corrosion under the tested conditions. The specimens retained their residual stress after the long environmental exposure.
NTIS
Nickel Alloys; Submerging; Titanium; U Bends

20080037756 Lawrence Livermore National Lab., Livermore, CA USA
Crevice Repassivation Potential of Alloy 22 in High-Nitrate Dust Deliquescence Type Environments
Lian, T.; Gdpwslo, G. E.; Hailey, P. D.; Rebak, R. B.; Feb. 13, 2007; 13 pp.; In English
Report No.(s): DE2007-913549; UCRL-PROC-228001; No Copyright; Avail.: National Technical Information Service (NTIS)

The nitrate ion (NO3 -) is an inhibitor for crevice corrosion of Alloy 22 (N06022) in chloride (Cl-) aqueous solutions. Naturally formed electrolytes may contain both chloride and nitrate ions. The higher the ratio R = (NO3 -)/(Cl-) in the solution the stronger the inhibition of crevice corrosion. Atmospheric desert dust contains both chloride and nitrate salts, generally based on sodium (Na+) and potassium (K+). Some of these salts may deliquescence at relatively low humidity at temperatures on the order of 150 degrees C and higher. The resulting deliquescent brines are highly concentrated and especially rich in nitrate. Electrochemical tests have been performed to explore the anodic behavior of Alloy 22 in high chloride high nitrate electrolytes at temperatures as high as 150 degrees C at ambient atmospheres. Naturally formed brines at temperatures higher than 120 degrees C do not induce crevice corrosion in Alloy 22 because they contain high levels of nitrate. The inhibitive effect of nitrate on crevice corrosion is still active for temperatures higher than 100 degrees C.
NTIS
Cracks; Dust; Nickel Alloys; Nitrates; Potassium Nitrates; Sodium Chlorides

20080037819 Lane (Philip D), Charlotte, NC, USA
Filament Winding for Metal Matrix Composites
Gordon, B. L., Inventor; Wolfe, G. W., Inventor; 24 Nov 04; 12 pp.; In English
Contract(s)/Grant(s): DAAD19-01-2-0006
Patent Info.: Filed Filed 24 Nov 04; US-Patent-Appl-SN-10-995 275
Report No.(s): PB2008-102073; No Copyright; Avail.: CASI: A03, Hardcopy

A wet filament winding method and apparatus for producing a consolidated metal matrix composite is described. The methods are directed to winding a softened metal infiltrated fiber bundle and layering the resulting softened metal infiltrated fiber bundle onto a rotating mandrel in a prescribed pattern on the surface of the mandrel to form a consolidated metal matrix composite. Upon cooling, the matrix metal solidifies and the resulting consolidated metal matrix composite may be removed from the mandrel. The consolidated metal matrix composites may be produced in a variety of shapes, such as cylinder, a tapered cylinder, a sphere, an ovoid, a cube, a rectangular solid, a polygonal solid, and panels.
NTIS
Filament Winding; Metal Matrix Composites; Metal Fibers

20080038786 Minnesota Univ., Minneapolis, MN USA
Design of Active Materials from First Prinicples: New Transforming Materials with Unprecedented Physical and Mechanical Properties
James, Richard D; Feb 28, 2007; 4 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0261
Report No.(s): AD-A482448; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482448

A strong correlation has been found between the size of the hysteresis in structural phase transformations and certain special values of the lattice parameters. These special values are associated with conditions of compatibility between the phases. One such condition is seen to have an especially dramatic effect: this is the condition that the middle eigenvalue lambda(sub 2) of the transformation strain matrix is 1. The authors systematically varied the composition in the system TiNiX, X = Cu, Pd, Pt, Au, to achieve lambda(sub 2) = 1. They found a sharp drop in hysteresis in all cases. Since hysteresis is a measure of the energy dissipated by the material, there is a strong likelihood that these special conditions also relate to reversibility (i.e., the number of times one can go through the transformation without significant degradation of the material).

The authors have begun to understand the relative roles of compatibility and numbers of variants/strains/interfaces. They now have evidence that the latter also are important for behavior, even though they do not have a big hysteresis effect. These discoveries open up the possibility of seeking new families of highly reversible transforming materials. This is especially interesting in cases in which the two phases have distinct electromagnetic or optical (EMO) properties. The latter can be expected because EMO properties are generally sensitive to lattice parameters and structural phase transformations have a change of lattice parameters. Promising material systems were identified, including highly reversible Cu-based shape memory materials, ferroelectrics near the morphotropic boundary, GMR/CMR materials, fuel-cell compounds, multiferroic materials, nonvolatile memory materials in the family Ge2Sb2Te5, certain high-energy density battery electrode materials, and ferromagnetic shape memory/thermomagnetic alloys.
DTIC
Hysteresis; Lattice Vibrations; Mechanical Properties; Phase Transformations; Shape Memory Alloys

20080039001 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Investigation into Fretting Fatigue Under Cyclic Contact Load and in Conjunction with Plain Fatigue of Titanium Alloy
Al-Noaimi, Abdulla; Mar 2008; 169 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482711; AFIT/GAE/ENY/08-M30; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Fretting fatigue is the surface damage that occurs at the interface between two components that are under going a small amplitude oscillatory movements. It results in a reduction of the material life comparing to the plain fatigue. Most of the previous works were accomplished under a constant applied contact load and a little effort has been done under a variable contact load, while none of these studies have taken the phase difference between the axial and the contact load. The primary goal of this study is to investigate the effect of phase difference between axial and contact loads on fretting fatigue behavior of Ti-6Al-4V alloy and to determine the behavior of this material under combination of fretting fatigue and plain fatigue. The frequency of both axial and contact loads was the same .i.e. 10 Hz. During the variable contact load condition; only the axial stress range and the phase angle were varying. Cracks were always found to initiate on the contact surface and near the trailing edge for all tests. The software program, ABAQUAS, was used in finite element analysis to determine the contact region state variables such as stress, strain, and displacement. The fatigue parameters; such as the stress range, effective stress, and modified shear stress range (MSSR) were analyzed to predict the fatigue life. The out of phase condition was found to increase the fatigue life of 20% to 30% in life with low cycles and up to 150% at life with high cycles. As the application ratio of plain fatigue to fretting fatigue increases the life will increase. The MSSR parameter was effective in predicting the fatigue life, crack initiation location, and crack initiation orientation.
DTIC
Axial Loads; Contact Loads; Cyclic Loads; Fatigue Life; Finite Element Method; Fretting; Metal Fatigue; Shear Stress; Titanium Alloys

20080039002 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The Effect of Elevated Temperature on the Fretting Fatigue Behavior of Nickel Alloy IN-100
Ownby, John F; Apr 2008; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482712; AFIT/GA/ENY/08-M04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis studied the effect of elevated temperature (600 C) on the fretting fatigue behavior of IN-100. First, fretting and plain fatigue S-N curves were determined over a large range of applied stress at an identical stress ratio of 0.03 at 600 C and for fretting tests, with a constant contact load. The partial slip condition was verified by using hysteresis between shear force and axial stress techniques. The contact width and the crack initiation location were observed for all of the fretting specimens. The contact widths were consistent with expected values and the crack initiation location was at the trailing edge of contact for all fretting specimens. This study compared its high temperature results to room temperature testing accomplished by this study as well as room temperature data from a previous study using IN-100 with an identical microstructure and another room temperature study of IN-100 with a coarser microstructure. It was found that fretting fatigue reduces the cycles to failure compared to plain fatigue at elevated temperature but a more pronounced reduction was noticed than with room temperature. It was also found that the elevated temperature environment increased the both the plain and fretting fatigue life as compared to similar stress levels at room temperature. The study found that elevated temperature does have an effect on crack initiation and crack propagation as compared to room temperature environment. The higher temperature allowed a longer initiation and

crack propagation time which strongly suggests the fatigue life increases with temperature up to 600 C. The creation of oxide films and temperature induced softening or plasticity were both found to act as crack closure mechanisms in another nickel based superalloy, IN-718, when fatigued in the high temperature environment.
DTIC
Axial Stress; Fretting; High Temperature; Hysteresis; Metal Fatigue; Nickel Alloys; Oxidation; Shear Stress; Temperature Effects; Thermal Fatigue

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NONMETALLIC MATERIALS

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

20080036808 Army Research Lab., Aberdeen Proving Ground, MD USA
From Filaments to Fabric Packs - Simulating the Performance of Textile Protection Systems
Cheeseman, B A; Yen, C F; Scott, B R; Powers, B; Bogetti, T A; LaMattina, B; Duan, Y; Keefe, M; Miao, Y; Wang, Y; Nov 2006; 9 pp.; In English
Report No.(s): AD-A481950; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481950

Enhancements in lightweight and compliant textile based protection systems require the use of advanced materials as well as innovative reinforcement and hybridization schemes. To date, the majority of the ballistic textile development has relied on experiments and experience. While both analytical and computational methods for this class of materials, specifically fabrics and compliant composite laminates, has yielded insight, advanced material models and modeling capabilities with the resolution to accurately describe the interactions between the fibers, yarns and impacting projectile have only recently become available. Scientists at the U.S. Army Research Laboratory and the U.S. Army Research Office are collaborating with researchers in academia to develop and utilize advanced modeling capabilities for fabrics and armor grade composites used in body armor designs. The technology being developed will ultimately relate the constituent material the filament to its incorporation into a textile architecture through its manufacturing processes to a ballistic performance prediction of the corresponding textile and will allow a true materials-by-design approach to textile based protection systems. The current paper describes efforts associated with utilizing numerical analysis towards gaining a fundamental understanding of the projectile-textile interaction, the development of numerical techniques relating textile manufacture to ballistic prediction and hybridized systems currently being developed that can benefit from this detailed analysis.
DTIC
Armor; Computerized Simulation; Fabrics; Protection; Simulation; Textiles

20080037311 Wiley Rein and Fielding, LLP, Washington, DC, USA
High-Density Metallic-Glass-Alloys, Their Composite Derivatives and Methods for Making the Same
Zahrah, T. F., Inventor; Rowland, R., Inventor; Kecskes, L., Inventor; 22 Sep 04; 27 pp.; In English
Contract(s)/Grant(s): W911QX-04-P-0271; N00014-03-C-0287
Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10-946 132
Report No.(s): PB2008-101987; No Copyright; Avail.: CASI: A03, Hardcopy

The invention includes a method for producing high-density composites of metallic glass alloy powders in combination with a refractory metal powder, and includes related methods for producing metallic glass alloys. The invention, in one aspect, employs a system of monitoring the temperature and hot isostatic pressing conditions during the consolidation of metallic compositions in order to produce higher densities and materials of a larger diameter, for example. In another aspect, the invention involves method whereby a third interfacial phase at a metallic glass alloy/refractory metal interface is effectively controlled to produce composites with advantageous properties.
NTIS
Derivation; Metallic Glasses; Patent Applications

20080037334 Caesar Rivise Bernstein Cohen and Pokotilow Ltd., Philadelphia, PA, USA
Degradation Resistant Polyurethanes
Alferiev, I., Inventor; Levy, R. J., Inventor; Stachelek, S. J., Inventor; 21 Sep 05; 30 pp.; In English
Contract(s)/Grant(s): NHLBI59730
Patent Info.: Filed Filed 21 Sep 05; US-Patent-Appl-SN-11-233 149
Report No.(s): PB2008-101919; No Copyright; Avail.: CASI: A03, Hardcopy

A degradation resistant polyurethane and methods of making and using thereof wherein the degradation resistant polyurethane has a modified hard segment which includes a urethane nitrogen and an antioxidant substituent pendant from the urethane nitrogen.

NTIS
Degradation; Nitrogen; Patent Applications; Polyurethane Resins; Urethanes

20080037337 Rutan and Tucker, LLP, Costa Mesa, CA, USA
Transition Metal-Catalyzed Synthesis of Dendritic Polymers
Guan, Z., Inventor; 23 Aug 05; 18 pp.; In English
Contract(s)/Grant(s): NSF DMR-0135233; DAAD19-01-1-0686
Patent Info.: Filed Filed 23 Aug 05; US-Patent-Appl-SN-11-210 347
Report No.(s): PB2008-101916; No Copyright; Avail.: CASI: A03, Hardcopy

Dendritic amphiphilic polymers are contemplated. Most preferably, such polymers will be fabricated in a single step to the final product that may further be derivatized with, among others, biological relevant molecules. In alternative aspects, precursors of such molecules are prepared in a single step, and the precursors are then reacted to the dendritic amphiphilic polymers.

NTIS
Catalysis; Dendrimers; Molecules; Patent Applications; Transition Metals

20080037519 Air Products and Chemicals, Inc., Allentown, PA, USA
Control of Differential Strain During Heating and Cooling of Mixed Conducting Metal Oxide Membranes
Carolan, M. F., Inventor; 17 Sep 04; 16 pp.; In English
Contract(s)/Grant(s): DE-FC26-98FT40343
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943 574
Report No.(s): PB2008-102080; No Copyright; Avail.: CASI: A03, Hardcopy

Method of operating an oxygen-permeable mixed conducting membrane having an oxidant feed side and a permeate side, which method comprises controlling the differential strain between the oxidant feed side and the permeate side by varying either or both of the oxygen partial pressure and the total gas pressure on either or both of the oxidant feed side and the permeate side of the membrane while changing the temperature of the membrane from a first temperature to a second temperature.

NTIS
Ceramics; Cooling; Heating; Membranes; Metal Oxides; Oxygen; Patent Applications

20080037523 Air Products and Chemicals, Inc., Allentown, PA, USA
Operation of Mixed Conducting Metal Oxide Membrane Systems Under Transient Conditions
Carolan, M. F., Inventor; 27 Apr 05; 19 pp.; In English
Contract(s)/Grant(s): DE-FC26-98FT40343
Patent Info.: Filed Filed 27 Apr 05; US-Patent-Appl-SN-11-115 778
Report No.(s): PB2008-102076; No Copyright; Avail.: CASI: A03, Hardcopy

Method of operating an oxygen-permeable mixed conducting membrane having an oxidant feed side, an oxidant feed surface, a permeate side, and a permeate surface, which method comprises controlling the differential strain between the permeate surface and the oxidant feed surface at a value below a selected maximum value by varying the oxygen partial pressure on either or both of the oxidant feed side and the permeate side of the membrane.

NTIS
Ceramics; Membranes; Metal Oxides; Oxygen; Patent Applications

20080037532 Battelle Columbus Labs., OH USA; Battelle Memorial Inst., Arlington, VA, USA

High Strength Insulating Metal-to-Ceramic Joints for Solid Oxide Fuel Cells and Other High Temperature Applications and Method of Making

Weil, K. S., Inventor; Chick, L. A., Inventor; Coyle, C. A., Inventor; Hardy, J. S., Inventor; Xia, G., Inventor; 22 Sep 04; 9 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41246

Patent Info.: Filed Filed 22 Sep 04; US-Patent-Appl-SN-10-948 346

Report No.(s): PB2008-102083; No Copyright; Avail.: CASI: A02, Hardcopy

A seal formed between a metal part and a second part that will remain gas tight in high temperature operating environments which experience frequent thermal cycling, which is particularly useful as an insulating joint in solid oxide fuel cells. A first metal part is attached to an reinforcing material. A glass forming material in the positioned in between the first metal part and the second part, and a seal is formed between the first metal part and the second part by heating the glass to a temperature suitable to melt the glass forming materials. The glass encapsulates and bonds at least a portion of the reinforcing material, thereby adding tremendous strength to the overall seal. A ceramic material may be added to the glass forming materials, to assist in forming an insulating barrier between the first metal part and the second part and to regulating the viscosity of the glass during the heating step.

NTIS

Ceramics; High Strength; High Temperature; Insulation; Metal Joints; Patent Applications; Solid Oxide Fuel Cells; Thermal Cycling Tests

20080037585 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Seal Ring for F-18 Hornet

Aug 15, 2003; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-03-0002-06

Report No.(s): AD-A481962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The problem was a 303 Stainless Steel Aircraft seal ring with a very small face groove at multiple depths and very thin walls on the outer diameter and inner diameter. The standard manufacturing process produced 18 pieces per hour and used three different tools to process the face groove. The process utilized a rough groove tool, a finish groove tool, and a necking tool for an undercut. The machine spindle was limited to 2000-RPM max. To improve this process, the National Center for Defense Manufacturing and Machining (NCDMM) applied form-ground carbide inserts with a thicker cross section to provide stronger radial relief. The roughing tool was ground to meet the form of the component, eliminating the need to generate the groove form by programming. The finishing tool was ground to form including a relieved area for cutting the undercut portion to eliminate the need for a separate necking tool. The tool path also was changed to accommodate the thin walls. The tool path started from the face of the part working towards the chuck of the machine to avoid side loading insert. If side loading was required, the feed rate was reduced to reduce the cutting pressure.

DTIC

Cutters; F-18 Aircraft; Grooving; Machine Tools; Seals (Stoppers); Stainless Steels

20080037615 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Transparent Calibrated Moisture Boot for UH-60 Pitch Trim Actuator

Jun 7, 2007; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-07-0125-01

Report No.(s): AD-A481928; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481928

The UH-60 Black Hawk Helicopter Pitch Trim Actuator manufactured by MOOG Inc. Aircraft Group currently utilizes a black opaque dust and moisture boot for protecting a rotating shaft and seal. During normal operation, hydraulic fluid can seep past the seal and collect in the boot. Currently, there is no way to determine the amount of fluid that has collected in the boot. This fluid will continue to collect in the boot until a sufficient quantity is accumulated to detach the boot from its seat on the Pitch Trim Actuator end cap, ultimately spilling hydraulic fluid on the upper flight deck. Once the hydraulic fluid is detected on the flight deck, the Pitch Trim Actuator is assumed to be unserviceable and consequently turned in for repair. It is estimated that 20% of the Pitch Trim Actuators turned in for this reason are still serviceable. The National Center for

Defense Manufacturing and Machining (NCDMM), working together with Alliance Partner Polymer Technologies Incorporated (PTI), set out to develop a transparent calibrated moisture boot for the Pitch Trim Actuator. This calibrated boot will allow for a visual inspection to measure the fluid seepage as a function of flight hours to determine Pitch Trim Actuator serviceability.
DTIC
Actuators; Calibrating; Coverings; Helicopters; Hydraulic Equipment; Hydraulic Fluids; Injection Molding; Inspection; Moisture; Transparence; Visual Observation

20080037624 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Ceramic Machining Evaluation
Jun 24, 2005; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-NQ04-0001-02
Report No.(s): AD-A481793; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481793

The U.S. Army Research, Development and Engineering Command's (RDECOM) Aviation and Missile Research Development and Engineering Center's (AMRDEC) Manufacturing Science and Technology Division (MS&T) at Redstone Arsenal, Alabama, is engaged in a Ceramic Manufacturing Technology Program (CMTP). The objective of this effort is to assess current and newly developed ceramic machining technologies and to perform initial evaluation of various machining parameters and tooling. The light weight of ceramic materials and their outstanding resistance to wear and high temperatures make them increasingly preferred for industrial applications. However, machining ceramics is very costly and time consuming. Grinding, with its high cost and low volume material removal rate (MRR), is still the most common method used to finish machine sintered (fired) ceramic components. New machining methods must be evaluated to produce ceramic components in a more timely, cost-effective manner. The accompanying table of NCDMM test results shows that machining ceramic material in the presintered 'bisque' state using Polycrystalline Diamond (PCD) tools produced a higher MRR (up to 250 or 1000 times greater if compared to grinding, depending on endmill size used) than machining sintered ceramics using other methods. Therefore, to minimize the time and cost associated with finish machining after sintering, ceramic materials should be machined in the bisque state with PCD tooling whenever possible.
DTIC
Ceramics; Cost Reduction; Machining; Manufacturing; Production Engineering

20080037643 Army Natick Soldier Center, Natick, MA USA
Aromatic Nylons for Transparent Armor Applications
Song, John W; Lofgren, Joel; Hart, Kyle D; Tsantinis, Nick; Paulson, Roy; Hatfield, Jay N; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481774; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481774

Failure and kinetic energy absorption mechanisms upon ballistic impact of two new types of nylons, TROGAMID T-5000 (T-5000) and TROGAMIDCX7323 (CX-7323) as well as traditional materials such as polycarbonate (PC) and polymethylmethacrylate (PMMA) were examined and compared. Under ballistic impact, T-5000 showed brittle failure similar to PMMA, while CX-7323 exhibited ductile behavior similar to PC. Like PC and PMMA, the failure modes of T-5000 and CX-7323 are different from each other. However, unlike PC and PMMA, the overall ballistic performance of these two TROGAMIDs were similar to each other. Among these four materials, PMMA exhibited the most sensitive response to frequency or impact velocity by showing the most rapid increase of kinetic energy absorption with increasing impact velocity or sample thickness. For monolithic samples the ballistic impact resistance of these two TROGAMIDs is noticeably better than PC and PMMA for a wide range of thicknesses. Furthermore, the hybrid of these two materials shows a synergistic effect, which is similar to behavior observed in hybrids of PC and PMMA. The data obtained from flat plaques indicate that the improvement of ballistic resistance of these new nylon materials from the currently fielded system could be significant in certain applications.
DTIC
Armor; Nylon (Trademark); Terminal Ballistics; Transparence

20080037647 MKP Structural Design Associates, Inc., Ann Arbor , MI USA

Designing an Innovative Composite Armor System for Affordable Ballistic Protection

Ma, Zheng-Dong; Wang, Hui; Cui, Yushun; Rose, Douglas; Socks, Adria; Ostberg, Donald; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481733; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481733

We will demonstrate a new design methodology, called Function-Oriented Material Design (FOMD), by designing an innovative composite armor system against ballistic and fragment penetration. A new composite armor concept, called BTR-Ba, is presented, which has three major subsystem modules: 1) a mosaic ceramic armor (MCA) frontal plate, 2) a biomimetic tendon reinforced (BTR) composite back plate, and 3) an optimized cable network supporting structure. The FOMD tool developed at MKP Inc. is extended in this research for designing ballistic-protective composite structures. This paper focuses on the frontal armor plate and back plate design problems with demonstration examples, including both results of the virtual prototyping and ballistic testing for proof-of-concept of the new armor concept and design methodology developed.

DTIC

Armor; Composite Materials; Composite Structures; Protection

20080037687 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

M1 Abrams Seal Ring

Apr 26, 2004; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-03-0009-09

Report No.(s): AD-A481957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481957

The U.S. Army's Anniston Depot in Anniston, Alabama, is designated the Center of Technical Excellence for the M1 Abrams Tank division of the Tank-Auto and Armaments Command (TAACOM). The Depot was commissioned to reduce the manufacturing time of a housing seal for the M1 Abrams engine. The 3.650-inch-diameter, 0.500-inch-wide seal, made of wrought A-286 nickel-iron super alloy, is difficult to clamp securely during machining, making it a challenge to maintain required roundness tolerances. Anniston was turning the seal in four set-ups on a lathe, and then employing a machining center to mill off two tabs as required in the part specifications. The Depot requested the assistance of the National Center for Defense Manufacturing and Machining (NCDMM) to help reduce machining costs and improve work holding effectiveness. The NCDMM recommended application of cutting tools from alliance partner Kennametal Inc. featuring advanced coatings and geometries. The new tooling permitted a doubling of cutting speeds as well as an increase in depth of cut, reducing machining time and cost. In addition, new fixturing configurations produced strong gripping power without distorting the part. The fixtures enabled the turning operations to be completed in a single clamping, saving time spent handling and relocating the part for multiple setups.

DTIC

Lathes; Machining; Milling Machines; Production Engineering; Seals (Stoppers)

20080037778 Second Sight Medical Products, Inc., Sylmar, CA, USA

Catalyst and a Method for Manufacturing the Same

Zhou, D. M., Inventor; Greenberg, R., Inventor; 26 Oct 05; 18 pp.; In English

Contract(s)/Grant(s): R24EY12893

Patent Info.: Filed Filed 26 Oct 05; US-Patent-Appl-SN-11-260 002

Report No.(s): PB2008-100712; No Copyright; Avail.: CASI: A03, Hardcopy

An improved platinum and method for manufacturing the improved platinum wherein the platinum having a fractal surface coating of platinum, platinum gray, with an increase in surface area of at least 5 times when compared to shiny platinum of the same geometry and also having improved resistance to physical stress when compared to platinum black having the same surface area. The process of electroplating the surface coating of platinum gray comprising plating at a moderate rate, for example at a rate that is faster than the rate necessary to produce shiny platinum and that is less than the rate necessary to produce platinum black. Platinum gray is applied to manufacture a fuel cell and a catalyst.

NTIS

Coating; Electroplating; Manufacturing; Patent Applications; Platinum

20080037815 Virginia Univ. Patent Foundation, Charlottesville, VA, USA
Bond Coat for a Thermal Barrier Coating System and Related Method Thereof
Wortman, D. J., Inventor; Wadley, H. N. G., Inventor; 21 Nov 03; 17 pp.; In English
Contract(s)/Grant(s): GI 11083; 117237
Patent Info.: Filed Filed 21 Nov 03; US-Patent-Appl-SN-10-535 364
Report No.(s): PB2008-100704; No Copyright; Avail.: CASI: A03, Hardcopy

Method and Apparatus for efficiently applying a bond coat and related coating systems to a surface that can survive the thermal gradient that is encountered in very high temperature, high heat flux environments such as a rocket engine. An apparatus for efficiently applying coating systems using a vapor or cluster deposition technique such as a directed vapor deposition (DVD) approach, and more particularly providing a thermal barrier coating (TBC) system applications with very high temperature utility in either oxidizing or non-oxidizing conditions.
NTIS
Coating; Joints (Junctions); Patent Applications; Thermal Control Coatings

20080038081 Corning, Inc., Corning, NY, USA
Rare Earth Doped Single Polarization Double Clad Optical Fiber with Plurality of Air Holes
Berkey, G. E., Inventor; Chen, X., Inventor; Koh, J., Inventor; Nolan, D. A., Inventor; Walton, D. T., Inventor; 22 Oct 04; 22 pp.; In English
Contract(s)/Grant(s): DARPA-MDA-972-02-3-004
Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-971 319
Report No.(s): PB2008-101618; No Copyright; Avail.: CASI: A03, Hardcopy

An optical fiber including: (i) a silica based, rare earth doped core having a first index of refraction n(sub 1); (ii) a silica based inner cladding surrounding the core and having a second index of refraction n(sub 2), such that n(sub 1)>n(sub 2), said inner cladding having a plurality of air holes extending longitudinally through the length of said optical fiber; (iii) a silica based outer cladding surrounding said inner cladding and having a third index of refraction n(sub 3), such that n(sub 2)>n(sub 3), wherein said optical fiber supports a single polarization mode within the operating wavelength range.
NTIS
Fiber Optics; Optical Fibers; Optical Properties; Patent Applications; Silicon Dioxide

20080038083 Corning, Inc., Corning, NY, USA
Rare Earth Doped Single Polarization Double Clad Optical Fiber and a Method for Making Such Fiber
Berkey, G. E., Inventor; Chen, X., Inventor; Koh, J., Inventor; Li, M. J., Inventor; Nolan, D. A., Inventor; 14 Feb 05; 23 pp.; In English
Contract(s)/Grant(s): MDA-972-02-3-004
Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-058 309
Report No.(s): PB2008-101620; No Copyright; Avail.: CASI: A03, Hardcopy

An optical fiber, comprising: (i) a rare earth doped silica based elongated core with a first refractive index (n(sub 1)) with an aspect ratio of 1:5 to 1; (ii) a silica based moat abutting and at least substantially surrounding the core, the moat having a refractive index n(sub 2), wherein n(sub 2)<n(sub 1); (iii) a silica based inner cladding surrounding the moat, the inner cladding having a third refractive index (n(sub 3)), wherein n(sub 1)>n(sub 3); and n(sub 3)>n(sub 2); (iv) a silica based outer cladding surrounding said inner cladding, the outer cladding having a fourth refractive index (n(sub 4)), such that n(sub 4)<n(sub 3); the optical fiber exhibits single polarization at the operating wavelength band.
NTIS
Fiber Optics; Optical Fibers; Optical Properties; Patent Applications; Silicon Dioxide

20080038732 Pittsburgh Univ., PA USA
Using Theory and Simulation to Design Self-Healing Surfaces
Balazs, Anna C; Nov 16, 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0233
Report No.(s): AD-A482337; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482337

Our aim in the previous studies was to design polymeric composites and blends that would heal defects that were present within the material. We considered three distinct approaches, which involved: (1) Harnessing nanoparticles to heal cracks in

layered composites; (2) Using microcapules to deliver nanoparticles to damaged coatings; (3) Exploiting photo-chemical reactions to create defect-free hierarchical structures. As we note below, our findings generated considerable interest in the scientific community. We are also initiating new studies on controlling crack propagation in brittle materials. Herein, we provide a brief description of our research in each of these areas.
DTIC
Chemical Reactions; Healing; Microcracks; Nanostructures (Devices); Polymeric Films; Simulation; Surface Reactions

20080038892 Naval Research Lab., Washington, DC USA
Effects of Thin High-z Layers on the Hydrodynamics of Laser-Accelerated Plastic Targets
Obenschain, S P; Colombant, D; Karasik, M; Pawley, C J; Serlin, V; Schmitt, A J; Gardner, J H; Phillips, L; Aglitskly, Y; Chan, Y; Jan 2002; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present experimental results and simulations that study the effects of thin metallic layers with high atomic number (high-Z) on the hydrodynamics of laser accelerated plastic targets. These experiments employ a laser pulse with a low-intensity foot that rises into a high-intensity main pulse. This pulse shape simulates the generic shape needed for high-gain fusion implosions. Imprint of laser nonuniformity during start up of the low intensity foot is a well-known seed for hydrodynamic instability. We observe large reductions in hydrodynamic instability seeded by laser imprint when certain minimum thickness gold or palladium layers are applied to the laser-illuminated surface of the targets. The experiment indicates that the reduction in imprint is at least as large as that obtained by a 6 times improvement in the laser uniformity. We present simulations supported by experiments showing that during the low intensity foot the laser light can be nearly completely absorbed by the high-Z layer. X-rays originating from the high-Z layer heat the underlying lower-Z plastic target material and cause large buffering plasma to form between the layer and the accelerated target. This long-scale plasma apparently isolates the target from laser nonuniformity and accounts for the observed large reduction in laser imprint. With onset of the higher intensity main pulse, the high-Z layer expands and the laser light is transmitted. This technique will be useful in reducing laser imprint in pellet implosions and thereby allow the design of more robust targets for high-gain laser fusion.
DTIC
Hydrodynamics; Laser Beams; Laser Fusion; Laser Targets; Plasmas (Physics); Plastics

20080038907 California Univ., Santa Cruz, CA USA
Semiconducting Nanocrystals in Mesostructured Thin Films for Optical and Opto-Electronic Device Applications
Chmelka, Bradley F; Mar 1, 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0085
Report No.(s): AD-A482526; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The compositions, structures, and surface properties of InGaP, GaN, ZnSe, ZnS2, and SiO2 nanocrystals and conjugated polymer/(SnS2 or SiO2) nanocomposite films have been measured and controlled to modify, enhance, and understand their optical and/or semiconducting properties over a hierarchy of dimensions, from molecular to macroscopic. This progress has enabled new and general strategies for the development and optimization of nanocrystals and nanostructured composites for applications in electro- or photoluminescent devices, sensors, and solid-state lighting. The macroscopic optical and semiconducting properties of novel inorganic-organic hybrid materials, based on monodisperse nanocrystals and/or ordered nanostructured inorganic-organic composite solids with tunable compositions and dimensions, depend crucially on molecular-level compositions, structures, and interfaces. Till now, such molecular-level structural details have not been measured, not understood, nor have they been used as feedback criteria for improving or optimizing materials syntheses, or device processing conditions. During the course of this project, new molecular-level insights provided by very-high-field and multidimensional NMR characterization protocols have enabled the development of novel nano- and hierarchically scaled optical and semiconducting materials and devices. New and general strategies for controlling nanocrystal structures and interfaces have allowed the incorporation of semiconducting nanocrystals and polymers into nanocomposite films, yielding novel opto-electronic and optical properties.
DTIC
Conjugation; Nanocrystals; Optical Materials; Optical Properties; Photoluminescence; Semiconductors (Materials); Surface Properties; Thin Films

20080038930 Technische Univ., Munich, Germany

New Materials Based on Spider Silk

Vendrely, C; Scheibel, T; Nov 6, 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-06-1-0451

Report No.(s): AD-A482569; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this project, we investigated the dragline silk proteins ADF-3 and ADF-4 of the spider Araneus diadematus. Adf-3 and Adf-4 cDNA can each be expressed directly in insect cells using the Baculovirus-expression-System. Recombinant ADF-4 is insolubly produced in the cytoplasm of insect cells and soluble produced upon secretion into the media. Further, parameters influencing stability and solubility of recombinantly produced ADF analogues have been investigated. We detected that intermolecular disulfide bridges formed between monomers of the ADF analogues stabilized formed dimer. Additionally, it was found that potassium phosphate triggers assembly of ADF analogues into spheres and fibrils.

DTIC

Cytoplasm; Silk; Spiders

20080038961 Clarkson Univ., Potsdam, NY USA

Nonwettable Thin Films from Hybrid Polymer Brushes can be Hydrophilic

Motornov, Mikhail; Sheparovych, Roman; Tokarev, Ihor; Roiter, Yuri; Minko, Sergiy; Mar 30, 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0339

Report No.(s): AD-A482631; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hybrid brushes composed of two liquid polymers, poly(dimethylsiloxane) (PDMS) and a highly branched ethoxylated polyethylenimine (EPEI), were synthesized on Si wafers by the 'grafting to' method and by applying a combinatorial approach (fabrication of gradient brushes). The combinatorial approach revealed a strong effect of 'layer assisted tethering', which allowed us to synthesize hybrid brushes twice as thick as the reference homopolymer brushes. The hybrid brushes are stable thin films that can rapidly and reversibly switch between hydrophilic and hydrophobic states in water and air, respectively. The switching in water affects a rapid release of amino functional groups which can be used to regulate adhesion and reactivity of the material. The switching in air rapidly returns the brush to a hydrophobic state. The hybrid brush is hydrophilic because of two mechanisms: (1) exposure of EPEI chains to the brush-water interface under water, and (2) retention of some fraction of water via swollen EPEI chains (the EPEI chains swell by 2-3 times), which are conserved by a PDMS cap in air. The hybrid brush is wettable under water, and at the same time, the brush is nonwettable in air because water droplets are trapped in a metastable state when the water contact angle is above 9O%.

DTIC

Brushes; Polymers; Thin Films

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*.

20080037627 Drexel Univ., Philadelphia, PA USA

Selectivity of Piezoelectric-Excited Millimeter-Sized Cantilever (PEMC) Sensors to Bacillus anthracis Spores in the Presence of Bacillus thuringiensis and Bacillus cereus Spores in a Flow Cell

Campbell, Gossett A; Mutharasan, Raj; Nov 2006; 7 pp.; In English

Contract(s)/Grant(s): PA-26-0017-00; NIH 5R01EB000720

Report No.(s): AD-A481687; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481687

We report a highly sensitive, rapid and reliable method for the detection of Bacillus Anthracis spores at 300/mL using a piezoelectric-excited millimeter-sized cantilever (PEMC) sensor. Antibody specific to Bacillus anthracis (BA, Sterne strain 7702) spores was immobilized on PEMC sensors, and exposed to spores (300 to 3x106 spores/mL). The resonant frequency decreased at a rate proportional to the spore concentration and reached a steady state frequency change of 5 plus/minus 5 (n=3), 92 plus/minus 7 (n=3), 500 plus/minus 10 (n=3), 1030 plus/minus 10 (n=2), and 2696 plus/minus 6 (n=2) Hz corresponding to 0, 3x10(^2), 3x10(^3), 3x10(^4), and 3x10(^6) spores/mL, respectively. Selectivity of the antibody functionalized sensor was determined with samples containing BA (3 x 10(^6)/mL) mixed with Bacillus thuringiensis (BT;

1.5x10(^9)/mL) in various volume ratios that yielded BA:BT ratios of 1:0, 1:0.008, 1:0.004, 1:0.002 and 0:1. The corresponding resonance frequency decreases were, 2345, 1980, 1310, 704 and 10 Hz. Sample containing 100% BT spores (1.5 x 10(^9)/mL and no BA) gave a steady state frequency decrease of 10 Hz, which is within noise level of the sensor, indicating excellent selectivity. These results show that detection of Bacillus anthracis spore at a very low concentration (300 spores/mL) and with high selectivity in presence of another Bacillus spore (BT) can be accomplished using piezoelectric-excited millimeter-sized cantilever sensors.
DTIC
Bacillus; Millimeter Waves; Piezoelectricity; Spores

20080038069 National Defense Univ., Washington, DC USA
A Study of Critical Technology Events in the Development of Selected Army Weapons Systems
Chait, Richard; Lyons, John; Nov 30, 2006; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481952; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481952

Critical Technology Events (CTEs) came out of problem-driven research -- the 'Mining' phase. CTEs are central technology events in the development of a weapons system that has led to a key capability; they can originate in industry, in-house government labs, academia, or with international partners. The role of Army laboratories has been to 1) Collaborated with others on CTEs; 2) Evaluated performance of prototypes, including fixes for technical problems; 3) Acted as consultants to contractors and to the Program Manager; and 4)Acted as advisors to the Army to ensure a 'smart buyer' capability. This briefing argues it is important to maintain strong in-house Army laboratories.
DTIC
Weapon Systems; Weapons Development; Industries

20080038945 RAND Corp., Santa Monica, CA USA
U.S. Competitiveness in Science and Technology
Galama, Titus; Hosek, James; Jan 2008; 190 pp.; In English
Report No.(s): AD-A482598; W74V8H-06-C-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this report is to present and consider information related to whether the USA is losing its edge in science and technology (S&T). Claims have been made about insufficient expenditures on research and development (R&D) (particularly on basic research), problems with U.S. education in science and engineering (S&E), a shortage of S&E workers in the USA, increasing reliance on foreigners in the workforce, and decreasing attractiveness of S&E careers to U.S. citizens. A loss of leadership in S&T could diminish U.S. economic growth, standard of living, and national security. Our assessment of the measures we have examined indicates that the U.S. S&T enterprise is performing well. We find that the USA leads the world in S&T and has kept pace or grown faster than the rest of the world in many measures of S&T. Although developing nations such as China, India, and South Korea showed rapid growth in S&T, these nations still account for a small share of world innovation and scientific output. Furthermore, we find that the consequences of the globalization of S&T and the rise of S&T capability in other nations are more likely to be economically beneficial to the USA than harmful. We also find that the USA has continued to invest in its S&T infrastructure and that the S&E workforce has managed to keep up with the demand for highly skilled S&E workers through immigration. However, there are potential weaknesses in the persistent underperformance of older K-12 students in math and science, in the limited attractiveness of S&E careers to U.S. students, and in the heavy focus of federal research funding on the life sciences, and we do not yet fully understand the consequences of an increasing reliance on foreign-born workers in S&E.
DTIC
Engineering; Research and Development; Technologies; United States

20080038995 Naval Observatory, Washington, DC USA
The StarScan Plate Measuring Machine: Overview and Calibrations
Zacharias, N; Winter, L; Holdenried, E R; De Cuyper, J P; Rafferty, T J; Wycoff, G L; May 28, 2008; 12 pp.; In English
Report No.(s): AD-A482702; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The StarScan machine at the U.S. Naval Observatory (USNO) completed measuring photographic astrograph plates to allow determination of proper motions for the USNO CCD Astrograph Catalog (UCAC) program. All applicable 1940 AGK2 plates about 2200 Hamburg Zone Astrograph plates, 900 Black Birch (USNO Twin Astrograph) plates, and 300 Lick Astrograph plates have been measured. StarScan comprises a CCD camera, a telecentric lens, an air-bearing granite table,

stepper motor screws, and Heidenhain scales to operate in a step-stare mode. The repeatability of StarScan measures is about 0.2 microns. The CCD mapping as well as the global table coordinate system has been calibrated using a special dot calibration plate and the overall accuracy of StarScan x, y data is derived to be 0.5 microns.
DTIC
Calibrating; Measuring Instruments; Photographic Plates

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*.

20080037307 Intelliserv, Inc., Houston, TX, USA
Apparatus and Method for Adjusting Bandwidth Allocation in Downhole Drilling Networks
Hall, D. R., Inventor; Pixton, D. S., Inventor; Johnson, M. I., Inventor; Bartholomew, D. B., Inventor; Hall, H. T., Inventor; 28 Jun 04; 19 pp.; In English
Contract(s)/Grant(s): DE-FC26-01NT41229
Patent Info.: Filed Filed 28 Jun 04; US-Patent-Appl-SN-10-878 145
Report No.(s): PB2008-101981; No Copyright; Avail.: CASI: A03, Hardcopy

A high-speed downhole network providing real-time data from downhole components of a drilling strings includes a bottom-hole node interfacing to a bottom-hole assembly located proximate the bottom end of a drill string. A top-hole node is connected proximate the top end of the drill string. One or several intermediate nodes are located along the drill string between the bottom-hole node and the top-hole node. The downhole network is configured to include a data rate adjustment module to monitor network traffic traveling in both uphole and downhole directions. The data rate adjustment module is configured to optimize network settings and efficiency by adjusting the allocation of available network bandwidth for data traffic traveling uphole and downhole.
NTIS
Bandwidth; Drilling; Patent Applications

20080037321 National Telecommunications and Information Administration, Washington, DC USA
Propagation Loss Prediction Considerations for Close-In Distances and Low-Antenna Height Applications
DeMinco, N.; Jul. 2007; 164 pp.; In English
Report No.(s): PB2008-102381; NTIA-TR-07-449; No Copyright; Avail.: National Technical Information Service (NTIS)

An investigation of different propagation modeling methods to meet the special requirements of a short-range propagation model with low antenna heights was performed, and has resulted in the development of approaches to be taken to accurately model radio-wave propagation loss for these types of scenarios. The basic requirements for the Short-Range Mobile-to-Mobile Propagation Model include: separation distances between the transmitter and receiver from one meter to two kilometers, a frequency range of 150 MHz to 3000 MHz, and antenna heights of one to three meters for both transmitter and receiver sites. It is necessary to develop alternative methods for accurate predictions of propagation loss to provide a propagation model that will simultaneously meet all of these requirements. This will require special considerations that currently available models do not include in their methods of analysis. Several analytical approaches were investigated to develop propagation loss prediction methods that take all of these considerations into account. Analysis efforts have determined that the development of this model will require the use of mutual-coupling predictions and should also include the effects of the surface wave. Conventional far-field antenna patterns and gain of the antennas may also not be valid at close separation distances, since one antenna may not be in the far field of the other antenna. Analysis efforts have also determined that these issues and effects become more significant for the lower frequencies (900 MHz and below). For low antenna heights the effects of the close proximity between the Earth and the antenna produce a strong interaction between the antenna and the ground. The antenna pattern performance is vastly different than if the antenna were in free space.
NTIS
Distance; Height; Losses; Mobile Communication Systems; Radio Waves; Antenna Radiation Patterns

20080037378 Manchini (Joseph A.), Rome, NY, USA
Task Distribution Method for Protecting Servers and Tasks in a Distributed System
Bailey, M. W., Inventor; Klwiat, K. A., Inventor; 7 Sep 04; 17 pp.; In English
Patent Info.: Filed Filed 7 Sep 04; US-Patent-Appl-SN-10-935 331
Report No.(s): PB2008-102762; No Copyright; Avail.: CASI: A03, Hardcopy

Method for securing tasks and servers in a distributed system from outside attack. Tasks are protected from modification and faulty execution using a combination of redundancy and distribution of data. A stripe virtual machine process control the execution of remote tasks at each server. Stripes are executed redundantly on multiple servers and concurrently on each server. A poller determines the majority machine state among the servers. Attacks are annulled by voting down the attacked server's state and restoring it to the majority state.
NTIS
Computers; Patent Applications; Distributed Parameter Systems

20080037403 Newcastle-upon-Tyne Univ., Newcastle, UK
Improving Service Availability without Improving Availability of Individual Services
Chen, Y.; Romanovsky, A.; May 2007; 13 pp.; In English
Report No.(s): PB2008-102627; CS-TR-1025; Copyright; Avail.: National Technical Information Service (NTIS)

This paper presents a novel architectural solution for improving dependability of Web Services. This approach is based on the concepts from the emerging resilience-explicit computing combined with the traditional fault-tolerance techniques such as recovery blocks and N-version programming applied in the context of the service-oriented architecture. We propose a distributed solution called WS-Mediator, which is implemented as an overlay network of specialized services. The globally distributed architecture of the WS-Mediator system collects dependability metadata from the end-users perspective, analyses them and acts upon them to tolerate faults using dynamic reconfiguration. Therefore to improve dependability of Web Services by introducing service redundancy,we have implemented a Java WS-Mediator framework based upon WS-Mediator concept, which can be easily integrated into implementation of Java Web Services applications. We report the results of the extensive experiments conducted in the context of the bioinformatics domain, in which we demonstrate the applicability of our approach.
NTIS
Web Services; Applications Programs (Computers); Service Oriented Architecture; Java (Programming Language)

20080037410 Newcastle-upon-Tyne Univ., Newcastle, UK
Evaluation of P2P Search Algorithms for Discovering Trust Paths
Ribeiro de Mello, E.; van Moorsel, A.; da Silva, J.; Jun. 2007; 12 pp.; In English
Report No.(s): PB2008-102626; CS-TR-1033; Copyright; Avail.: National Technical Information Service (NTIS)

Distributed security models based on a web of trust eliminate single points of failure and alleviate performance bottlenecks. However, such distributed approaches rely on the ability to find trust paths between participants, which introduces performance overhead. It is therefore of importance to develop trust path discovery algorithms that minimize such overhead. Since peer-to-peer (P2P) networks share various characteristics with the web of trust, P2P search algorithms can potentially be exploited to find trust paths. In this paper we systematically evaluate the application of P2P search algorithms to the trust path discovery problem. We consider the number of iterations required (as expressed by the TTL parameter) as well as the messaging overhead, for discovery of single as well as multiple trust paths. Since trust path discovery does not allow for resource replication (usual in P2P applications), we observe that trust path discovery is very sensitive to parameter choices in selective forwarding algorithms (such as Kwalker), but is relatively fast when the underlying network topology is scale-free.
NTIS
Algorithms; Exploration

20080037730 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
cMsg: A General Purpose, Publish-Subscribe, Interprocess Communication Implementation and Framework
Timmer, C.; Abbot, D.; Gyurjyan, V.; Heyes, G.; Jastrzembski, E.; January 2006; 9 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-913559; No Copyright; Avail.: National Technical Information Service (NTIS)

cMsg is software used to send and receive messages in the Jefferson Lab online and runcontrol systems. It was created to replace the several IPC software packages in use with a single API. cMsg is asynchronous in nature, running a callback for each message received. However, it also includes synchronous routines for convenience. On the framework level, cMsg is a

thin API layer in Java, C, or C++ that can be used to wrap most message-based interprocess communication protocols. The top layer of cMsg uses this same API and multiplexes user calls to one of many such wrapped protocols (or domains) based on a URL-like string which we call a Uniform Domain Locator or UDL. One such domain is a complete implementation of a publish-subscribe messaging system using network communications and written in Java (user APIs in C and C++ too). This domain is built in a way which allows it to be used as a proxy server to other domains (protocols). Performance is excellent allowing the system not only to be used for messaging but also as a data distribution system.
NTIS
Interprocessor Communication; Communication Networks; Data Systems; On-Line Systems

20080037777 Ference and Associates, Pittsburgh, PA, USA
Voice Packet Identification Based on Celp Compression Parameters
Saha, D., Inventor; Shae, Z. Y., Inventor; 30 Oct 04; 8 pp.; In English
Patent Info.: Filed Filed 30 Oct 04; US-Patent-Appl-SN-10-978 055
Report No.(s): PB2008-103488; No Copyright; Avail.: CASI: A02, Hardcopy

Mechanisms, and associated methods, for conducting voice analysis (e.g., speaker ID verification) directly from a compressed domain of a voice signal. Preferably, the feature vector is directly segmented, based on its corresponding physical meaning, from the compressed bit stream.
NTIS
Packet Switching; Patent Applications; Voice Communication

20080037822 Dorsey and Whitney, LLP, Seattle, WA, USA
Software Application for Modular Sensor Network Node
Davis, J. H. Z., Inventor; Stark, D. P., Inventor; Edmonds, N., Inventor; 20 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 20 Oct 04; US-Patent-Appl-SN-10-970 684
Report No.(s): PB2008-103489; No Copyright; Avail.: CASI: A03, Hardcopy

A software application enables communication among a plurality of modules in a modular sensor network node. The modular sensor node senses a parameter from the surrounding environment and generates data representative of the sensed parameter. The software application resides in each of the plurality of modules and includes program codes for transmission and reception of messages among the modules. The software application includes program codes that process the data to generate outgoing messages, transmit the outgoing messages over a communication bus coupled to the plurality of modules, and receive and process incoming messages.
NTIS
Computer Networks; Computer Systems Programs; Computer Techniques; Patent Applications

20080037857 Brinks, Hofer, Gilson, Lione, Chicago, IL, Chicago, IL, USA
Method and System for Dynamic Range Power Control
Salvi, R., Inventor; 30 Sep 04; 9 pp.; In English
Patent Info.: Filed Filed 30 Sep 04; US-Patent-Appl-SN-10-955 431
Report No.(s): PB2008-103083; No Copyright; Avail.: CASI: A02, Hardcopy

A system for current efficient dynamic power range control in a transmitter lineup can include a switched mixer coupled to a switched step attenuator and a switched power driver coupled to the switched step attenuator. Linearity and efficiency can be substantially maintained for more than 70 dB of dynamic power range for the system. The dynamic power range control can all occur within the radio frequency range and current can be dynamically switched along with the output power. The transmitter can allow for over 30 dB of continuous power control and over 45 dB of discrete power control. The switched power driver can further include continuous power control via a stacked current steer and stepped power control via a current switched IQ summer amplifier where the steered current switched IQ summer amplifier can provide over 60 dB power control range.
NTIS
Dynamic Range; Patent Applications; Trajectory Control; Transmitters

20080037860 Shumaker and Sieffert, P.A., Saint Paul, MN, USA

Noncoherent Ultra-Wideband (UWB) Demodulation

Giannakis, G. B., Inventor; Yang, L., Inventor; 3 Oct 05; 25 pp.; In English

Contract(s)/Grant(s): DAAD19-01-2-0011; NSF-EIA-0324864

Patent Info.: Filed Filed 3 Oct 05; US-Patent-Appl-SN-11-242 623

Report No.(s): PB2008-102783; No Copyright; Avail.: CASI: A03, Hardcopy

Techniques are described that provide noncoherent demodulation via correlating 'dirty' templates in wireless communication systems. In particular, the described techniques cross-correlate dirty templates that are adjacent symbol-long segments of the received noisy waveform. Unlike transmitted reference (TR) and differential templates that are noisy, i.e., propagate through the wireless communication channel, these dirty templates are both noisy and offset in time and, thus, are dirty. As a result, the described techniques enable noncoherent demodulation without timing synchronization and channel estimation. Symbol demodulation may be performed utilizing a maximum likelihood (ML) sequence detector or, alternatively, conditional ML demodulation may be performed to reduce receiver complexity. The described techniques may also be applied to a TR scheme to improve performance in the presence of mistiming. In any case, the techniques may be applied to narrowband, wideband, or ultra-wideband (UWB) communication systems and remain operational without timing synchronization or channel estimation.

NTIS

Broadband; Demodulation; Patent Applications; Wideband Communication

20080037861 Michigan Univ., Ann Arbor, MI, USA

Blind Synchronization and Demodulation

Glannakis, G. B., Inventor; Luo, X., Inventor; 4 Oct 05; 28 pp.; In English

Contract(s)/Grant(s): DAAD 19-01-2-0011

Patent Info.: Filed Filed 4 Oct 05; US-Patent-Appl-SN-11-243-454

Report No.(s): PB2008-102782; No Copyright; Avail.: CASI: A03, Hardcopy

Techniques are described that provide inter-symbol interference--(ISI) and multi-user interference--(MUI) resilient blind timing synchronization and low complexity demodulation in wireless communication systems. A nonzero mean symbol is transmitted with a predetermined period in a stream of zero mean symbols during a synchronization phase. Only nonzero mean symbols are transmitted outside of the synchronization phase. Blind or non-data aided synchronization is performed at the receiver while bypassing channel estimation. The techniques enable timing synchronization via energy detection and low-complexity demodulation by matching the received waveform to a synchronized aggregate template (SAT). The SAT is recovered by averaging samples of the received waveform during the synchronization phase. In this manner, the described techniques may be applied to single or multi-user narrowband, wideband, or ultra-wideband (UWB) wireless communication systems with fixed or ad hoc access, but are particularly advantageous for wideband or UWB multi-user ad hoc access.

NTIS

Demodulation; Patent Applications; Synchronism; Wireless Communication

20080037869

Devices and Methods for Connecting Housings

Chintala, T. J., Inventor; Semenik, S. R., Inventor; 12 Oct 04; 12 pp.; In English

Contract(s)/Grant(s): MDA904-01-G-0620

Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-964 405

Report No.(s): PB2008-103079; No Copyright; Avail.: CASI: A03, Hardcopy

The described embodiments provide mobile electronic devices and associated methods for securely maintaining a connected relationship between device housings. These embodiments include a first housing having at least one first engagement portion and a second housing having at least one second engagement portion, where the second engagement portion is movable between a disconnected state and a connected state relative to the first engagement portion. Further, the second engagement portion is also movable a predetermined engagement distance. Additionally, a limiting structure is positionable adjacent to at least one of the first housing and the second housing such that the limiting structure prevents the second engagement portion from moving the predetermined engagement distance after achieving the connected state.

NTIS

Connectors; Housings; Patent Applications

20080037871 Qualcomm, Inc., San Diego, CA, USA
Devices and Methods for Retaining an Antenna
Chintala, T. J., Inventor; 12 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): MDA904-01-G-0620
Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-964 403
Report No.(s): PB2008-103067; No Copyright; Avail.: CASI: A03, Hardcopy

The disclosed embodiments provide devices and methods for securely retaining an antenna to a communications device. The disclosed embodiments include an antenna assembly connectable with a housing. The antenna assembly may include a connector having a connector body extending from a first end to a second end and thereby defining a longitudinal axis. The first end and the housing include at least one set of corresponding, irreversible engagement members movable one way from an unlocked position and a locked position. In the unlocked position the antenna assembly is movable along the longitudinal axis relative to the communications device, while in the locked position the antenna assembly is not movable along the longitudinal axis relative to the communications device. An antenna is securable relative to the connector body and is connectable with the communications device through an electrical conductor. A retainer mechanism having a retainer body may be fixedly positioned relative to the first engagement member to secure the antenna assembly in the locked position. Methods of retaining an antenna assembly in a communications device are also disclosed.
NTIS
Communication Equipment; Patent Applications; Antennas

20080037891 Dorsey and Whitney, LLP, Seattle, WA, USA
Modular Sensor Network Node (PAT APPL-10-960-298)
Davis, J. H. Z., Inventor; Stark, D. P., Inventor; Kershaw, C. P., Inventor; Kyker, R. D., Inventor; 6 Oct 04; 10 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 6 Oct 04; US-Patent-Appl-SN-10-960 298
Report No.(s): PB2008-102812; No Copyright; Avail.: CASI: A02, Hardcopy

A distributed wireless sensor network node is disclosed. The wireless sensor network node includes a plurality of sensor modules coupled to a system bus and configured to sense a parameter. The parameter may be an object, an event or any other parameter. The node collects data representative of the parameter. The node also includes a communication module coupled to the system bus and configured to allow the node to communicate with other nodes. The node also includes a processing module coupled to the system bus and adapted to receive the data from the sensor module and operable to analyze the data. The node also includes a power module connected to the system bus and operable to generate a regulated voltage.
NTIS
Communication Networks; Patent Applications

20080037894 Henricks Slavin and Homes, LLP, El Segundo, CA, USA
Compensating Structures and Reflector Antenna Systems Employing the Same
Lange, M. J., Inventor; 2 Nov 04; 24 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Patent Info.: Filed Filed 2 Nov 04; US-Patent-Appl-SN-10-979 942
Report No.(s): PB2008-102813; No Copyright; Avail.: CASI: A03, Hardcopy

A compensating structure includes layers of non-uniform arrays of conductive patches configured to provide phase and/or amplitude distribution modification of feed primary patterns.
NTIS
Antenna Design; Patent Applications; Reflector Antennas; Reflectors

20080037925 Army Research Lab., Aberdeen Proving Ground, MD USA
Interpreting Commander's Intent: Do We Really Know What We Know and What We Don't Know
Thomas, Jeffrey A; Pierce, Linda G; Dixon, Melissa W; Fong, Gwenda; Jun 2007; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481530; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481530

The 21st Century Military is shifting its focus from traditional combat operations to stability, security, transition, and reconstruction (SSTR) operations (Department of Defense Directive, 2005). US policy on SSTR operations requires full

interoperability among representatives across US Departments and Agencies, foreign governments and security forces, international organizations, US and foreign non-governmental organizations, and members of the private sector. This shift in focus has drawn attention to the idea that one of the most salient dimensions of 21st Century warfighting is the ability to operate effectively with others despite the fact that there are likely substantial differences in capabilities and cultural backgrounds. However, knowing the degree to which a team is completely interoperable can be elusive and hard to quantify. One approach is to evaluate how effective teams are able to interpret commander's intent and develop situational awareness in various conditions. This paper describes a technique for evaluating interoperability through a quantitative evaluation of commander's intent and how intent was promulgated through a simulated, distributed and collocated Coalition Task Force (CTF) during an October 2006 Defense Advanced Projects Agency (DARPA) sponsored joint experiment between the Singapore (SN) Armed Forces and the U.S. Army Research Laboratory, Human Research and Engineering Directorate (ARL-HRED).
DTIC
Situational Awareness; Interoperability; Organizations

20080037982 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Reconfigurable L-Band Radar
Rincon, Rafael F.; [2008]; 4 pp.; In English; European Radar Conference, 27-31 Oct. 2008, Denmark; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037982

The reconfigurable L-Band radar is an ongoing development at NASA/GSFC that exploits the capability inherently in phased array radar systems with a state-of-the-art data acquisition and real-time processor in order to enable multi-mode measurement techniques in a single radar architecture. The development leverages on the L-Band Imaging Scatterometer, a radar system designed for the development and testing of new radar techniques; and the custom-built DBSAR processor, a highly reconfigurable, high speed data acquisition and processing system. The radar modes currently implemented include scatterometer, synthetic aperture radar, and altimetry; and plans to add new modes such as radiometry and bi-static GNSS signals are being formulated. This development is aimed at enhancing the radar remote sensing capabilities for airborne and spaceborne applications in support of Earth Science and planetary exploration This paper describes the design of the radar and processor systems, explains the operational modes, and discusses preliminary measurements and future plans.
Author
Ultrahigh Frequencies; Synthetic Aperture Radar; Airborne Equipment; Imaging Radar; Remote Sensing; Space Exploration; Earth Sciences; Phased Arrays; Radio Altimeters

20080038013 California Inst. of Tech., Pasadena, CA USA
Complex Networks
Doyle, John; Nov 2006; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481934; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481934

CHALLENGES IN the NS REPORT: 1. Dynamics, spatial location, and information propagation in networks. 2. Modeling and analysis of very large networks. 3. Design and synthesis of networks. 4. Increasing the level of rigor and mathematical structure. 5. Abstracting common concepts across fields. 6. Better experiments and measurements of network structure. 7. Robustness and security of networks. * ORGANIZED COMPLEXITY SUMMARY: 1. Complex systems are robust yet fragile, with unavoidable constraints and trade-offs. 2. High proof complexity implies problem fragility. 3. Thus robustness and its verifiability are compatible design objectives. 4. Potentially good news for the study of all forms of organized complexity. 5. Needs 'new math and technology' not 'new science.' 6. Encouraging beginnings but the math is not yet readily accessible (making progress on both theory and education).
DTIC
Networks; Mathematical Models; Complex Systems; Proving; Network Analysis

20080038014 Army Research Lab., Aberdeen Proving Ground, MD USA
Social Networks and Network Structures
Deitz, Paul H; Nov 2006; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481932; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481932

Social Network Analysis (SNA) is the collection, mapping and measurement of relationships and flows among persons, groups, organizations, technologies or other information processing entities.
DTIC
Communication Networks; Organizations; Flow Measurement

20080038015 National Academy of Sciences - National Research Council, Washington, DC USA
Network Science
Leland, Will; Nov 2006; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481931; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481931

OVERVIEW: (1) A committee of technical experts, military officers and R&D managers was assembled by the National Research Council to reach consensus on the nature of networks and network research. (2) It evaluated extensive data collected from the literature and from a large, diverse sample of active network researchers. (3) The data were analyzed to provide both general learning on networks and answers to specific questions about a field of Network Science as posed by the statement of task. (4) The resulting report was published in 2005 and describes a context, scope, content, and challenges for Network Science as a coherent field of investigation for the Army.
DTIC
Networks; Conferences; Defense Program; Research and Development

20080038737 ASRC Communication Ltd., Kirtland AFB, NM USA
TADIL TALES Templates: Modeling Tactical Data Links for Command and Control Training
Sorroche, Joe; Jun 2007; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482343; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482343

The US Air Force Distributed Mission Operations (DMO) concept continues to be the most successful application of Modeling and Simulation (M&S) for warfighter training. The program extends beyond individual pilot or crew training to include the entire real world operations spectrum. One important component of DMO is Command and Control (C2) training. Until recently, DMO C2 training requirements were difficult to meet because there were no accurate tactical data link simulation models. Now, C2 training requirements are met due to the recent development of modeling real world tactical data links. Development started with modeling Link 16, thus creating 'Tactical Digital Information Link Technical Advice and Lexicon for Enabling Simulations' (TADIL TALES). TADIL TALES provides a simulated model for Link 16 using the Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) simulation protocols. The 'TADIL TALES' format has been verified by experiments conducted during Joint Expeditionary Force Experiment (JEFX) 04 and JEFX 06, and was incorporated into the recently approved Simulation Interoperability Standards Organization (SISO) standard SISO-STD-002. This standard is now widely used for Link 16 C2 training in DMO events, which now include the U.S. Army, Navy, Marines, and Joint Coalition warfighters. By using the TADIL TALES format, other C2 tactical data links can be modeled in the DIS and HLA simulation protocols at various fidelity levels. This paper describes the TADIL TALES formats for DIS and HLA and how other data links are being modeled, thus creating a new class of tactical data link simulation standards for DMO C2 warfighter training.
DTIC
Command and Control; Data Links; Education; Military Operations; Simulation

20080038773 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Dependable Emergency-Response Networking Based on Retaskable Network Infrastructures
Lemay, Michael D; Apr 2008; 88 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-04-1-0562; N00014-02-1-0715
Report No.(s): AD-A482389; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482389

Data networking can aid disaster recovery efforts by allowing victims to contact rescuers, rescuers to communicate among themselves, and concerned friends and relatives to contact victims. Unfortunately, conventional data networks themselves are often destroyed by disasters, currently rendering these services unavailable. My thesis is that heterogeneous robust subnetworks that manage to survive a disaster can be enhanced and dynamically retasked to form an Emergency-Response Network (ERN) using techniques from mobile ad-hoc networks. In this dissertation, we discuss the challenges that arise in

such applications, with particular attention being paid to security challenges. We describe specific solutions to the challenges of emergency detection, platform support, and topology planning and assessment, relying on the philosophy espoused by the pioneers of the Internet, that protocols and related mechanisms should be as simple as possible, to make it easy to develop correct and interoperable implementations and resist the accumulation of gold-plated requirements that restrict the applicability of the mechanisms. Then, we demonstrate several emergency-response applications running on a prototype ERN based on ZigBee and UDP/IP, and explain how such ERN applications could be deployed on realistic networks.
DTIC
Communication Networks; Emergencies

20080038989 Florida Univ., Gainesville, FL USA
Wireless Cooperative Networks: Self-Configuration and Optimization
Yang, Liuqing; Jun 15, 2008; 5 pp.; In English
Contract(s)/Grant(s): N00014-07-1-0868
Report No.(s): AD-A482689; 2; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Distributed multi-input multi-output (MIMO) system is a promising architecture to provide reliable communications over spatially separated relaying nodes. In this paper, we will investigate the optimum resource allocation techniques in distributed MIMO systems, employing differential (de)modulation and various relaying protocols. Instead of limiting to energy optimization, we solve this problem via a two-dimensional energy and location optimization. Benefits of our resource optimization approaches are illustrated through extensive analysis and simulations. Comparisons between different optimization techniques and systems with different protocols are also included.
DTIC
Networks; Optimization; Wireless Communication

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

20080037313 Winstea Sechrest and Minick, PC, Dallas, TX, USA
Dynamic Leakage Control Circuit
Ngo, H. C., Inventor; Kuang, J. B., Inventor; Nowka, K. J., Inventor; Joshi, R. V., Inventor; 16 Sep 04; 12 pp.; In English
Contract(s)/Grant(s): NBCH 30390004
Patent Info.: Filed Filed 16 Sep 04; US-Patent-Appl-SN-10-942 419
Report No.(s): PB2008-102064; No Copyright; Avail.: CASI: A03, Hardcopy

A low power consumption pipeline circuit architecture has power partitioned pipeline stages. The first pipeline stage is non-power-gated for fast response in processing input data after receipt of a valid data signal. A power-gated second pipeline stage has two power-gated modes. Normally the power rail in the power-gated second pipeline stage is charged to a first voltage potential of a pipeline power supply. In the first power gated mode, the power rail is charged to a threshold voltage below the first voltage potential to reduce leakage. In the second power gated mode. the power rail is decoupled from the first voltage potential. A power-gated third pipeline stage has its power rail either coupled to the first voltage potential or power-gated where its power rail is decoupled from the first voltage potential. The power rail of the second power-gated pipeline stage charges to the first voltage potential before the third power-gated pipeline stage.
NTIS
Circuits; CMOS; Dynamic Control; Leakage; Patent Applications

20080037320 Istituto Superiore di Sanita, Rome, Italy
Sistema di Prova Semi-Automatico per la Verifica della Compatibilita Elettromagnetica di un Pacemaker in Accordo agli Standard EN 45502-2-1:2004 e ANSI/AAMI PC69:2000 (Semi-Automatic System to Test the Electromagnetic Compatibility of a Pacemaker According to the Standards EN45502-2-1:2004 e ANSI/AAMI PC69:2000)
Mattei, E.; Calcagnini, G.; Censi, F.; Triventi, M.; Delogu, A.; January 2007; 31 pp.; In Italian
Report No.(s): PB2008-102402; ISTISAN-07/21; Copyright; Avail.: National Technical Information Service (NTIS)

The harmonized European norm EN 45502-2-1 provides the essential requirements for implantable medical devices that

treat bradyarrhythmia (pacemaker) in order to guarantee safety for the patient. On the electromagnetic compatibility of such devices in the frequency range from 450 MHz to 3 GHz, the norm refers to the international standard ANSI/AAMI PC69:2000. In this paper the experimental set-up--developed by the Notified Body 0373 of the Department of Technology and Health of the Istituto Superiore di Sanita (The National Health Institute in Italy) to perform the compatibility tests as provided by the standard--is presented. Because of the complexity of the procedure and the high number of variables to be managed, it has also been developed a software for the semi-automatic control of the test, to reduce the need for the operator to modify the experimental set-up and the time requested by the tests, as well as the error probability. At the end of each test session, the program allows to save the results both on harddisk memory and on paper.
NTIS
Electromagnetic Compatibility; Electromagnetic Fields; Heart; Medical Equipment

20080037331 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA
Heterodyning Time Resolution Boosting Method and System
Erskine, D. J., Inventor; 22 Sep 05; 60 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Patent Info.: Filed Filed 22 Sep 05; US-Patent-Appl-SN-11-234 611
Report No.(s): PB2008-101976; No Copyright; Avail.: CASI: A04, Hardcopy

A method for enhancing the temporal resolving power of an optical signal recording system such as a streak camera or photodetector by sinusoidally modulating the illumination or light signal at a high frequency, approximately at the ordinary limit of the photodetector's capability. The high frequency information of the input signal is thus optically heterodyned down to lower frequencies to form beats, which are more easily resolved and detected. During data analysis the heterodyning is reversed in the beats to recover the original high frequencies. When this is added to the ordinary signal component, which is contained in the same recorded data, the composite signal can have an effective frequency response which is several times wider than the detector used without heterodyning. Hence the temporal resolving power has been effectively increased while maintaining the same record length. Multiple modulation frequencies can be employed to further increase the net frequency response of the instrument. The modulation is performed in at least three phases, recorded in distinct channels encoded by wavelength, angle, position or polarization, so that during data analysis the beat and ordinary signal components can be unambiguously separated even for wide bandwidth signals. A phase stepping algorithm is described for separating the beat component from the ordinary component in spite of unknown or irregular phase steps and modulation visibility values.
NTIS
Heterodyning; Patent Applications; Temporal Resolution

20080037340 UT-Battelle, LLC, Oak Ridge, TN, USA
In-Vivo Orthopedic Implant Diagnostic Device for Sensing Load, Wear, and Infection
Evans, B. M., Inventor; Thundat, T. G., Inventor; Komistek, R. D., Inventor; Dennis, D. A., Inventor; 25 Aug 04; 15 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 25 Aug 04; US-Patent-Appl-SN-10-926 216
Report No.(s): PB2008-101119; No Copyright; Avail.: CASI: A03, Hardcopy

A device for providing in vivo diagnostics of loads, wear, and infection in orthopedic implants having at least one load sensor associated with the implant, at least one temperature sensor associated with the implant, at least one vibration sensor associated with the implant, and at least one signal processing device operatively coupled with the sensors. The signal processing device is operable to receive the output signal from the sensors and transmit a signal corresponding with the output signal.
NTIS
Detection; Diagnosis; Implantation; In Vivo Methods and Tests; Infectious Diseases; Loads (Forces); Orthopedics; Patent Applications

20080037344 International Business Machines Corp., Dallas, TX, USA; International Business Machines Corp., Armonk, NY, USA
Fast Turn-Off Cicuit for Controlling Leakage
Kuang, J. B., Inventor; Ngo, H. C., Inventor; Nowka, K. J., Inventor; 23 Sep 04; 13 pp.; In English
Contract(s)/Grant(s): NBCH30390004

Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-948 444
Report No.(s): PB2008-101971; No Copyright; Avail.: CASI: A03, Hardcopy

A buffer, logic circuit, and data processing system employing fast turn-off drive circuitry for reducing leakage. Leakage current in logic circuitry is managed by coupling and decoupling the voltage potentials applied to large, high-leakage devices. Circuitry includes a low leakage logic path for holding logic states of an output after turning off high-leakage devices. A fast turn-off logic path in parallel with the low leakage logic path is used to assert each logic state in the forward direction from input to output. The large output device in each fast turn-off path is relieved of leakage stress by asserting logic states at driver inputs that cause the driver to turn OFF after the output logic state has been asserted.
NTIS
Circuits; Leakage; Patent Applications

20080037345 Lawrence Livermore National Lab., Livermore, CA USA
Selectively-Etched Nanochannel Electophoretic and Electrochemical Devices
Surh, M. P., Inventor; Wilson, W. D., Inventor; Barbee, T. W., Inventor; Lane, S. M., Inventor; 8 Jun 04; 6 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Patent Info.: Filed Filed 8 Jun 04; US-Patent-Appl-SN-10-864 778
Report No.(s): PB2008-101968; No Copyright; Avail.: CASI: A02, Hardcopy

Nanochannel electrophoretic and electrochemical devices having selectively-etched nanolaminates located in the fluid transport channel. The normally flat surfaces of the nanolaminate having exposed conductive (metal) stripes are selectively-etched to form trenches and baffles. The modifications of the prior utilized flat exposed surfaces increase the amount of exposed metal to facilitate electrochemical redox reaction or control the exposure of the metal surfaces to analytes of large size. These etched areas variously increase the sensitivity of electrochemical detection devices to low concentrations of analyte, improve the plug flow characteristic of the channel, and allow additional discrimination of the colloidal particles during cyclic voltammetry.
NTIS
Electrochemistry; Etching; Microelectronics; Patent Applications

20080037347 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA
All Diamond Self-Aligned Thin Film Transistor
Gerbi, J., Inventor; 13 Sep 05; 10 pp.; In English
Contract(s)/Grant(s): W-31-109-ENG-38
Patent Info.: Filed Filed 13 Sep 05; US-Patent-Appl-SN-11-226 703
Report No.(s): PB2008-101966; No Copyright; Avail.: CASI: A02, Hardcopy

A substantially all diamond transistor with an electrically insulating substrate, an electrically conductive diamond layer on the substrate, and a source and a drain contact on the electrically conductive diamond layer. An electrically insulating diamond layer is in contact with the electrically conductive diamond layer, and a gate contact is on the electrically insulating diamond layer. The diamond layers may be homoepitaxial, polycrystalline, nanocrystalline or ultrananocrystalline in various combinations. A method of making a substantially all diamond self-aligned gate transistor is disclosed in which seeding and patterning can be avoided or minimized, if desired.
NTIS
Alignment; Diamonds; Patent Applications; Thin Films; Transistors

20080037348 Polster Lieder Woodruff and Lucchesi, Saint Louis, MO, USA
Low-Noise Semiconductor Photodetectors
Rafferty, C. S., Inventor; King, C. A., Inventor; 23 Aug 05; 34 pp.; In English
Contract(s)/Grant(s): DM1-0450487
Patent Info.: Filed Filed 23 Aug 05; US-Patent-Appl-SN-11-210 223
Report No.(s): PB2008-101967; No Copyright; Avail.: CASI: A03, Hardcopy

A photodetector is formed from a body of semiconductor material substantially surrounded by dielectric surfaces. A passivation process is applied to at least one surface to reduce the rate of carrier generation and recombination on that surface. Photocurrent is read out from at least one electrical contact, which is formed on a doped region whose surface lies entirely on a passivated surface. Unwanted leakage current from un-passivated surfaces is reduced through one of the following methods. (A) The un-passivated surface is separated from the photo-collecting contact by at least two junctions. (B) The

un-passivated surface is doped to a very high level, at least equal to the conduction band or valence band density of states of the semiconductor. (C) An accumulation or inversion layer is formed on the un-passivated surface by the application of an electric field. Electrical contacts are made to all doped regions, and bias is applied so that a reverse bias is maintained across all junctions.
NTIS
Low Noise; Patent Applications; Photometers; Semiconductors (Materials)

20080037350 Xerox Corp., Rochester, NY, USA; Xerox Corp., Palo Alto, CA, USA
Nanoparticle Deposition Process
Wu, V., Inventor; Li, Y., Inventor; Ong, B. S., Inventor; 3 Nov 05; 11 pp.; In English
Contract(s)/Grant(s): 70NANBOH3033
Patent Info.: Filed Filed 3 Nov 05; US-Patent-Appl-SN-11-265 935
Report No.(s): PB2008-101965; No Copyright; Avail.: CASI: A03, Hardcopy
An apparatus composed of: (a) a substrate; and (b) a deposited composition comprising a liquid and a plurality of metal nanoparticles with a covalently bonded stabilizer.
NTIS
Deposition; Metals; Nanoparticles; Patent Applications

20080037352 Parker (Christie) and Half, LLP, Pasadena, NY, USA
Resonant Optical Devices Incorporating Multi-Layer Dispersion-Engineered Waveguides
Painter, O. J., Inventor; Vernooy, D. W., Inventor; Vahala, K. J., Inventor; 16 Nov 04; 81 pp.; In English
Contract(s)/Grant(s): N00014-00-3-0023
Patent Info.: Filed Filed 16 Nov 04; US-Patent-Appl-SN-10-990 950
Report No.(s): PB2008-101953; No Copyright; Avail.: CASI: A05, Hardcopy
A multi-layer laterally-confined dispersion-engineered optical waveguide may include one multi-layer reflector stack for guiding an optical mode along a surface thereof, or may include two multi-layer reflector stacks with a core therebetween for guiding an optical mode along the core. Dispersive properties of such multi-layer waveguides enable modal-index-matching between low-index optical fibers and/or waveguides and high-index integrated optical components and efficient transfer of optical signal power therebetween. Integrated optical devices incorporating such multi-layer waveguides may therefore exhibit low (<3 dB) insertion losses. Incorporation of an active layer (electro-optic, electro-absorptive, non-linear-optical) into such waveguides enables active control of optical loss and/or modal index with relatively low-voltage/low-intensity control signals. Integrated optical devices incorporating such waveguides may therefore exhibit relatively low drive signal requirements.
NTIS
Optical Equipment; Patent Applications; Waveguides

20080037353 Hewlett-Packard Co., Fort Collins, CO, USA
Reduction of a Feature Dimension in a Nano-Scale Device
Sharma, S., Inventor; 17 Sep 04; 18 pp.; In English
Contract(s)/Grant(s): MDA972-01-3-0005
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943 559
Report No.(s): PB2008-101943; No Copyright; Avail.: CASI: A03, Hardcopy
Nano-scale devices and methods provide reduced feature dimensions of features on the devices. A surface of a device substrate having a pattern of spaced apart first nanowires is consumed, such that a dimension of the first nanowires is reduced. A second nanowire is formed in a trench or gap between adjacent ones of the first nanowires, such that the nano-scale device includes a set of features that includes the first nanowires with the reduced dimension and the second nanowire spaced from the adjacent first nanowires by sub-trenches.
NTIS
Patent Applications; Nanostructures (Devices)

20080037359 Wolf, Greenfield and Sacks, P.C., Boston, MA, USA; Rensselaer Polytechnic Inst., Troy, NY, USA
Semiconductor Device Having Multiple-Zone Junction Termination Extension, and Method for Fabricating the Same
Chow, T. S. P., Inventor; Losee, P., Inventor; Balachandran, S., Inventor; 24 Sep 04; 9 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0246; NSF-ERC-EEC-9731677

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-949 982
Report No.(s): PB2008-102835; No Copyright; Avail.: CASI: A02, Hardcopy

A semiconductor device includes a graded junction termination extension. A method for fabricating the device includes providing a semiconductor layer having a pn junction, providing a mask layer adjacent to the semiconductor layer, etching the mask layer to form at least two laterally adjacent steps associated with different mask thicknesses and substantially planar step surfaces, and implanting a dopant species through the mask layer into a portion of the semiconductor layer adjacent to the termination of the pn junction. The semiconductor layer is annealed to activate at least a portion of the implanted dopant species to form the graded junction termination extension.

NTIS

Fabrication; Patent Applications; Semiconductor Devices

20080037360 Summa, Allan and Addition, P.A., Charlotte, NC, USA

Low 1C Screw Dislocation 3 Inch Silicon Carbide Wafer

Powell, A., Inventor; Brady, M., Inventor; Mueller, S. G., Inventor; Tsvetkov, V. F., Inventor; Leonard, R. T., Inventor; 4 Oct 04; 10 pp.; In English
Contract(s)/Grant(s): DARPA-N00014-02-C-0306
Patent Info.: Filed Filed 4 Oct 04; US-Patent-Appl-SN-10-957 806
Report No.(s): PB2008-102826; No Copyright; Avail.: CASI: A02, Hardcopy

A high quality single crystal wafer of SiC is disclosed having a diameter of at least about 3 inches and a 1 c screw dislocation density of less than about 2000 cm(sup -2).

NTIS

Patent Applications; Screw Dislocations; Silicon Carbides; Single Crystals; Wafers

20080037361 Britt (Trask), Salt Lake City, UT, USA

Anodically-Bonded Elements for Flat Panel Displays

Hoffmann, J. J., Inventor; Elledge, J. B., Inventor; 21 Nov 05; 19 pp.; In English
Contract(s)/Grant(s): DABT-3-93-C-0025
Patent Info.: Filed Filed 21 Nov 05; US-Patent-Appl-SN-11-285 472
Report No.(s): PB2008-102827; No Copyright; Avail.: CASI: A03, Hardcopy

A process for anodically bonding an array of spacer columns to one of the inner major faces on one of the generally planar plates of an evacuated, flat panel video display. The process includes using a generally planar plate having a plurality of spacer column attachment sites; providing electrical interconnection between all attachment sites; coating each attachment site with a patch of oxidizable material; providing an array of unattached permanent glass spacer columns, each unattached permanent spacer column being of uniform length and being positioned longitudinally perpendicular to a single plane, with the plane intersecting the midpoint of each unattached spacer column; positioning the array such that an end of one permanent spacer column is in contact with the oxidizable material patch at each attachment site; and anodically bonding the contacting end of each permanent spacer column to the oxidizable material layer.

NTIS

Bonding; Flat Panel Displays; Patent Applications; Spacers

20080037362 Sparkman (Klarquist), LLP, Portland, OR, USA

Scaffold-Organized Clusters and Electronic Devices Made Using Such Clusters (PAT-APPL-11-120 352)

Hutchison, J. E., Inventor; Wybourne, M. N., Inventor; Reed, S. M., Inventor; 2 May 05; 40 pp.; In English
Contract(s)/Grant(s): NSF-DMR 9705343
Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-120 352
Report No.(s): PB2008-102771; No Copyright; Avail.: CASI: A03, Hardcopy

A method for forming arrays of metal, alloy, semiconductor or magnetic nanoparticles is described. An embodiment of the method comprises placing a scaffold on a substrate, the scaffold comprising, for example, polynucleotides and/or polypeptides, and coupling the nanoparticles to the scaffold. Methods of producing arrays in predetermined patterns and electronic devices that incorporate such patterned arrays are also described.

NTIS

Nanoparticles; Patent Applications

20080037365 Lanier Ford Shaver and Payne, Huntsville, AL, USA

Embeddable Polarimetric Fiber Optic Sensor and Method for Monitoring of Structures

Williams, J. L., Inventor; Kranz, M. S., Inventor; Heaton, L. C., Inventor; 17 Oct 05; 14 pp.; In English

Contract(s)/Grant(s): MDA-F33615-02-C-5013

Patent Info.: Filed Filed 17 Oct 05; US-Patent-Appl-SN-11-251 739

Report No.(s): PB2008-102767; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides the capability of ascertaining, through a quick and simple measurement, locations on a structure that may have experienced damage that could result in reduced structure lifetime, strength, or reliability. The sensing element is a connectorized section of polarization maintaining ('PM') optical fiber, where a length of PM fiber represents a fully distributed sensor array. Stress-induced changes to the sensor are measured through white-light Polarimetric interferometry. The output of the measurement is a data array representing the stress concentration magnitude at an array of locations along the length of the sensor. In an application, the knowledge of the optical fiber position on the structure, coupled with the measurement of stress locations along the fiber length, allows the user to determine locations on the structure with large stress concentrations. These locations may signify structural damage. This knowledge would allow the user to employ a more sophisticated system, albeit a larger and slower one, to fully characterize and evaluate that area of potential damage and take appropriate action.

NTIS

Fiber Optics; Nondestructive Tests; Optical Fibers; Patent Applications; Polarimetry

20080037371 Purdue Univ., West Lafayette, IN USA

Nanoscale Science and Technology for the Development of Environmental Sensors

Jan. 2007; 15 pp.; In English

Contract(s)/Grant(s): DE-FG02-01ER15207

Report No.(s): DE2007-898981; No Copyright; Avail.: National Technical Information Service (NTIS)

Under this funding, we proposed to: (1) develop a ChemFET sensor platform, (2) develop a ChemDiode sensor platform, (3) synthesize receptor molecules suitable for chemical sensing, (4) study the electrostatic potential changes induced by receptor/target binding on surfaces and (5) develop VLSI fabrication approaches for micron-scale chemical sensor devices. The accomplishments under these various thrusts are summarized in this section.

NTIS

Nanotechnology; Research and Development; Sensitivity; Technologies

20080037376 Sandia National Labs., Albuquerque, NM USA

LDRD 102610 Final Report New Processes for Innovative Nicrosystems Engineering with Predictive Simulation

Mitchell, S. A.; Mattsson, A. E.; Thomas, S. W.; Aug. 2007; 14 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-913217; SAND2007-4888; No Copyright; Avail.: Department of Energy Information Bridge

This LDRD Final report describes work that Stephen W. Thomas performed in 2006. The initial problem was to develop a modeling, simulation, and optimization strategy for the design of a high speed microsystem switch. The challenge was to model the right phenomena at the right level of fidelity, and capture the right design parameters. This effort focused on the design context, in contrast to other Sandia efforts focus on high-fidelity assessment. This report contains the initial proposal and the annual progress report. This report also describes exploratory work on micromaching using femtosecond lasers. Steve's time developing a proposal and collaboration on this topic was partly funded by this LDRD.

NTIS

Predictions; Semiconductors (Materials); Simulation; Switches

20080037377 Greer, Burns and Crain, Chicago, IL, USA; Louisville Univ. Foundation, Inc., KY, USA

MEMS Capacitive Cantilever Strain Sensor, Devices, and Formation Methods

Walsh, K., Inventor; Crain, M., Inventor; Hnat, W., Inventor; Jackson, D., Inventor; Lin, J. T., Inventor; 24 Sep 04; 7 pp.; In English

Contract(s)/Grant(s): NSF-BES-0097521

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-949 723

Report No.(s): PB2008-103050; No Copyright; Avail.: CASI: A02, Hardcopy

An embodiment of the invention provides a MEMS cantilever strain sensor. Capacitor plates in a MEMS device of the

invention are carried on cantilevered opposing micro-scale plates separated by a micro-scale gap under an unstrained condition. At least one of the micro-scale plates may be attached to a substrate or forms a substrate, which may be part of a monitored system. When a load is applied to the substrate, distal ends of the opposing cantilevered micro-scale plates become further separated, resulting in a change of capacitance. The change of capacitance is proportional to a load and therefore is an indication of the strain. Electrodes may be integrated into the strain sensor to provide a connection to measurement circuitry, for example. Sensors of the invention also provide for telemetric communication using radio frequency (RF) energy and can be interrogated without a power supply to the sensor.
NTIS
Capacitance; Microelectromechanical Systems; Patent Applications; Sensors

20080037379 Sandia National Labs., Albuquerque, NM USA
Simulation of Neutron Displacement Damage in Bipolar Junction Transistors Using High-Energy Heavy Ion Beams
Vizkelethy, G.; Bielejec, E. S.; Doyle, B. L.; Buller, D. L.; Fleming, R. M.; Dec. 2006; 39 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-913228; SAND2006-7746; No Copyright; Avail.: National Technical Information Service (NTIS)

Electronic components such as bipolar junction transistors (BJTs) are damaged when they are exposed to radiation and, as a result, their performance can significantly degrade. In certain environments the radiation consists of short, high flux pulses of neutrons. Electronics components have traditionally been tested against short neutron pulses in pulsed nuclear reactors. These reactors are becoming less and less available; many of them were shut down permanently in the past few years. Therefore, new methods using radiation sources other than pulsed nuclear reactors needed to be developed. Neutrons affect semiconductors such as Si by causing atomic displacements of Si atoms. The recoiled Si atom creates a collision cascade which leads to displacements in Si. Since heavy ions create similar cascades in Si we can use them to create similar damage to what neutrons create. This LDRD successfully developed a new technique using easily available particle accelerators to provide an alternative to pulsed nuclear reactors to study the displacement damage and subsequent transient annealing that occurs in various transistor devices and potentially qualify them against radiation effects caused by pulsed neutrons.
NTIS
Bipolar Transistors; Damage; Displacement; Ion Beams; Junction Transistors; Neutrons; Silicon; Simulation

20080037522 Kenyon and Kenyon, New York, NY, USA
Organic Photosensitive Devices
Peumans, P., Inventor; Forrest, S. R., Inventor; 27 Sep 04; 20 pp.; In English
Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-949 375
Report No.(s): PB2008-102077; No Copyright; Avail.: CASI: A03, Hardcopy

A photoactive device is provided. The device includes a first electrode, a second electrode, and a photoactive region disposed between and electrically connected to the first and second electrodes. The photoactive region further includes an organic donor layer and an organic acceptor layer that form a donor-acceptor heterojunction. The mobility of holes in the organic donor region and the mobility of electrons in the organic acceptor region are different by a factor of at least 100, and more preferably a factor of at least 1000. At least one of the mobility of holes in the organic donor region and the mobility of electrons in the organic acceptor region is greater than 0.001 cm(sup 2)/V-sec, and more preferably greater than 1 cm(sup 2)/V-sec. The heterojunction may be of various types, including a planar heterojunction, a bulk heterojunction, a mixed heterojunction, and a hybrid planar-mixed heterojunction.
NTIS
Optoelectronic Devices; Patent Applications; Photosensitivity

20080037533 Illinois Univ., Urbana-Champaign, IL, USA
Parallel, Individually Addressable Probes for Nanolithography
Liu, C., Inventor; Zhang, M., Inventor; Bullen, D. A., Inventor; 7 Mar 05; 14 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0414
Patent Info.: Filed Filed 7 Mar 05; US-Patent-Appl-SN-11-073 938
Report No.(s): PB2008-102777; No Copyright; Avail.: CASI: A03, Hardcopy

A microfabricated probe array for nanolithography and process for designing and fabricating the probe array. The probe array consists of individual probes that can be moved independently using thermal bimetallic actuation or electrostatic actuation methods. The probe array can be used to produce traces of diffusively transferred chemicals on the substrate with

sub-1 micrometer resolution, and can function as an arrayed scanning probe microscope for subsequent reading and variation of transferred patterns.
NTIS
Lithography; Nanofabrication; Nanotechnology; Patent Applications

20080037535 Greer, Burns and Crain, Chicago, IL, USA
Metal/Dielectric Multilayer Microdischarge Devices and Arrays
Eden, J. G., Inventor; Park, S. J., Inventor; 4 Oct 04; 14 pp.; In English
Contract(s)/Grant(s): AFOSR-F49620-00-1-0391; AFOSR-F49620-031-0391
Patent Info.: Filed Filed 4 Oct 04; US-Patent-Appl-SN-10-958 175
Report No.(s): PB2008-102775; No Copyright; Avail.: CASI: A03, Hardcopy

A microdischarge device that includes one or more electrodes encapsulated in a nanoporous dielectric. The devices include a first electrode encapsulated in the nanoporous dielectric and a second electrode that may also be encapsulated with the dielectric. The electrodes are configured to ignite a microdischarge in a microcavity when an AC or a pulsed DC excitation potential is applied between the first and second electrodes. The devices include linear and planar arrays of microdischarge devices. The microcavities in the planar arrays may be selectively excited for display applications.
NTIS
Dielectrics; Patent Applications; Alternating Current; Linear Arrays

20080037536 General Electric Corp. and Development, Niskayuna, NY, USA
Multilayer Radiation Shield
Urbahn, J. A., Inventor; Laskaris, E. T., Inventor; 18 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): DE-FC36-02G011100
Patent Info.: Filed Filed 18 Oct 04; US-Patent-Appl-SN-10-968 444
Report No.(s): PB2008-102774; No Copyright; Avail.: CASI: A03, Hardcopy

A power generation system including: a generator including a rotor including a superconductive rotor coil coupled to a rotatable shaft; a first prime mover drivingly coupled to the rotatable shaft; and a thermal radiation shield, partially surrounding the rotor coil, comprising at least a first sheet and a second sheet spaced apart from the first sheet by centripetal force produced by the rotatable shaft. A thermal radiation shield for a generator comprising a rotor including a super-conductive rotor coil comprising: a first sheet having at least one surface formed from a low emissivity material; and at least one additional sheet having at least one surface formed from a low emissivity material spaced apart from the first sheet by centripetal force produced by the rotatable shaft, wherein each successive sheet is an incrementally greater circumferental arc length and wherein the centripetal force shapes the sheets into a substantially catenary shape.
NTIS
Patent Applications; Rotation; Rotors; Shafts (Machine Elements); Turbines

20080037620 Army Research Lab., Adelphi, MD USA
Organic Light Emitting Devices and Materials Integrated with Active Matrix Backplanes for Flexible Displays
Forsythe, E W; Shi, J; Dedeian, K; Morton, D C; Girolamo, H; Chiu, D; Blomquist, S; Raupp, G; Colanari, N; Nov 2006; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481895; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481895

The following paper details the development of a new phosphorescent emitting dopant molecule for organic light emitting diodes (OLEDs). A systematic series of heteroleptic tris-cyclometallated iridium compounds were fabricated. Of the molecules, the fac- Ir(dfppy)(dfppz)2 compound had the blue-est emission with the highest quantum efficiency. Phosphorescent emitting OLEDs (PhOLED) were fabricated and properties measured. The emitting dopant was integrated into a device structure and the properties measured as a function of doping concentration. The device efficiency is 20 lm/W at 100 cd/m2 and a peak emission of 498 nm. The Army's Flexible Display Center (FDC) has fabricated thin film transistors on a rigid opaque substrate that make up an active matrix (AM) backplane. ARL's OLEDs are being integrated with the AM backplanes to demonstrate high performance emissive test demonstrator displays with a 1.1' diag.
DTIC
Circuit Boards; Display Devices; Light Emitting Diodes; Organic Materials

20080037622 MegaWave Corp., Boylston, MA USA
An Advanced VHF/UHF Short Range, Groundwave Propagation Model for Paths With Near-Earth Antennas
Cross, Marshall W; Fung, Tat Y; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W15P7T-05-C-J407; W15P7T-06-C-J001
Report No.(s): AD-A481899; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481899

Short range VHF and UHF paths between devices with antennas very close to, or on the earth such as: Unattended Ground Sensors (UGS) and Intelligent Munitions Systems (IMS), are attenuated above free space values by the lossy earth itself and any obstructions between a transmitter and receiver pair. Due to a paucity of measured data and propagation methods for the cases of military interest, an innovative propagation model is described that combines the seminal work of Franceschetti et al and Norton.
DTIC
Antennas; Ultrahigh Frequencies; Very High Frequencies; Wave Propagation

20080037634 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Low Cost, High-Temperature Conformal Antennas
Jun 23, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0111-09
Report No.(s): AD-A481623; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481623

Due to a critical need for the development of high-temperature conformal antennas to enable hypersonic flight (in excess of MACH 4), Alliant Techsystems (ATK) is evaluating materials for forming these complex shapes. The objective of this project was to develop a conformal antenna solution to meet the demands of aerodynamic heating. The project focused on the development of two formulations of HotBlox with ideal dielectric properties of 2.0 and 4.0 and the development of a process for molding the parts to near net shape. Most importantly, one component needed to have a dielectric constant twice that of the other component. The National Center for Defense Manufacturing and Machining (NCDMM) provided program management and lessons learned from working with American Technical Coatings (ATC) on earlier HotBlox projects that recommended further application of this material.
DTIC
Compressing; High Temperature; Injection Molding; Low Cost; Molds; Shapes; Thermal Resistance

20080037641 Army Research Lab., Adelphi, MD USA
Graphite and BN/AlN Annealing Caps for Ion Implanted SiC
Wood, M C; Jones, K A; Zheleva, T S; Kirchner, K W; Derenge, M A; Bolonikov, A; Sudarshan, T S; Vispute, D; Hullavarad, S S; Dhar, S; Nov 2006; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481775; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481775

The activation of dopants for wide band-gap semiconductors such as SiC is a subject of much research. Silicon Carbide is problematic as Si sublimates from the SiC matrix at the temperatures required for activation. We have investigated the success of capping SiC substrates with more thermally stabile materials to impede Si sublimation. We present data taken from the SiC capping strategies using carbon and AlN/BN surface caps. We found that the C cap protects the surface at all analyzed annealing temperatures. While the nitride cap protects the surface at all temperatures, however, it was very difficult to remove. There were modest increases in the sheet resistance for the C capped material when compared to the nitride capped material with the exception of the graphite capped 1800 degree sample.
DTIC
Annealing; Graphite; Semiconductors (Materials); Silicon Carbides

20080037649 Army Research Lab., Adelphi, MD USA
Overview on Pendeo-Epitaxy of GaN-Based Heterostructures for Novel Devices Applications
Zheleva, T S; Derenge, M A; Jones, K A; Shah, P B; Ewing, D; Molstad, J; Lee, U; Ervin, M H; Stepp, D N; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481726; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481726

A relatively new class of materials known as wide bandgap materials and the corresponding devices fabricated from them

have extremely useful characteristics for high temperature, high-frequency, high-power applications in numerous army systems and components. However, the technology for these new materials is not mature enough and these materials contain various types of structural defects in high concentrations. It is well known that structural defects degrade the performance of the electronic devices and greatly diminish their reliability. Therefore, various approaches for materials and device optimization have been utilized in order to improve the operational characteristics of the wide bandgap electronic devices. One approach for defect reduction and improved electronic performance of wide-bandgap devices fabricated from material such as gallium nitride (GaN) is via pendeo-epitaxy. Pendeo-epitaxy as a technology is known to enable drastic reduction of the densities of structural defects in GaN over three to four orders of magnitude. We have used metal organic chemical vapor deposition (MOCVD) technique to grow pendeo-epitaxial (PE)-GaN, performed analysis of the morphology, structure, and electrical properties via numerous characterization techniques available at ARL, and correlated the materials and electrical characteristics with the growth and processing conditions. Further, we designed and fabricated test device structures in order to investigate the improved electronic performance of the Shottky contacts and high electron mobility transistors (HEMTs) and correlate the improved devices performance with the improved structural quality of the GaN material.
DTIC
Energy Gaps (Solid State); Epitaxy; Gallium Nitrides; Semiconductor Devices

20080037707 Public Health Inst., Berkeley , CA, USA
Fatality Assessment and Control Evaluation (FACE) Report for California: An Electrician Was Electrocuted While Repairing a Lighting Circuit
Aug. 2007; 5 pp.; In English
Report No.(s): PB2008-102539; FACE-06-CA-007; No Copyright; Avail.: CASI: A01, Hardcopy

A 43-year-old Hispanic electrician was electrocuted while repairing a lighting circuit that had been damaged by a contractor doing building renovations. The victim was installing a temporary feed to replace wires that had been damaged when the incident occurred. The victim was instructed by his supervisor to shut off the power to the circuit at the junction box before working on it. The power had not been shut off and no lockout/tagout had been applied. The CA/FACE investigator determined that in order to prevent future occurrences, employers, as part of their Injury and Illness Prevention Program (IIPP), should: Ensure that workers follow established lockout/tagout procedures for control of hazardous energy when working on electrical circuits.
NTIS
Accident Investigation; Circuits; Illuminating; Maintenance

20080037765 Weiss, Moy and Harris, P.C., Scottsdale, AZ, USA
Multi-Threshold Complementary Metal-Oxide Semiconductor (MTCMOS) Bus Circuit and Method for Reducing Bus Power Consumption Via Pulsed Standby Switching
Deogun, H. S., Inventor; Nowka, K. J., Inventor; Rao, R. M., Inventor; 14 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): F33615-030C-4106
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-965 106
Report No.(s): PB2008-102778; No Copyright; Avail.: CASI: A03, Hardcopy

A multi-threshold complementary metal-oxide semiconductor (MTCMO) bus circuit reduces bus power consumption via a reduced circuit leakage standby and pulsed control of standby mode so that the advantages of MTCMOS repeater design are realized in dynamic operation. A pulse generator pulses the high-threshold voltage power supply rail standby switching devices in response to changes detected at the bus circuit inputs. The delay penalty associated with leaving the standby mode is overcome by reducing cross-talk induced delay via a cross-talk noise minimization encoding and decoding scheme. A subgroup of bus wires is encoded and decoded, simplifying the encoding, decoding and change detection logic and results in the bus subgroup being taken out of standby mode only when changes occur in one or more of the subgroup inputs, further reducing the power consumption of the overall bus circuit.
NTIS
Bus Conductors; Circuits; CMOS; Leakage; Metal Oxide Semiconductors; Patent Applications; Switching

20080037775 Nutter, McClennen and Fish, Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Resist with Reduced Line Edge Roughness
Fedynyshyn, T. H., Inventor; 7 Jun 05; 12 pp.; In English
Contract(s)/Grant(s): F19628-00-0002

Patent Info.: Filed Filed 7 Jun 05; US-Patent-Appl-SN-11-146 597
Report No.(s): PB2008-103096; No Copyright; Avail.: CASI: A03, Hardcopy

Novel photoresists containing at least about 0.2 molar ratio of a base with respect to the concentration of a photoacid generator present and their preparation are described. It has been discovered that inclusion of a sufficient amount of base counteracts the detrimental effects of photoacid generators, thus providing resists having submicron linewidth resolution.
NTIS
Patent Applications; Photoresists; Semiconductors (Materials); Surface Roughness; Wafers

20080037776 Qualcomm, Inc., San Diego, CA, USA
Devices and Methods for Creating an Electrical Connection
Chintala, T. J., Inventor; 12 Oct 04; 12 pp.; In English
Contract(s)/Grant(s): MDA904-01-G-0620
Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-964 105
Report No.(s): PB2008-103087; No Copyright; Avail.: CASI: A03, Hardcopy

The described embodiments provide devices and methods for creating an electrical connection in an electronic system. The devices and methods include a standoff that connects a circuit element with a circuit board and supports the circuit element at a sufficient height above the circuit board to create an additional layout area. The additional layout area may be utilized to mount additional circuit elements to the circuit board.
NTIS
Electric Connectors; Patent Applications; Electronics

20080037814 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA
Devices Using Resin Wafers and Applications Thereof
Lin, Y. J., Inventor; Henry, M. P., Inventor; Snyder, S. W., Inventor; St. Martin, E., Inventor; Arora, M., Inventor; 17 Mar 05; 12 pp.; In English
Contract(s)/Grant(s): W-31-109-ENG-38
Patent Info.: Filed Filed 17 Mar 05; US-Patent-Appl-SN-11-082 469
Report No.(s): PB2008-100706; No Copyright; Avail.: CASI: A03, Hardcopy

Devices incorporating a thin wafer of electrically and ionically conductive porous material made by the method of introducing a mixture of a thermoplastic binder and one or more of anion exchange moieties or cation exchange moieties or mixtures thereof and/or one or more of a protein capture resin and an electrically conductive material into a mold. The mixture is subjected to temperatures in the range of from about 60 degrees C to about 170 degrees C at pressures in the range of from about 0 to about 500 psig for a time in the range of from about 1 to about 240 minutes to form thin wafers. Devices include electrodeionization and separative bioreactors in the production of organic and amino acids, alcohols or esters for regenerating cofactors in enzymes and microbial cells.
NTIS
Electrical Resistivity; Patent Applications; Resins; Wafers

20080037821 Sun Microsystems, Inc., Davis, CA, USA
Structures and Methods for Proximity Communication Using Bridge Chips
Guenin, B. M., Inventor; Zingher, A. R., Inventor; Ho, R., Inventor; Nettleton, N. I., Inventor; Krishnamoorthy, A. V., Inventor; 1 Nov 05; 17 pp.; In English
Contract(s)/Grant(s): NBCH020055
Patent Info.: Filed Filed 1 Nov 05; US-Patent-Appl-SN-11-264 956
Report No.(s): PB2008-103490; No Copyright; Avail.: CASI: A03, Hardcopy

One embodiment of the present invention provides a system that facilitates proximity communication using a bridge chip. This system includes a base chip with an active face, upon which active circuitry and signal pads reside, and a back face opposite the active face. The bridge chip is mounted to the base chip using a mounting, interconnection, and communication structure. The bridge chip is positioned so that a free end is proximate to a neighboring chip, thereby supporting proximity communication between the base chip and the neighboring chip.
NTIS
Chips; Chips (Electronics); Patent Applications

20080037870 Wright, Lindsey and Jennings, LLP, Little Rock, AZ, USA
Multi-Stable Vortex States in Ferroelectric Nanostructure
Naumov, I. I., Inventor; Bellaiche, L., Inventor; Fu, H., Inventor; 13 Jun 05; 13 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0365; N00014-03-1-0598
Patent Info.: Filed Filed 13 Jun 05; US-Patent-Appl-SN-11-151 088
Report No.(s): PB2008-102800; No Copyright; Avail.: CASI: A03, Hardcopy

A ferroelectric nanostructure formed as a low dimensional nanoscale ferroelectric material having at least one vortex ring of polarization generating an ordered toroid moment switchable between multi-stable states. Such a nanostructure is capable of achieving ultrahigh recording density in non-volatile ferroelectric random access memory (NFERAM) and may have applications in piezoelectric sensors, efficient actuators, nano-scale dielectric capacitors for energy storage, and nano-scale ultrasounds for medical use.

NTIS
Ferroelectric Materials; Ferroelectricity; Microstructure; Nanostructure (Characteristics); Patent Applications; Vortices

20080037872 Nutter, McClennen and Fish, Boston, MA, USA
Femtosecond Laser-Induced Formation of Submicrometer Spikes on a Semiconductor Substrate
Mazur, E., Inventor; Shen, M., Inventor; 4 Aug 05; 14 pp.; In English
Contract(s)/Grant(s): DE-FC36-01G011053; NSF-PHY-0117795
Patent Info.: Filed Filed 4 Aug 05; US-Patent-Appl-SN-11-196 929
Report No.(s): PB2008-103085; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention generally provides semiconductor substrates having submicron-sized surface features generated by irradiating the surface with ultra short laser pulses. In one aspect, a method of processing a semiconductor substrate is disclosed that includes placing at least a portion of a surface of the substrate in contact with a fluid, and exposing that surface portion to one or more femtosecond pulses so as to modify the topography of that portion. The modification can include, e.g., generating a plurality of submicron-sized spikes in an upper layer of the surface.

NTIS
Lasers; Patent Applications; Semiconductors (Materials); Substrates

20080037874 Rader, Fishman, and Grauer, PPLC, Bloomfield Hills, MI, USA
Energy Recovery Boost Logic
Papaefthymiou, M. C., Inventor; Sathe, V. S., Inventor; Ziesler, C. H., Inventor; 15 Jun 05; 10 pp.; In English
Contract(s)/Grant(s): N66001-02-C-8059
Patent Info.: Filed Filed 15 Jun 05; US-Patent-Appl-SN-11-153 135
Report No.(s): PB2008-102779; No Copyright; Avail.: CASI: A02, Hardcopy

A boost circuit is disclosed that includes a plurality of transistors connected between complementary phases of a clock signal. The boost circuit further includes a first electrical node connected between at least two of the plurality of transistors wherein the plurality of transistors are configured to generate a second voltage from a first voltage at the electrical node in response to the clock signal.

NTIS
Circuits; Patent Applications; Transistors

20080037895 Rockwell Automation, Inc., Milwaukee, WI, USA
Electrical Power Converter Method and System Employing Multiple Output Converters
Beihoff, B. C., Inventor; Radosevich, L. D., Inventor; Meyer, A. A., Inventor; Golhardt, N., Inventor; Kannenberg, D. G., Inventor; 6 Dec 05; 55 pp.; In English
Contract(s)/Grant(s): DE-FC02-99EE50571
Patent Info.: Filed Filed 6 Dec 05; US-Patent-Appl-SN-11-294 986
Report No.(s): PB2008-102816; No Copyright; Avail.: CASI: A04, Hardcopy

A support may receive one or more power electronic circuits. The support may aid in removing heat from the circuits through fluid circulating through the support. The support, in conjunction with other packaging features may form a shield from both external EMI/RFI and from interference generated by operation of the power electronic circuits. Features may be provided to permit and enhance connection of the circuitry to external circuitry, such as improved terminal configurations.

Modular units may be assembled that may be coupled to electronic circuitry via plug-in arrangements or through interface with a backplane or similar mounting and interconnecting structures.
NTIS
Patent Applications; Power Converters; Coupling Circuits

20080037921 Office of Naval Research, Arlington, VA USA
The Navy's Program in Nanoscience and Nanotechnology - A Look Ahead
Kavetsky, Robert; Jan 2004; 7 pp.; In English
Report No.(s): AD-A482104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Navy anticipated in the early 1980s the possible opportunities nanoscience and nanotechnology might bring to building the 'Navy After Next'. The Office of Naval Research provided a leadership role in exploring those opportunities by creating focused programs and by organizing conferences that exposed the nation's scientists/engineers to many of these opportunities at the frontiers of science and technology. The Navy continues to provide leadership in the arenas of nanoscience and nanotechnology through its coordination and collaboration with other government agencies. As a result of the federal government's investment in nano approaching $1B in FY04, expectations for moving nano out of the laboratory and into fielded products have increased. The topic of how nanoscience and nanotechnology may be a key impetus for creating both new capabilities for Naval forces as well as new intellectual capacity in the Navy's research and development centers will be discussed. Additionally, the Navy has invested over $10M in a state-of-the-art research facility focused on multidisciplinary efforts in nanoscience. Ideas for collaborative activities in this center will be discussed, as well as an overview of the Center itself.
DTIC
Nanotechnology; Research and Development; Navy

20080038001 Maryland Univ., College Park, MD USA
A Parameterized Design Framework for Hardware Implementation of Particle Filters
Saha, Sankalita; Bambha, Neal K; Bhattacharyya, Shuvra S; Mar 2008; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482034; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Particle filtering methods provide powerful techniques for solving non-linear state-estimation problems, and are applied to a variety of application areas in signal processing. Because of their vast computational complexity, real-time hardware implementation of particle-filter-based systems is a challenging task. However, many particle filter applications share common characteristics, and the same system design can be reused with appropriate streamlining. To achieve this, a parameterized design framework for particle filters is proposed in this paper. In this framework, parameterization of system features that vary over specific implementations enables reuse of a generic design for a wide range of applications with minimal re-design effort. Using this framework, we explore different design options for implementing two different particle filtering applications on field-programmable gate arrays (FPGAs), and we present associated results on trade-offs between area (FPGA resource requirements) and execution speed.
DTIC
Signal Processing; Field-Programmable Gate Arrays

20080038003 Johns Hopkins Univ., Laurel, MD USA
Metrics for TRUST in Integrated Circuits
Wilt, Daniel P; Meitzler, Richard C; DeVale, John P; Jun 1, 2008; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MDA972-01-D-0005; HR0011-06-D-0003
Report No.(s): AD-A482033; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper we report on metrics approaches adapted for the DARPA TRUST in ICs program. A metrics approach initially focused on detection of malicious alterations in integrated circuit die has been adapted for use on FPGA bitstreams and the ASIC design process. We also discuss metrics for techniques focused on prevention of malicious alterations.
DTIC
Integrated Circuits; Application Specific Integrated Circuits; Field-Programmable Gate Arrays; Prevention

20080038085 Sun Microsystems, Inc., Davis, CA, USA
Using an Interposer to Facilitate Capacitive Communication between Face-to-Face Chips
Drost, R. J., Inventor; Ho, R., Inventor; Proebsting, R. J., Inventor; 22 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): DARPA-NBCH-020055

Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-973 114
Report No.(s): PB2008-101623; No Copyright; Avail.: CASI: A03, Hardcopy

One embodiment of the present invention provides a system that improves communications between capacitively coupled integrated circuit chips. The system operates by situating an interposer over capacitive communication pads on a first integrated circuit chip, wherein the interposer is made up of material that is anisotropic with respect to transmitting capacitive signals. A second integrated circuit chip is situated so that communication pads on the second integrated circuit chip are aligned to capacitively couple signals between the integrated circuit chips through the interposer. The increased dielectric permittivity caused by the interposer can improve capacitive coupling between opposing communication pads on the integrated circuit chips. The interposer can also reduce cross talk between communication pads on the first integrated circuit chip and pads adjacent to the opposing communication pads on the second integrated circuit chip.
NTIS
Capacitance; Chips; Integrated Circuits; Patent Applications

20080038086 Daly, Crowley, Mofford & Durkee, LLP, Canton, MA, USA
Analog Storage Cell with Low Leakage
O'Halloran, M. G., Inventor; Sarpeshkar, R., Inventor; 21 Oct 05; 25 pp.; In English
Contract(s)/Grant(s): NSF-CCR-0122419; ONR-N00014-02-0434
Patent Info.: Filed Filed 21 Oct 05; US-Patent-Appl-SN-11-256 632
Report No.(s): PB2008-101626; No Copyright; Avail.: CASI: A03, Hardcopy

An analog storage cell circuit includes a switch that minimizes subthreshold conduction and diode leakage, as well as an accumulation-mode coupling mechanism to minimize overall switch leakage to minimize accumulation-mode leakage. In one embodiment, an analog storage circuit includes a sample and hold circuit including an amplifier having first and second inputs and a switch coupled to the first input of the amplifier. The switch includes a first switching device forming a core of the switch, a second switching device coupled to the first switching device to disconnect the first switching device from a first terminal during the hold phase, and a third switching device coupled to the first switching device to connect the first switching device to a second terminal during the hold phase to minimize accumulation mode conduction in the first switching device.
NTIS
Leakage; Patent Applications; Switches

20080038091 Senterfitt (Akerman), West Palm Beach, FL, USA
Time-Based Integrated Potentiostat
Narula, H. S., Inventor; Harris, J. G., Inventor; 22 Feb 05; 19 pp.; In English
Contract(s)/Grant(s): NSF-0087676
Patent Info.: Filed Filed 22 Feb 05; US-Patent-Appl-SN-11-063 266
Report No.(s): PB2008-101633; No Copyright; Avail.: CASI: A03, Hardcopy

An integrated potentiostat includes a voltage controller that maintains within a predetermined range a potential between a reference electrode and a working electrode in an electrochemical cell. The integrated potentiostat further includes a capacitor that supplies or receives a current through the working electrode or reference electrode of the electrochemical cell. The rate of change of a voltage across the capacitor is functionally related to the current and thus provides a time equivalent of the current.
NTIS
Controllers; Electric Potential; Electrochemical Cells; Patent Applications

20080038093 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Thin Film Thermoelectric Devices for Hot-Spot Thermal Management in Microprocessors and Other Electronics
Venkatasubramanian, R., Inventor; Alley, R. G., Inventor; Addepalli, P., Inventor; Siivola, E. P., Inventor; O'Quinn, B. C., Inventor; 22 Oct 04; 37 pp.; In English
Contract(s)/Grant(s): DARPA-N00014-97-C-0211; DARPA-DAAD-19-01-C-0070
Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-970 378
Report No.(s): PB2008-101638; No Copyright; Avail.: CASI: A03, Hardcopy

A structure, system and method for controlling a temperature of a heat generating device in a solid medium, wherein heat is extracted from the medium into at least one heat extraction device, the heat extraction device dissipates heat into an

environment apart from the medium by a heat sink thermally coupled to the heat extraction device; and heat from the medium is dissipated into the heat sink by a first thermal interface material thermally coupling the heat sink to the medium.
NTIS
Extraction; Microprocessors; Patent Applications; Temperature Control; Thermoelectricity; Thin Films

20080038642 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Characterizing SRAM Single Event Upset in Terms of Single and Double Node Charge Collection
Black, J. D.; Ball, D. R., II; Robinson, W. H.; Fleetwood, D. M.; Schrimpf, R. D.; Reed, R. A.; Black, D. A.; Warren, K. M.; Tipton, A. D.; Dodd, P. E.; Haddad, N. F.; Xapsos, M. A.; Kim, H.; Friendlich, M.; July 14, 2008; 8 pp.; In English; Nuclear and Space Radiation Effects Conference (NSREC), 14-18 Jul. 2008, Tucson, AZ, USA; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

A well-collapse source-injection mode for SRAM SEU is demonstrated through TCAD modeling. The recovery of the SRAM s state is shown to be based upon the resistive path from the p+-sources in the SRAM to the well. Multiple cell upset patterns for direct charge collection and the well-collapse source-injection mechanisms are then predicted and compared to recent SRAM test data.
Author
Random Access Memory; Circuits; Single Event Upsets; Three Dimensional Models; Injection; Transistors

20080038707
STIC: Photonic Quantum Computation through Cavity Assisted Interaction
Kimble, Harry; Dec 28, 2007; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0201
Report No.(s): AD-A482297; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482297

One of the promising models for scalable quantum computation utilizes polarizations of single-photon pulses as qubits. The critical and difficult tasks for this approach include how to generate deterministically well-controlled single-photon pulses, how to make efficient single-photon detections, and in particular, how to realize controlled quantum gate operations between these pulses. Based on the state-of-the-art cavity technology, we propose to use a high-Q ? cavity with a single-trapped atom as the critical resource to fulfill all these difficult tasks. In particular: We propose experiments to use a single atom in an optical cavity to generate deterministically single-photon pulses and multi-partite entanglement between the pulses. We propose an efficient scheme for quantum gate operations between these photonic qubits by coherent interactions of the single-photon pulses from the single-atom cavity. This method is scalable, robust to important practical noise, and fits well the experimental capabilities. We will achieve proof-of-principle experiments for these quantum gate operations. We propose to use the single-atom cavity as an efficient quantum non-demolition detector of single photon pulses. Its efficiency can be significantly higher than conventional detectors, and can detect the photon without destroying it. These features enable many important applications. We propose to study efficient quantum error correction for our model of quantum computation. Due to its special noise properties, it is possible with this setup to find error thresholds significantly better than those in existing analyses for large-scale fault-tolerant quantum computation.
DTIC
Cavities; Photons; Quantum Computation

20080038716 Naval Research Lab., Washington, DC USA
W-Structured Type-II Superlattice Long-Wave Infrared Photodiodes with High Quantum Efficiency
Aifer, E H; Tischler, J G; Warner, J H; Vurgaftman, I; Bewley, W W; Meyer, J R; Kim, J C; Whitman, L J; Canedy, C L; Jackson, E M; Apr 2006; 4 pp.; In English
Report No.(s): AD-A482316; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482316

Results are presented for an enhanced type-II W-structured superlattice (WSL) photodiode with an 11.3 micron cutoff and 34% external quantum efficiency (at 8.6 microns) operating at 80 K. The new WSL design employs quaternary Al0.4Ga0.49In0.11Sb barrier layers to improve collection efficiency by increasing minority-carrier mobility. By fitting the quantum efficiencies of a series of p-i-n WSL photodiodes with background-doped i-region thicknesses varying from 1 to 4 microns, the authors determine that the minority-carrier electron diffusion length is 3.5 microns. The structures were grown

on semitransparent n-GaSb substrates that contributed a 35%-55% gain in quantum efficiency from multiple internal reflections.
DTIC
Infrared Radiation; Photodiodes; Quantum Efficiency; Superlattices

20080038723 Princeton Univ., NJ USA
Closed Loop Quantum Control and Quantum Information Sciences: Concepts and Laboratory Implementations
Rabitz, Herschel; Walmsley, Ian; Kosut, Robert; Nov 30, 2007; 23 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0534
Report No.(s): AD-A482326; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482326

This is the final report on research concerned with combining control concepts and quantum information systems. Particular emphasis is being given to closed loop laboratory techniques for obtaining the maximum performance from quantum information systems. These studies entail minimization of the influence of environmental decoherence effects, maximum robustness to noise in the system controllers, the creation of robust gate operations, and the means to identify quantum information system Hamiltonians and evolving state behavior. The research includes both theoretical and laboratory components. The research summary is broken out into the accomplishments and findings in a set of interrelated QuIST projects.
DTIC
Control; Control Theory; Feedback Control; Quantum Theory

20080038725 Kansas State Univ., Manhattan, KS USA
Wide Bandgap III-Nitride Micro- and Nano-Photonics
Jiang, Hongxing; Lin, Jingyu; May 5, 2008; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0337
Report No.(s): AD-A482328; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482328

AlGaN alloys with high Al contents, covering from 350 nm to 200 nm, are ideal materials for the development of efficient ultraviolet (UV) light sources/sensors. There are many problems and questions that still stand in the way of the practical device implementation of UV photonic devices. Among these, the attainment of highly conductive Al-rich AlGaN remains one of the biggest obstacles for the III-nitride research. The objectives of this program were to address some of the fundamental material and device issues and to explore potential applications of III-nitrides for UV micro- and nano-photonic devices. The KSU team has achieved 1. n-type Al-rich AlGaN alloys with record high conductivities. 2. converted highly insulating AlN to n-type conductive AlN by Si doping. 3. nano-fabrication and characterization of III-nitride photonic crystals (PC) and demonstrated the first current-injected III-nitride PC emitter operating below 330 nm. 4. p-type conduction in Al-rich AlxGa1-xN for x up to 0.7. 5. nano-fabrication of deep UV photonic crystals on AlN wafers. 6. achieved 280 nm UV LEDs that are among the best in the world. 7. demonstrated the operation of 200 nm DUV Schottky detectors based on AlN having a detectivity that is comparable to those of photomultiplier tubes.
DTIC
Aluminum Nitrides; Energy Gaps (Solid State); Nitrides; Photonics; Semiconductor Devices

20080038733 Oakland Univ., Rochester, MI USA
Microwave and Millimeter Wave Magnetoelectric Interactions in Engineered Multiferroics and Dual Electric and Magnetic Field Tunable Devices
Srinivasan, Gopalan; Slavin, Andrei; Mantese, Joseph; Jan 16, 2008; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0299
Report No.(s): AD-A482338; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482338

Layered magnetostrictive-ferroelectric structures are multifunctional due to their response to mechanical and electromagnetic forces. Investigations on microwave magneto-electric (ME)interactions were performed on ferrite-ferroelectrics layered structures. Systems studied include yttrium iron garnet (YIG)-lead zirconate titanate (PZT) or YIG-barium strontium titanate (BST). Our efforts have resulted in the following breakthroughs in experimental and theoretical understanding: (i) The observation of strong microwave ME interactions in YIG-PZT; (ii) Theory and experiments on the

creation and propagation characteristics of hybrid spin-electromagnetic waves in YIG-BST; and (iii) Fabrication of electric field tunable YIG-PZT and YIG-BST resonators and phase shifters operating at 3-12 GHz. These results have been published in 35 journal articles.
DTIC
Electric Fields; Ferroelectric Materials; Magnetic Fields; Magnetostriction; Microwaves; Millimeter Waves; Wave Interaction

20080038735 Arizona State Univ., Tempe, AZ USA
Development of Improved Microwave Dielectric Materials and Devices using Advanced Experimental and Theoretical Methods
Newman, Nathan; Schilfgaarde, Van; Apr 17, 2008; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0376
Report No.(s): AD-A482340; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482340

Our work has made important progress towards developing a fundamental understanding of the microscopic mechanism that causes loss in high performance microwave dielectrics, and can explain why some dielectric materials exhibit markedly better performance than others. Ab-initio electronic structure calculations elucidated the physical reason for this desirable microwave properties in Ba(Cd1/3Ta2/3)O3 (BCT) and Ba(Zn1/3Ta2/3)O3 (BZT). The presence of significant charge transfer between cation d-orbitals provides a degree of covalent directional bonding between atoms that resist angular distortions, a property absent in conventional ionic compounds. We have also been able to show a direct correlation between the number of point defects present and enhanced microwave loss. High quality single-crystalline BZT films were also produced, for the first time. The availability of single crystal materials is essential to the fundamental studies. Zn-enriched targets and high oxygen pressures are used to compensate for Zn loss during film growth. The Ba(Zn1/3Ta2/3)O3 films have an indirect band gap of ~3.0 eV and a refractive index of 1.91 in the visible. Development of high dielectric-constant material with diminished microwave loss and a near-zero temperature coefficient of resonant frequency, will enable the production of smaller and higher performance microwave devices.
DTIC
Ceramics; Dielectrics; Microwave Equipment; Microwaves

20080038757 George Mason Univ., Fairfax, VA USA
Defects and Related Carrier Traps in GaN AlGaN and Implanted SiC
Mulpuri, Venkata R; Oct 8, 2007; 11 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0428
Report No.(s): AD-A482368; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482368

In this project, work has been performed on nine different topics: (1) Ultra-fast microwave annealing of ion-implanted 4H-SiC ; (2) Silicon carbide nanowires grown by a novel microwave heating-assisted physical vapor transport process; (3) Depth resolved X-ray determination of surface strain in free-standing films of HVPE-grown GaN and 71Ga NMR characterization (4) Effects of the surface and interface related defects in free-standing HVPE grown GaN films by high resolution X-ray diffraction measurements; (5) Bias stress induced instability in 4H-SiC DMOSFETs; (6) Stability and 2-D simulation studies of avalanche breakdown in 4H-SiC DMOSFETs with JTE; and (7) Power added efficiency and linearity tradeoffs in class AB biased GaN and GaAs microwave power HEMTs (8) High quality interlayer dielectric for 4H-SiC DMOSFETs; and (9)Thermally stable Ge/Cu/Ti ohmic contacts to n-type GaN. Important results on each topic are given in the attachment. We collaborated with Dr. Ken Jones of ARL on the topic: microwave annealing of implanted SiC .
DTIC
Annealing; Defects; Microwaves; Nanostructures (Devices); Traps

20080038763 Princeton Univ., NJ USA
Photonic Crystal/Nano-Electronic Device Structures for Large Array Thermal Imaging
Tsui, Daniel C; Nov 19, 2007; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0370
Report No.(s): AD-A482374; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482374

Lattice-matched InGaAs/Inp quantum well infrared detector (QWIP) exhibits high photoconductive gain but un-

adjustable detection wavelength because of its fixed barrier height. The use of InxGa1-xAsyP1-y (InGaAsP) as the barrier material is superior to that of InP with regard to the flexibility of operating wavelength. In this letter we investigate the application of InGaAsP material in the long wavelength infrared detection. We report a broadband quantum well InGaAs/InGaAsP detector covering 8-14 m. The excellent agreement between the observed responsivity spectrum and the calculated one is achieved indicating the validness of our design model. In order to determine the usefulness of InGaAsP in long-wavelength detection, we also design a GaAs/AlGaAs quantum well detector with similar spectrum and compare its performance with that of the InGaAs/InGaAsP detector. The dark current noise measurement indicates that the gain in InGaAsP is 4.6 times larger than that of AlGaAs, showing that InGaAsP is a good candidate for long-wavelength high-speed infrared detection.
DTIC
Crystals; Electronic Structure; Infrared Detectors; Photometers; Quantum Wells; Thermal Mapping

20080038767 California Inst. of Tech., Pasadena, CA USA
Multiscale Modeling and Process Optimization for Engineered Microstructural Complexity
Bhattacharya, Kaushik; Oct 26, 2007; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482378; DAAD19-01-1-0517; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482378
This reports on the results of the MURI project on Engineering Microstructural Complexity in Ferroelectric Devices.
DTIC
Ferroelectricity; Microstructure

20080038878 Naval Research Lab., Washington, DC USA
Monolithic Integration of Resonant Interband Tunneling Diodes and High Electron Mobility Transistors in the InAs/GaSb/AlSb Material System
Bennett, B R; Bracker, A S; Magno, R; Boos, J B; Bass, R; Park, D; Jun 2000; 4 pp.; In English
Report No.(s): AD-A482490; No Copyright; Avail.: Defense Technical Information Center (DTIC)
InAs/AlSb high electron mobility transistors (HEMTs) and resonant interband tunneling diodes (RITD) with AlSb barriers and GaSb wells were grown in a single heterostructure by molecular beam epitaxy. The resulting HEMTs exhibit excellent dc and microwave performance at low drain voltages with an intrinsic unity-current-gain cutoff frequency of 220 GHz. The RITD performance is comparable to RITDs grown directly on InAs substrates, with peak current densities above 10(exp 4) A/sq cm and peak-to-valley ratios near 11 for 15 Angstrom AlSb barriers. The results represent an important step toward the fabrication of high-speed, low-power logic circuits in this material system.
DTIC
Aluminum Antimonides; Aluminum Compounds; Diodes; Gallium Antimonides; High Electron Mobility Transistors; Indium Arsenides; Logic Circuits; Molecular Beam Epitaxy; Resonant Tunneling; Tunnel Diodes; Wells

20080038879 Naval Research Lab., Washington, DC USA
Photoionisation Spectroscopy of Traps in AlGaN/GaN High Electron Mobility Transistors Grown by Molecular Beam Epitaxy
Klein, P B; Mittereder, J A; Binari, S C; Roussos, J A; Katzer, D S; Storm, D F; Sep 4, 2003; 3 pp.; In English
Report No.(s): AD-A482491; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Photoionization spectroscopy has been carried out in bias-stressed AlGaN=GaN high electron mobility transistors (HEMTs) grown by Molecular Beam Epitaxy (MBE) to probe the nature of the deep trapping centers responsible for stress-induced current collapse in these devices. The results indicate that a GaN buffer layer trap previously associated with current collapse in devices grown by Metal Organic Chemical Vapor Deposition (MOCVD) is responsible for induced collapse in MBE-grown structures.
DTIC
Aluminum Nitrides; Collapse; Gallium Nitrides; High Electron Mobility Transistors; Molecular Beam Epitaxy; Photoionization; Spectroscopy; Traps

20080038880 Naval Research Lab., Washington, DC USA
Observation of Deep Traps Responsible for Current Collapse in GaN Metal-Semiconductor Field-Effect Transistors
Klein, P B; Freitas, Jr , J A; Binari, S C; Wickenden, A E; Dec 20, 1999; 4 pp.; In English
Report No.(s): AD-A482492; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Deep traps responsible for current collapse phenomena in GaN metal semiconductor field-effect transistors have been

detected using a spectroscopic technique that employs the optical reversibility of current collapse to determine the photoionization spectra of the traps involved. In the n-channel device investigated, the two electron traps observed were found to be very deep and strongly coupled to the lattice. Photoionization thresholds for these traps were determined at 1.8 and at 2.85 eV. Both also appear to be the same traps recently associated with persistent photoconductivity effects in GaN.
DTIC
Collapse; Depth; Field Effect Transistors; Gallium Nitrides; Photoionization; Spectroscopy

20080038881 Naval Research Lab., Washington, DC USA
Proton Irradiation of InAs/AlSb/GaSb Resonant Interband Tunneling Diodes
Magno, R; Weaver, B D; Bracker, A S; Bennett, B R; Apr 23, 2001; 4 pp.; In English
Report No.(s): AD-A482493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Room temperature current voltage measurements have been made on InAs/AlSb/GaSb resonant interband tunnel diodes (RITDs) irradiated with 2 MeV protons to determine the effect of displacement damage on the negative resistance peak current I(sub p) and the peak-to-valley current ratio P/V. Diodes with 5 and 13 ML AlSb barrier thickness were irradiated and measured several times until the total fluences reached 1 x 10(exp 15) and 2 x 10(exp 14) H(+)/sq cm, respectively. The current due to radiation-induced defects has a nonlinear voltage dependence with a large increase occurring in the voltage range between the negative resistance peak and the valley. I(sub p) increased less than 50%, while a large increase in the valley current decreased the P/V ratios to about 2.
DTIC
Aluminum Antimonides; Aluminum Compounds; Diodes; Gallium Antimonides; Indium Arsenides; Irradiation; Proton Irradiation; Radiation Damage; Resonant Tunneling; Tunnel Diodes

20080038882 Naval Research Lab., Washington, DC USA
Resonant Interband Tunnel Diodes with AlGaSb Barriers
Magno, R; Bracker, A S; Bennett, B R; May 15, 2001; 4 pp.; In English
Report No.(s): AD-A482494; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The peak current density of InAs/AlSb/GaSb/AlSb/InAs resonant interband tunneling diodes (RITDs) has been enhanced by replacing the AlSb barriers with Al(1-x)Ga(x)Sb that has a narrower band gap. The devices were grown by molecular beam epitaxy and tested at room temperature. Diodes with nominally identical 7-ML-thick ternary alloy barriers with x=0.35 are found to have peak current densities three times larger than those with AlSb barriers. The peak-to-valley current ratio decreases by only one third from 18 for the AlSb diodes to 12 for diodes with the ternary alloy barriers.
DTIC
Aluminum Alloys; Aluminum Antimonides; Current Density; Diodes; Gallium Antimonides; Indium Arsenides; Resonant Tunneling; Ternary Alloys; Tunnel Diodes

20080038883 Naval Research Lab., Washington, DC USA
Photoluminescence of InAs(1-x)Sb(x)/AlSb Single Quantum Wells: Transition from Type-II to Type-I Band Alignment
Yang, M J; Bennett, B R; Fatemi, M; Lin-Chung, P J; Moore, W J; Yang, C H; Jun 1, 2000; 4 pp.; In English
Report No.(s): AD-A482496; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Infrared photoluminescence has been used to study the band-gap energy of InAs(1-x)Sb(x) digital superlattices and the band alignment of InAs(1-x)Sb(x)/AlSb quantum wells at 5 K. It is found that the InAs(1-x)Sb(x) digital alloys have a smaller effective band gap than InAs(1-x)Sb(x) random alloys. In addition, the valence band offset between type-II InAs/AlSb is determined to be 130 meV. This number reduces as the Sb mole fraction in InAs(1-x)Sb(x) is increased, and the alignment between InAs(1-x)Sb(x)/AlSb becomes type I when x > 0.15.
DTIC
Alignment; Aluminum Antimonides; Antimonides; Energy Gaps (Solid State); High Electron Mobility Transistors; Indium Antimonides; Indium Arsenides; Photoluminescence; Quantum Wells; Superlattices

20080038884 Naval Research Lab., Washington, DC USA
Transport Properties of Be- and Si-Doped AlSb
Bennett, Brian R; Moore, W J; Yang, M J; Shanabrook, B V; Jun 1, 2000; 5 pp.; In English
Report No.(s): AD-A482497; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thick epitaxial layers of AlSb(Si) and AlSb(Be) were grown by molecular beam epitaxy and characterized by

variable-temperature Hall/van der Pauw measurements. Si is shown to be predominantly an acceptor in AlSb, with an energy level 33 +/- 4 meV above the top of the valence band. Be is also an acceptor, with an energy level 38 +/- 4 meV above the top of the valence band. Be is a robust doping source for p-AlSb for carrier densities ranging from 10(exp 15) to 10(exp 19) /cu cm. Background impurity levels in AlSb can be assessed by measuring the transport properties of lightly doped AlSb(Be) layers.
DTIC
Additives; Aluminum Alloys; Aluminum Antimonides; Antimonides; Beryllium; Doped Crystals; Molecular Beam Epitaxy; Silicon; Transport Properties

20080038925 Texas Univ., Austin, TX USA
InP Based Avalanche Photodiode Arrays for Mid Infrared Applications
Holmes, Jr, Archie L; Apr 5, 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-1-0303
Report No.(s): AD-A482560; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This program will develop avalanche photodiodes (APDs) and APD arrays for applications in the MIR. Results to date include photodiodes operating at 2.5 microns, theoretical designs for absorption regions out to 5 microns, and initial results on strain-compensated absorption regions.
DTIC
Avalanche Diodes; Avalanches; Infrared Radiation; Photodiodes

20080038926 Mississippi State Univ., Mississippi State, MS USA
Interface Structures of III-V Semiconductor Heterostructures
Kim, Seong-Gon; Kim, Sungho; Shen, Jun; Nosho, B Z; Erwin, S C; Whitman, L J; Jan 2003; 12 pp.; In English
Report No.(s): AD-A482562; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report first-principles calculations of the electronic and geometric structure of the (110) cross-sectional surfaces on InAs/GaSb superlattices and compare the results to scanning tunneling microscopy images of filled electronic states. We also study the atomic scale structure of (001) interface surfaces and the adsorption of deposited atoms on these surfaces to simulate the process occurring during the heterostructure growth. In both the predicted and measured images the InAs (110) surfaces appear lower than GaSb, a height difference we show is caused primarily by differences in the electronic structure of the two materials. In contrast, local variations in the apparent height of (110) surface atoms at InSb- or GaAs-like interfaces arise primarily from geometric distortions associated with local differences in bond length. We further observed that both Ga- and Sb-terminating (001) surfaces showed dimerization of surface atoms. Ga-terminating (001) surfaces exhibited substantial buckling of surface atoms while Sb-terminating (001) surfaces did not show appreciable buckling. The adsorption of arsenic atoms occurred preferably at the bridge sites between the dimerized Sb atoms on Sb-terminating (001) surfaces. Indium atoms, on the other hand, were observed to have somewhat equal probabilities to be adsorbed at a few different sites on Ga-terminating (001) surfaces. Our calculated energies for atomic intermixing indicate that anion exchanges are exothermic for As atoms on Ga-terminating (001) interfaces but endothermic for In atoms on Sb-terminating (001) interfaces. This difference may explain why GaAs interfaces are typically more disordered than InSb interfaces in these heterostructures.
DTIC
Semiconductors (Materials); Superlattices

20080038946 Rensselaer Polytechnic Inst., Troy, NY USA
Scaled up Fabrication of High-Throughout SWNT Nanoelectronics and Nanosensor Devices
Ajayan, Pulickel M; Apr 20, 2007; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-1-0031
Report No.(s): AD-A482603; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project's primary goal was to build integrated, on-chip carbon nanotube based devices that could be used as multi-agent sensors. The main tasks were controlled growth of carbon nanotubes of various types, for integration into the on-chip sensor, fabrication of the carbon nanotube based sensor devices and, the electrical and other relevant characterization. The project was done in collaboration with personnel at the Army Research Laboratory.
DTIC
Carbon Nanotubes; Electronic Equipment; Fabrication; Nanotechnology; Walls

20080038988 Naval Research Lab., Washington, DC USA

Trapping Effects in GaN and SiC Microwave FETs

Binari, Steven C; Klein, P B; Kazior, Thomas E; Jun 2002; 12 pp.; In English

Report No.(s): AD-A482683; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It is well known that trapping effects can limit the output power performance of microwave field-effect transistors (FETs). This is particularly true for the wide bandgap devices. In this paper, we review the various trapping phenomena observed in SiC- and GaN-based FETs that contribute to compromised power performance. For both of these material systems, trapping effects associated with both the surface and with the layers underlying the active channel have been identified. The measurement techniques utilized to identify these traps and some of the steps taken to minimize their effects, such as modified buffer layer designs and surface passivation, are described. Since similar defect-related phenomena were addressed during the development of the GaAs technology, relevant GaAs work is briefly summarized.

DTIC

Field Effect Transistors; Microwaves; Trapping

20080039131 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Electron Diffusion Region: Forces and Currents

Hesse, Michael; July 08, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The dissipation mechanism of magnetic reconnection remains a subject of intense scientific interest. On one hand, one set of recent studies have shown that particle inertia-based processes, which include thermal and bulk inertial effects, provide the reconnection electric field in the diffusion region. On the other hand, a second set of studies emphasizes the role of wave-particle interactions in providing anomalous resistivity in the diffusion region. In this presentation, we present analytical theory results, as well as PIC simulations of guide-field magnetic reconnection. We will show that the thermal electron inertia-based dissipation mechanism, expressed through nongyrotropic electron pressure tensors, remains viable in three dimensions. We will demonstrate the thermal inertia effect through studies of electron distribution functions. Furthermore, we will show that the reconnection electric field provides a transient acceleration on particles traversing the inner reconnection region. This inertia1 effect can be described as a diffusion-like term of the current density, which matches key features of electron distribution functions.

Author

Electron Diffusion; Magnetic Field Reconnection; Electric Fields; Wave-Particle Interactions; Electrical Resistivity; Semiconductors (Materials)

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FLUID MECHANICS AND THERMODYNAMICS

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

20080036834 American Inst. of Aeronautics and Astronautics, Washington, DC, USA

Cryogenic Pressure Control Modeling for Ellipsoidal Space Tanks in Reduced Gravity

Hedayat, Ali; Lopez, Alfredo; Grayson, Gary D.; Chandler, Frank O.; Hastings, Leon J.; July 21, 2008; 1 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20 - 23 Jul. 2008, Hartford, CT, USA

Contract(s)/Grant(s): NNM05AB18C; Copyright; Avail.: Other Sources; Abstract Only

A computational fluid dynamics (CFD) model is developed to simulate pressure control of an ellipsoidal-shaped liquid hydrogen tank under external heating in low gravity. Pressure control is provided by an axial jet thermodynamic vent system (TVS) centered within the vessel that injects cooler liquid into the tank, mixing the contents and reducing tank pressure. The two-phase cryogenic tank model considers liquid hydrogen in its own vapor with liquid density varying with temperature only and a fully compressible ullage. The axisymmetric model is developed using a custom version of the commercially available FLOW-3D software and simulates low gravity extrapolations of engineering checkout tests performed at Marshall Space Flight Center in 1999 in support of the Solar Thermal Upper Stage Technology Demonstrator (STUSTD) program. Model results illustrate that stable low gravity liquid-gas interfaces are maintained during all phases of the pressure control cycle. Steady and relatively smooth ullage pressurization rates are predicted. This work advances current low gravity CFD modeling

capabilities for cryogenic pressure control and aids the development of a low cost CFD-based design process for space hardware.
Author
Computational Fluid Dynamics; Pressure Reduction; Cryogenic Tanks; Microgravity

20080037370 National Energy Technology Lab., Morgantown, WV, USA
Computational Fluid Dynamics Modeling of the Operation of a Flame Ionization Sensor
Huckaby, E. D.; Chorpening, B.; Thornton, J.; Mar. 2007; 22 pp.; In English
Report No.(s): DE2007-913251; DOE/NETL-IR-2007-098; No Copyright; Avail.: National Technical Information Service (NTIS)

The sensors and controls research group at the USA Department of Energy (DOE) National Energy Technology Laboratory (NETL) is continuing to develop the Combustion Control and Diagnostics Sensor (CCADS) for gas turbine applications. CCADS uses the electrical conduction of the charged species generated during the combustion process to detect combustion instabilities and monitor equivalence ratio. As part of this effort, combustion models are being developed which include the interaction between the electric field and the transport of charged species. The primary combustion process is computed using a flame wrinkling model which is a component of the OpenFOAM toolkit. A sub-model for the transport of charged species is attached to this model. The formulation of the charged-species model similar that applied by Penderson and Brown (1993) for the simulation of laminar flames. The sub-model consists of an additional flux due to the electric field (drift flux) added to the equations for the charged species concentrations and the solution the electric potential from the resolved charge density. The subgrid interactions between the electric field and charged species transport have been neglected. Using the above procedure, numerical simulations are performed and the results compared with several recent CCADS experiments.
NTIS
Computational Fluid Dynamics; Flame Ionization; Flames; Ionization

20080037502 Air Force Research Lab., Wright-Patterson AFB, OH USA
Design Strategies to Mitigate Unsteady Forcing (Preprint)
Clark, John P; Apr 2008; 56 pp.; In English
Contract(s)/Grant(s): Proj-3066
Report No.(s): AD-A482210; AFRL-RZ-WP-TP-2008-2112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability to predict accurately the levels of unsteady forcing on turbine blades is critical to avoid high-cycle fatigue failures. Further, a demonstrated ability to make accurate predictions leads to the possibility of controlling levels of unsteadiness through aerodynamic design. Several ingredients were essential to the success achieved in this study. First, judicious post-processing of CFD solutions was required to ensure that proper periodicity was achieved, and this was contingent upon an understanding of basic concepts in digital signal processing that are essential to the accurate calculation of unsteady forces on airfoils. Second, time-resolved predictions were subjected to a thorough and rigorous validation study for the physics observed in the turbine of interest in a relevant environment. Third, a clear understanding of the necessary steps to obtain the most accurate solution possible given the fidelity of the predictive system employed was required, and this followed naturally from knowledge gained in the validation study. Finally, it was pertinent to ensure that design changes to reduce forcing did not result in new sources of high unsteady loading. The ability to predict accurately the levels of unsteady forcing on turbine blades is critical to avoid high-cycle fatigue failures. Further, a demonstrated ability to make accurate predictions leads to the possibility of controlling levels of unsteadiness through aerodynamic design. This lecture presents a successful example of forcing-function prediction and control during the design cycle of a modern gas-turbine engine. 3D time-resolved computational fluid dynamics was used within the design cycle to predict accurately the levels of unsteady forcing on a single-stage high-pressure turbine blade.
DTIC
Turbine Blades; Unsteady Aerodynamics

20080037565 NASA Langley Research Center, Hampton, VA, USA
On-orbit Passive Thermography
Howell, Patricia A.; Winfree, William P.; Cramer, K. Elliott; [2008]; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 377816.06.03.03.05; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037565

On July 12, 2006, British-born astronaut Piers Sellers became the first person to conduct thermal nondestructive

evaluation experiments in space, demonstrating the feasibility of a new tool for detecting damage to the reinforced carbon-carbon (RCC) structures of the Shuttle. This new tool was an EVA (Extravehicular Activity, or spacewalk) compatible infrared camera developed by NASA engineers. Data was collected both on the wing leading edge of the Orbiter and on pre-damaged samples mounted in the Shuttle s cargo bay. A total of 10 infrared movies were collected during the EVA totaling over 250 megabytes of data. Images were downloaded from the orbiting Shuttle to Johnson Space Center for analysis and processing. Results are shown to be comparable to ground-based thermal inspections performed in the laboratory with the same type of camera and simulated solar heating. The EVA camera system detected flat-bottom holes as small as 2.54cm in diameter with 50% material loss from the back (hidden) surface in RCC during this first test of the EVA IR Camera. Data for the time history of the specimen temperature and the capability of the inspection system for imaging impact damage are presented.

Author

Thermography; Time Temperature Parameter; Impact Damage; Space Shuttle Orbiters; Nondestructive Tests; Carbon-Carbon Composites; Composite Structures

20080037601 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

CVN-21 Carrier Turbine Blade Tree Section

Sep 23, 2005; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-05-0060-07

Report No.(s): AD-A481797; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481797

Dresser-Rand Corporation located in Wellsville, New York, is responsible for power generation for the new CVN-21 Carrier for the U.S. Navy. Development of newer power generation systems has lead to the use of advanced materials with characteristics that allow the turbine blade (bucket) to withstand increased condensation levels. The new material characteristics, with higher than normal Rockwell hardness, created many manufacturing challenges. Shorter tool life, longer processing times, and longer hand finishing operations all contributed to extended lead times and additional costs. Having previously demonstrated that the use of state-of-the-market tooling along with advanced programming techniques can optimize tool performance, Dresser-Rand requested the help of the National Center for Defense Manufacturing and Machining (NCDMM) to review and provide solutions that would reduce the cost and part cycle times of this component. After reviewing the current method, NCDMM engineers concluded that the roughing process encompassed the greatest optimization opportunity. The current method included drilling and milling with multiple tools. This process left uneven amounts of stock remaining on the part, resulting in unpredictable tool life. NCDMM engineers determined water jet roughing would leave an even amount of stock while eliminating several roughing tools.

DTIC

Cutters; Hydraulic Jets; Machining; Manufacturing; Production Engineering; Turbine Blades

20080037604 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

CVN-21 Carrier Power Generation/Turbine Blade

Feb 17, 2005; 2 pp.; In English

Contract(s)/Grant(s): Proj-NCDMM-04-0053-12

Report No.(s): AD-A481796; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481796

Dresser-Rand Corporation located in Wellsville, New York, is responsible for power generation for the new CVN-21 Carrier for the U.S. Navy. Development of newer power generation systems has lead to the use of advanced materials with characteristics that allow the turbine blade (bucket) to withstand increased condensation levels. The new material characteristics, with higher than normal Rockwell hardness, created many manufacturing challenges. Shorter tool life, longer processing times, and longer hand finishing operations all contributed to extended lead times and additional costs. Faced with these challenges, Dresser-Rand requested the help of the National Center for Defense Manufacturing and Machining (NCDMM) to review and provide solutions that would reduce their cost and turn-around times.

DTIC

Cutters; Machining; Manufacturing; Production Engineering; Turbine Blades

20080037779 Barnes and Thornburg, LLP, Chicago, IL, USA
Omega-Amino-PEG-Phosphoramidites and Conjugates Thereof
Chernov, B. K., Inventor; Kukhtin, A., Inventor; Golova, J. B., Inventor; 21 Sep 04; 13 pp.; In English
Contract(s)/Grant(s): W-31-109-ENG-38
Patent Info.: Filed Filed 21 Sep 04; US-Patent-Appl-SN-10-945 834
Report No.(s): PB2008-100711; No Copyright; Avail.: CASI: A03, Hardcopy

Omega-Amino-PEG conjugates, and processes and reagents for preparing omega-amino-PEG conjugates are described. NTIS

Amines; Patent Applications; Reagents

20080037823 Christian (Stephen R.), Idaho Falls, ID, USA
Gas Flow Meter and Method for Measuring Gas Flow Rate
Robertson, E. P., Inventor; 14 Oct 04; 12 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-966 632
Report No.(s): PB2008-102796; No Copyright; Avail.: CASI: A03, Hardcopy

A gas flow rate meter includes an upstream line and two chambers having substantially equal, fixed volumes. An adjustable valve may direct the gas flow through the upstream line to either of the two chambers. A pressure monitoring device may be configured to prompt valve adjustments, directing the gas flow to an alternate chamber each time a pre-set pressure in the upstream line is reached. A method of measuring the gas flow rate measures the time required for the pressure in the upstream line to reach the pre-set pressure. The volume of the chamber and upstream line are known and fixed, thus the time required for the increase in pressure may be used to determine the flow rate of the gas. Another method of measuring the gas flow rate uses two pressure measurements of a fixed volume, taken at different times, to determine the flow rate of the gas. NTIS

Flowmeters; Gas Flow; Patent Applications

20080038092 Wall Marjama and Bilinsk, Syracuse, NY, USA; Enidine, Inc., Orchard Park, NY, USA
Semi-Active Isolator (PAT-APPL-10-972 709)
Spyche, G. J., Inventor; Tomita, K., Inventor; 25 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): NO0167-01-D-0063
Patent Info.: Filed Filed 25 Oct 04; US-Patent-Appl-SN-10-972 709
Report No.(s): PB2008-101635; No Copyright; Avail.: CASI: A03, Hardcopy

A shock and vibration isolator that includes a double acting mechanical spring assembly that is mounted to act in parallel with a fluid or liquid spring assembly. The mechanical spring is arranged to provide a first spring rate over a first displacement range and a second spring rate over a further second displacement range. The liquid spring is connected to an accumulator by control circuitry that is under the control of a microprocessor to release stored energy which combines with that of the mechanical spring to rapidly dissipate the input G forces to a level sufficient to protect a substructure.
NTIS

Isolators; Patent Applications

20080038657 Fermi National Accelerator Lab., Batavia, IL, USA
Aerosol Particle Collector Design Study
Dimenna, R. A.; Lee, S. Y.; Sep. 2007; 51 pp.; In English
Report No.(s): DE2007-917512; WSRC-STI-2007-00511; No Copyright; Avail.: National Technical Information Service (NTIS)

A computational evaluation of a particle collector design was performed to evaluate the behavior of aerosol particles in a fast flowing gas stream. The objective of the work was to improve the collection efficiency of the device while maintaining a minimum specified air throughput, nominal collector size, and minimal power requirements. The impact of a range of parameters was considered subject to constraints on gas flow rate, overall collector dimensions, and power limitations. Potential improvements were identified, some of which have already been implemented. Other more complex changes were identified and are described here for further consideration. In addition, fruitful areas for further study are proposed.
NTIS

Accumulators; Aerosols; Gas Streams; Samplers

20080038751 Cornell Univ., Ithaca, NY USA
Insect Flight: Computation and Biomimetic Design
Wang, Z J; May 31, 2008; 8 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0076
Report No.(s): AD-A482361; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482361

Our research has focused on understanding fundamental mechanisms of unsteady aerodynamics in flapping flight. In particular we have focused on dragonfly flight and passive flight of fluttering and tumbling plates in fluid. We use computations, theoretical analyses, and tabletop experiments to unravel the essential mechanisms in these systems. They have yielded new insights into the unsteady aerodynamics and energetics of flapping flight. These new insights offer lessons on designs of efficient small scale flapping wing flight.
DTIC
Biomimetics; Computation; Flapping; Flight; Insects; Unsteady Aerodynamics

20080038931 North Carolina State Univ., Raleigh, NC USA
Simulation of Transient Dynamics of Shock Wave Boundary Layer Interactions Using Hybrid Large-Eddy/Reynolds-Averaged Navier-Stokes Models
Edwards, Jack R; May 1, 2007; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-1-0299
Report No.(s): AD-A482570; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Simulations of the Mach 5 compression-corner shock / turbulent boundary layer interaction experimentally mapped by Prof. David Dolling and co-workers have been performed using a hybrid large-eddy / Reynolds-averaged Navier-Stokes (LES/RANS) model. The model captures the mean-flow structure of the interaction reasonably well, with observed deficiencies traced to an under prediction of the displacement effects of the shock-induced separation region. The computational results provide some support for a recent theory relating to the underlying causes of low-frequency shock wave oscillation. The simulation results indicate that the sustained presence of a collection of neighboring streaks of low / high momentum fluid within the boundary layer induces a low frequency undulation of the separation front. Power spectra obtained at various streamwise stations are in good agreement with experimental results, indicating that the LES/RANS method is capable of predicting both the low and high-frequency dynamics of the interaction. Downstream of re-attachment, the simulations capture a three-dimensional mean flow structure, dominated by counter-rotating vortices that produce wide variations in the surface skin friction. Predictions of the structure of the re-attaching boundary layer agree well with experimental pitot pressure measurements. In comparison with Reynolds-averaged model predictions, the LES/RANS model predicts more amplification of Reynolds stresses and a broadening of the Reynolds-stress distribution within the boundary layer that is probably due to re-attachment shock motion.
DTIC
Average; Boundary Layers; Navier-Stokes Equation; Reynolds Averaging; Reynolds Equation; Shock Wave Interaction; Shock Waves; Simulation; Vortices

20080038996 ITT Systems and Sciences Corp., Colorado Springs, CO USA
Improving RUSTIC for Coastal, Ocean and Rolling/Rough Terrain Areas, CY-06
Burrows, Don; Tobin, Chuck; Roney, Jason; Diehl, Steve; Sep 28, 2007; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-C-0136
Report No.(s): AD-A482704; A-07-066U(R); No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the final report for the year one effort to improve RUSTIC for Coastal, Ocean and Rolling/Rough Terrain Areas. RUSTIC, developed by ITT, is a quasi-CFD wind field modeling software intended for urban domains limited to 2 km x 2 km. This effort produced RUSTIC-CR in order to incorporate physics that are more appropriate to domains on the order of 60 km x 60 km. For larger domains, it was necessary to incorporate new terms into the governing equations as well as treat the turbulence in different ways. The effort focused on incorporating the appropriate planetary boundary layer (PBL) model for these applications. With regards to these improvements, an upgrade to the model thermodynamics was completed, physics for moist boundary layers was added, and the previous turbulence model was replaced with a second-order-closure (SOC)

boundary layer model. In addition, the initial surface boundary conditions in RUSTIC-CR were improved by incorporating land use and land cover, sensible and latent heat fluxes, albedo and boundary layer height. The new product model was tested mainly in three different scenarios: Seattle, Colorado Springs, and Oklahoma City.
DTIC
Coasts; Marine Environments; Oceans; Terrain

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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*.

20080037427 Western Regional Strain Gage Committee., USA; NASA Dryden Flight Research Center, Edwards, CA, USA
High-Temperature Strain Sensing for Aerospace Applications
Piazza, Anthony; Richards, Lance W.; Hudson, Larry D.; August 18, 2008; 25 pp.; In English; WRSGC Summer Test and Measurements Conference, 18-20 Aug. 2008, Pennsylvania, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037427

Thermal protection systems (TPS) and hot structures are utilizing advanced materials that operate at temperatures that exceed abilities to measure structural performance. Robust strain sensors that operate accurately and reliably beyond 1800 F are needed but do not exist. These shortcomings hinder the ability to validate analysis and modeling techniques and hinders the ability to optimize structural designs. This presentation examines high-temperature strain sensing for aerospace applications and, more specifically, seeks to provide strain data for validating finite element models and thermal-structural analyses. Efforts have been made to develop sensor attachment techniques for relevant structural materials at the small test specimen level and to perform laboratory tests to characterize sensor and generate corrections to apply to indicated strains. Areas highlighted in this presentation include sensors, sensor attachment techniques, laboratory evaluation/characterization of strain measurement, and sensor use in large-scale structures.
Derived from text
Strain Gages; Aerospace Engineering; High Temperature Environments; Thermal Protection; Hot Surfaces

20080037544 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Night Vision Goggle Manufacturing Support
Feb 28, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-06-0121-11
Report No.(s): AD-A482035; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Letterkenny Army Depot (LEAD), located in Chambersburg PA, received an order to manufacture 12,000 night vision goggle (NVG) plates. These plates are used to mount the NVG to the Soldier's helmet. However, the quantities needed had increased over four fold from 12,000 to 52,000 (7,000 NVG plates per month) near the time of production. Based on these quantities, delivery dates, and current workload, LEAD requested the assistance of the National Center for Defense Manufacturing and Machining (NCDMM) to help optimize the NVG plate manufacturing process.
DTIC
Goggles; Manufacturing; Night Vision

20080037560 NASA Marshall Space Flight Center, Huntsville, AL, USA
GOES-R Geostationary Lightning Mapper Performance Specifications and Algorithms
Mach, Douglas M.; Goodman, Steven J.; Blakeslee, Richard J.; Koshak, William J.; Petersen, William A.; Boldi, Robert A.; Carey, Lawrence D.; Bateman, Monte G.; Buchler, Dennis E.; McCaul, E. William, Jr.; June 23, 2008; 1 pp.; In English; 2008 NOAA STAR GOES-R AWG Review, 23-26 Jun. 2008, Madison, Wi, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037560

The Geostationary Lightning Mapper (GLM) is a single channel, near-IR imager/optical transient event detector, used to detect, locate and measure total lightning activity over the full-disk. The next generation NOAA Geostationary Operational Environmental Satellite (GOES-R) series will carry a GLM that will provide continuous day and night observations of

lightning. The mission objectives for the GLM are to: (1) Provide continuous, full-disk lightning measurements for storm warning and nowcasting, (2) Provide early warning of tornadic activity, and (2) Accumulate a long-term database to track decadal changes of lightning. The GLM owes its heritage to the NASA Lightning Imaging Sensor (1997- present) and the Optical Transient Detector (1995-2000), which were developed for the Earth Observing System and have produced a combined 13 year data record of global lightning activity. GOES-R Risk Reduction Team and Algorithm Working Group Lightning Applications Team have begun to develop the Level 2 algorithms and applications. The science data will consist of lightning 'events', 'groups', and 'flashes'. The algorithm is being designed to be an efficient user of the computational resources. This may include parallelization of the code and the concept of sub-dividing the GLM FOV into regions to be processed in parallel. Proxy total lightning data from the NASA Lightning Imaging Sensor on the Tropical Rainfall Measuring Mission (TRMM) satellite and regional test beds (e.g., Lightning Mapping Arrays in North Alabama, Oklahoma, Central Florida, and the Washington DC Metropolitan area) are being used to develop the prelaunch algorithms and applications, and also improve our knowledge of thunderstorm initiation and evolution.
Derived from text
Earth Observing System (EOS); Functional Design Specifications; GOES Satellites; Lightning; Remote Sensing; Synchronous Satellites

20080037650 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
Night Vision Goggle Clip 'Make vs. Buy' Study
McCullough, Lee; Dec 18, 2006; 9 pp.; In English
Contract(s)/Grant(s): Proj-06-0121-11
Report No.(s): AD-A481717; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481717

Letterkenny Army Depot 'LEAD', located in Chambersburg PA, received an order to manufacture 12,000 night vision goggle 'NVG' plates. These plates are used to mount the NVG to the Soldier's helmet. However, the quantities needed had increased over four fold from 12,000 to 52,000 '7,000 NVG plates per month' near the time of production. Based on these quantities, delivery dates, and current workload, LEAD requested the assistance of the National Center for Defense Manufacturing and Machining 'NCDMM' to help optimize the NVG plate manufacturing process. The optimized tooling and tool path resulted in a 30% reduction in cycle time compared to the original program. Implementing this solution enables LEAD to meet its increased production schedule of 52,000 plates. This improvement also reduces the estimated cost $2.18 per NVG plate.
DTIC
Clips; Goggles; Helmet Mounted Displays; Night Vision; Tooling

20080038018 Numerica Corp., Loveland, CO USA
Optimization Problems in Multisensor and Multitarget Tracking
Poore, Aubrey B; Feb 25, 2008; 31 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0222
Report No.(s): AD-A481614; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481614

The objective of this research program is to develop optimization algorithms that solve key problems in multiple target tracking and sensor data fusion. The central problem in multiple target tracking is the data association problem of partitioning sensor reports into tracks and false alarms. New classes of data association problems have been formulated and initial algorithms developed to address cluster tracking, merged measurements, and even sensor resource management in the form of 'group-assignments.' In a different direction, an efficient k-best algorithm has been developed to approximate the uncertainty in data association, which is ontical for discrimination or combat identification. Statistical Monte Carlo methods are also applicable and are still under investigation. Bias estimation algorithms using known data association such as truth objects and targets of opportunity have been developed. Bias estimation in which data association is unknown is difficult due to the nonconvex and mixed integer nature of the mathematical formulation. Exact and approximate algorithms have been developed and successfully applied to system tracking. As a prerequisite to the development of multiple target tracking approaches to space surveillance, consistent measures of uncertainty for initial orbit determination and the propagation of the uncertainty over time have been developed.
DTIC
Targets; Multisensor Fusion; Tracking (Position)

20080038719 Solid State Scientific Corp., Nashua, NH USA

SWIR Variable Dispersion Spectral Imaging Sensor

Shepherd, F D; Mooney, J M; Reeves, T E; Franco, D S; Murguia, J E; Wong, C; Dumont, P; Khagani, F; Diaz, G; Weeks, M M; Jun 3, 2008; 7 pp.; In English

Contract(s)/Grant(s): F19628-02-C-0082; Proj-4916

Report No.(s): AD-A482320; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482320

A novel spectral imaging sensor based on dual direct vision prisms is described. The prisms project a spectral image onto the focal plane array of an infrared camera. The prism set is rotated on the camera axis and the resulting spectral information is extracted as an image cube(x, y, 1), using tomographic techniques. The sensor resolves more than 40 spectral bands (channels) at wavelengths between 1.2 microns and 2.5 microns wavelength. The sensor dispersion characteristic is determined by the vector sum of the dispersions of the two prisms. The number of resolved channels, and the related signal strength per channel, varies with the angle between the prism dispersion axes. This is a new capability for this class of spectral imaging sensor. Reconstructed short-wave imagery and spectral data is presented for outdoor and laboratory scenes and for standard test sources.

DTIC

Detectors; Emittance; Imaging Techniques; Spectra

20080038742 Nebraska Univ., Lincoln, NE USA

Nanometer-Size Magnetic Devices

Liou, Sy-Hwang; Jan 7, 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0298

Report No.(s): AD-A482350; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482350

This research is to understand the relationship between the local magnetic domain changes and the magnetization reversal behaviors of nanometer-sized magnetic features and to develop improved methods for understanding and characterizing the magnetic properties of nanometer-sized materials We have developed a few advanced cantilevers for magnetic characterization of small magnetic objects We have studied magnetic layers in magnetic sensors.

DTIC

Magnetic Domains; Magnetic Films; Magnetic Force Microscopy; Magnetic Properties

20080038748 Johns Hopkins Univ., Baltimore, MD USA

MURI Real Time, Explosive Specific Chemical Sensors: Spectroscopic and Time-Domain Detection of Trace Explosives in Condensed and Vapor Phases

Spicer, James B; Mar 27, 2008; 31 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0255

Report No.(s): AD-A482356; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482356

Under this MURI, research into the use of terahertz spectroscopy, femtosecond laser-induced breakdown spectroscopy, infrared spectroscopy, laser ionization-mass spectrometry and cavity ring-down spectroscopy for explosives detection was pursued. Fundamental studies have been completed that contribute to our understanding of explosives and how they behave when being sensed using the techniques selected for study. The highest level conclusion reached in this program is that all of the techniques have the ability to detect explosives in the environment - the critical issues that are still unresolved are the ultimate selectivities and sensitivities of these techniques. At this time, it is clear that the current sensitivities of terahertz techniques allow for detection of column/surface concentrations of approximately 10 micro-g/cm2, laser induced breakdown spectroscopy can detect at levels below 10 micro-g/cm2, and cavity ring-down spectroscopy can detect vapor phase concentrations below 1 ppb. While these levels of detection have been demonstrated through work in the MURI, more important results have been obtained that point in critical directions for the success of sensing schemes that might be pursued in the future.

DTIC

Condensing; Detection; Explosives; Explosives Detection; Infrared Spectroscopy; Laser Spectroscopy; Liquid Phases; Real Time Operation; Spectroscopy; Vapor Phases

20080038768 Pennsylvania Univ., Philadelphia, PA USA

Bio-Inspired Sensing and Imaging of Polarization Information in Nature

Engheta, Nader; Pugh, Jr , Edward N; Van der Spiegel, Jan; May 4, 2008; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0052

Report No.(s): AD-A482379; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482379

Our unaided eyes can detect two of the characteristics of image-forming visible light from a scene, namely, the intensity and the wavelength, which can then be encoded into perceptual qualities of brightness and color. Our eyes, however, are effectively blind to the third characteristic of light, its polarization. It is well known, however, that several species of animals have visual systems capable of detecting light's polarization and using the information so extracted. Understanding the biophysical mechanism behind the polarization vision and reverse engineering its functionality and utility leads to exciting novel methods and techniques in sensing and imaging with various applications. Motivated and inspired by the features of polarization-sensitive visual systems in nature, in our group we have been developing various man-made, non-invasive imaging methodologies, sensing schemes, camera systems, and visualization and display schemes that have shown exciting and that have shown exciting and promising outcomes with useful applications in system design.

DTIC

Detection; Image Processing; Imaging Techniques; Light (Visible Radiation); Optical Measurement

20080038950 Defence Science and Technology Organisation, Edinburgh, Australia

An Overview of Geolocation of Airborne Video Using 3D Models

Cooke, Tristrom; Whatmough, Robert; Redding, Nicholas J; El-Mahassni, Edwin; Jan 2008; 40 pp.; In English

Report No.(s): AD-A482615; DSTO-TR-2001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is an overview report which describes a method for automatic geolocation of video from an airborne sensor. The approach described here uses positional information from three sources to compute refined coordinates in three dimensions for any feature in the video sequence. These three sources are firstly, sensor-platform metadata describing the likely sensor footprint based on sensor-platform positional and attitudinal information; secondly, 3D information of a scene inherent in a video sequence collected from a moving platform; and thirdly, reference imagery of the region of interest that is geolocated and georectified such as aerial photography. The report describes the steps involved in this process, which have been successfully applied individually to two types of imagery (infrared MX-20 data, and high definition data from project Crystal View). Investigation into the final 2D registration stage and 3D registration with a CAD model is ongoing.

DTIC

Aerial Photography; Airborne Equipment; Position (Location); Three Dimensional Models; Video Equipment; Video Signals

20080038952 Defence Science and Technology Organisation, Edinburgh, Australia

Automatic Extraction of 3D Models From an Airborne Video Sequence

Cooke, Tristrom; Jan 2008; 66 pp.; In English

Report No.(s): AD-A482618; DSTO-TR-2095; No Copyright; Avail.: Defense Technical Information Center (DTIC)

One method for accurately georegistering a video sequence from an airborne platform is to transform the video to the same coordinate system as some reference imagery that is already georeferenced. This transformation will be dependent upon the 3D structure within the scene, which is not known a priori. The current report examines several aspects of the construction of a 3D model from a video sequence, which may then be used for registration. The topics examined include: extraction of useful features (points, lines, or planes) from the images, determination of a sparse 3D model and camera motion model in cases where data may be missing, a method for estimating the depth at every pixel within a video frame, and finally an analysis of the errors at each step of the model construction process.

DTIC

Aerial Photography; Airborne Equipment; Extraction; Three Dimensional Models; Video Equipment

20080038968

Radar-Based Detection, Tracking and Speciation of Marine Mammals from Ships

DeProspo, Douglas F; Mobley, Joseph; Hom, Wai; Carron, Mike; Jan 2004; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0729

Report No.(s): AD-A482654; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In addition to ship strikes, another cause of marine mammal injury and death is from exposure to high acoustic source

levels, e.g., those encountered during Navy-sponsored Low Frequency Active (LFA) sonar tests. Irrespective of the method of mammal injury or death, the act of injuring or killing whales can and does result in litigation proceedings. This is a consequence of the legal protection that Cetaceans (whales and dolphins) are granted in U.S. waters by the Marine Mammal Protection Act of 1972 (as amended in 1994), with some species additionally protected by the Endangered Species Act of 1973. Previously developed mitigation technologies, such as passive acoustic and visual observation, although promising, still fall significantly short of achieving the detection performance necessary to achieve full marine mammal mitigation. Radar surveillance technology, being developed under the current supported program, represents a fundamental paradigm shift and new approach toward the goal of achieving robust marine mammal mitigation. The eventual long-term goal of this work, if successful under the baseline and option programs, is to develop and transition this new radar surveillance technology to both the military and commercial fleets. The primary benefit would be the mitigation of harmful effects on marine mammals due to acoustic testing and ship strikes. The overall objective of the baseline effort, initiated approximately August 1, 2004, is to establish the ability of current or planned ship-based radars, augmented by specialized signal processing, to detect, discriminate and track (geo-locate) a number of different marine mammal species (e.g., great whales, schooling dolphins, etc.) under a variety of representative sea environments (e.g., Atlantic, Pacific, Mediterranean, etc.). Key to this assessment will be an initial, ship-based radar demonstration experiment planned for May, 2005 in the Mediterranean Sea.
DTIC
Animals; Biological Effects; Detection; Marine Biology; Marine Mammals; Radar Detection; Radar Signatures; Radar Tracking; Target Recognition; Tracking (Position)

20080038973 Rochester Univ., NY USA
Image Science Research for Speckle-based LADAR (Speckle Research for 3D Imaging LADAR)
George, Nicholas; Apr 3, 2008; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-06-1-0371
Report No.(s): AD-A482662; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose a basic study of image science topics related to a new class of speckle-based laser-ranging radars (LADAR). For this imaging radar we study two basic system configurations: a wavefront sensing configuration and an imaging configuration. Three major research projects are (1) study of speckle patterns to establish 3D qualitative features for a remote object (2) study of performance of this compact ladar at photon counting light levels and (3) space and wavelength dependence of speckle for a thick diffuser. A balanced research program of theory computer simulations and laboratory experiments is planned These will feature low light level speckle studies with tunable/ multi-tone lasers. For the first area of study, we develop a new thick diffuser for studies of turbidity and imaging. The diffuser consists of three to five different polysterene spheres emmersed in agar. Additionally were have published a paper describing the first infrared hologram at 10.6 microns. It is expected to be useful for examination of silicon boules. In this study we will employ machine vision techniques and neutral networks to ascertain the minimum number of photons that are required to set the boundaries or shape contours of a speckle. The study of space and wavelength dependence of speckle for a thick diffuser is important for assessing LADAR system performance in the presence of fog or smoke in the atmosphere. We seek to establish the capacity for these LADARS to see through turbulence and turbidity. Major objectives of this research are to contribute to the understanding of speckle phenomena and the feasibility of remote object classification using novel 3D-imaging means.
DTIC
Imaging Techniques; Laser Range Finders; Optical Radar; Radar Imagery

20080039123 NASA Stennis Space Center, Stennis Space Center, MS, USA
Making Smart Sensors Intelligent: Building on the IEEE 1451.x Standards
Schmalzel, John L.; Fugueroa, Fernando; Morris, Jon; Turowski, Mark; May 05, 2008; 33 pp.; In English; 54th International Instrumentation Symposium, 5 - 8 May 2008, Florida, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNS06AA50P; NNS04AB67T
Report No.(s): SSTI-2200-0097; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080039123

This brief presentation explores smart sensors and smart sensors with intelligent capabilities and their role in the future of space flight and integrated systems health management (ISHM).
Derived from text
Smart Structures; Sensors; Systems Health Monitoring

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*.

20080037574 NASA Langley Research Center, Hampton, VA, USA
Tunable Infrared Laser Instruments for Airborne Atmospheric Studies
Fried, A.; Diskin, G.; Weibring, P.; Richter, D.; Walega, J. G.; Sachse, G.; Slate, T.; Rana, M.; Podolske, J.; Applied Physics B: Lasers and Optics; [2008]; ISSN 0946-2171; Volume 92, No. 3, pp. 409-417; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 281945.02.38.01.06; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1007/s00340-008-3136-x

Tunable infrared laser-based instruments on airborne platforms have provided invaluable contributions to atmospheric studies over the past several decades. This paper presents an overview of some recent studies and developments using this approach that were presented at the 2007 Field Laser Applications in Industry and Research (FLAIR, http://www.inoa.it/flair/) conference in Florence, Italy. The present overview only covers select in situ absorption-based instruments that were presented in the airborne session at this conference. In no case are comprehensive details presented. These details can be found in the numerous references given. Additional approaches based upon cavity-enhanced and photoacoustic measurements, which are also making invaluable contributions in airborne atmospheric studies, are not discussed in this brief overview.
Author
Infrared Lasers; Tunable Lasers; Infrared Instruments; Flying Platforms; Laser Applications

20080038709 Texas Univ., Austin, TX USA
Dynamic Probing of High Strain-Rate Laser-Driven Shock Waves in Materials
Ditmire, Todd; Dec 20, 2007; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0211
Report No.(s): AD-A482302; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482302

Work under this grant was focused on the probing of fast dynamics induced by laser driven shock waves. These studies are motivated by the fact that a complete understanding of shock waves in materials requires comprehensive microscopic understanding of the compression wave. Under our ARO grant we undertook a series of experiments to develop ways of studying atomic scale motions in materials as a material undergoes very high strain rate shock compression, To study these dynamics we used short pulse lasers in high time resolution pump-probe experiments. Our initial work concentrated on examining the shock induced melt transition in various materials including tin and silicon. First we utilized a series of linear optical diagnostics to characterize the shock strengths achievable with our short pulse laser. In addition to these linear optical probes, we then developed a non-linear optical probe involving the generation of third-harmonic photons at the surface of our target. Using this technique, we have observed the first real-time shock induced phase changes in silicon.
DTIC
Crystals; Lasers; Pulsed Lasers; Shock Waves

20080038731 Harvard Univ., Cambridge, MA USA
Mode Locking of Quantum Cascade Lasers
Capasso, Federico; Kaertner, Franz X; Nov 9, 2007; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0253
Report No.(s): AD-A482336; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482336

A theoretical and experimental study of multimode operation regimes in quantum cascade lasers (QCLs) is presented. It is shown that the fast gain recovery of QCLs promotes two multimode regimes in QCLs: One is spatial hole burning (SHB), and the other one is related to the Risken-Nummedal-Graham-Haken (RNGH) instability predicted in the sixties. A model that can account for coherent phenomena, a saturable absorber and SHB is developed and studied in detail both analytically and numerically. A wide variety of experimental data on multimode regimes is presented. Lasers with narrow active region and/or with metal coating on the sides tend to develop a splitting in the spectrum, approximately equal to twice the Rabi frequency. It is proposed that this behavior stems from the presence of a saturable absorber, which can result from a Kerr lensing effect

in the cavity. Lasers with a wide active region, which have weaker saturable absorber, do not exhibit a Rabi splitting, and their multimode regime is governed by SHB. This experimental phenomenology is well explained by our theoretical model.
DTIC
Laser Mode Locking; Locking; Quantum Cascade Lasers

20080038782 Army Research Lab., Aberdeen Proving Ground, MD USA
Tailored Ultrafast Pulses for Selective Energetic Residue Sampling
De Lucia, Jr, Frank; Gottfreid, Jennifer; Apr 2008; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482422; ARL-TN-311; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482422

Femtosecond pulses offer several advantages over more conventional nanosecond pulses for laser-induced breakdown spectroscopy applications. These advantages include improved ablation, lower breakdown threshold, more efficient energy deposition, and less thermal damage to surrounding areas. The scope of this work is to determine if femtosecond laser-induced breakdown spectroscopy offers advantages for detecting trace explosive residues. Also, additional laser pulses, focused and nonfocused, were used to enhance the emission signal. It was determined that the lower breakdown threshold was the most important characteristic of the femtosecond pulse for, explosive residue detection. Enhancement of the plasma becomes more critical if lower-energy pulses are used since emission intensity is sacrificed.
DTIC
Ablation; Detection; Explosives; Laser Spectroscopy; Laser-Induced Breakdown Spectroscopy; Residues; Sampling

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*.

20080037503 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Effects of Pulsed-D.C. Discharge Plasma Actuators in a Separated Low Pressure Turbine Boundary Layer (Postprint)
Wall, J D; Boxx, I C; Rivir, R B; Franke, M E; Jan 2007; 11 pp.; In English
Contract(s)/Grant(s): Proj-2307
Report No.(s): AD-A482200; AFRL-RZ-WP-TP-2008-2113; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A pulsed DC dielectric barrier discharge plasma actuator is investigated to reattach the simulated separated flow of a highly loaded turbine blade suction surface. Pulse rates of 25, 50, 75, and 100 pulses per second were investigated at a nominal constant pulse power of 8.5 kW for a constant pulse width of 250 ns. The separation of the flat plate boundary layer is induced with an adverse free stream pressure gradient distribution from an upper wall. Phase-locked particle image velocimetry (PIV) was used to obtain two-dimensional velocity field measurements at 6 to 24 equally spaced phase-angles, depending on the pulse rate. At a pulse rate of 100 pulses per second the 70% velocity contour in the boundary layer was moved closer to the wall by 39%, compared to the unforced case, 15 mm downstream of the actuator.
DTIC
Actuators; Boundary Layers; District of Columbia; Low Pressure; Particle Image Velocimetry; Plasmas (Physics); Turbines

20080037526 Idaho Univ., Moscow, ID, USA
University of Idaho's Clean Snowmobile Design Using a Direct-Injection Two-Stroke Engine. 2007
Findlay, A.; Hanks, B.; Harker, N.; Johnson, J.; Tockey, C.; Oct. 2007; 38 pp.; In English
Contract(s)/Grant(s): DTRS98-G-0027
Report No.(s): PB2008-101709; NIATT-N08-01; No Copyright; Avail.: CASI: A03, Hardcopy

The University of Idaho's entry into the 2007 SAE Clean Snowmobile Challenge was a third-generation gasoline direct-injection (GDI) two-stroke powered snowmobile. The modulated and battery-less direct-injection system used to decrease exhaust emissions and improve fuel economy did not reduce the power output of the engine. The emissions output was reduced by using a reduction catalyst located in the exhaust silencer. Noise from the engine compartment was reduced by using sound absorbing materials and a sealed hood. During pre-competition testing, the snowmobile weighed 550 lbs (250 kg) wet, achieving 20 mpg (8.5 km/L) on lightly groomed trails with a pre-catalyst EPA five-mode emissions score of 158,

and a J192 sound magnitude score of 80 dBA. The team achieved First Place in the 2007 competition as well as Best Fuel Economy, Best Handling, Best Design, Best Value, Best Ride, Best Design Paper and Best Oral Presentation. The 2007 UI snowmobile averaged 19.6 miles per gallon in fuel economy, maintained stock power, was the lightest snowmobile, exceeded 2012 snowmobile emissions standards with an EPA five-mode emissions score of 177 and achieved National Park Service sound reduction requirements for park admission with a J192 sound magnitude of 73 dBA.
NTIS
Exhaust Emission; Idaho; Injection; Snow

20080037605 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
CVN-21 Carrier Casing
Aug 19, 2003; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-03-0001-06
Report No.(s): AD-A481795; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481795

The part in question was a pump-housing made of 304 Stainless Steel weighing 37,000 lbs., and taking approximately 1400-1500 hours to machine. To be awarded the contract for 4 housings, pricing had to be competitive. Creative machining methods had to be developed and utilized. One problem area was an operation to cut 24 4.25-inch threaded holes 10 inches deep. Other advanced machining methods and techniques were required to reduce the total machining time of the entire component. The National Center for Defense Manufacturing and Machining (NCDMM) was requested to review current processes against current manufacturing technologies and recommend tooling and process changes.
DTIC
Housings; Machining; Production Engineering

20080037637 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
TDI Automated Inspection Process
Jun 29, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0098-07
Report No.(s): AD-A481792; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481792

Technical Directions, Inc. (TDI), located in Ortonville, Michigan, has been selected by Lockheed Martin Missiles and Fire Control in Dallas, Texas, to supply small turbine engines in support of the Low-Cost Autonomous Attack System (LOCAAS) and the Surveilling Miniature Attack Cruise Missile (SMACM) programs. The components for the TDI-J45 engine are being provided by outside vendors selected by TDI. Upon receipt of the components, TDI must inspect each component to verify that it meets all dimensional specifications before assembly. The current inspection process for these components is very time-consuming. Each component requires multiple set ups to be completely inspected for dimensional accuracy. The current method of inspection utilizes v-blocks, angle plates, and modeling clay to ensure that the components remain stationary as they are manually inspected using a Sheffield Cordax Discovery II Coordinate Measure Machine (CMM). TDI requested that the National Center for Defense Manufacturing and Machining (NCDMM) develop an automated inspection process to decrease the amount of time required to inspect the incoming components.
DTIC
Engine Parts; Inspection; Optimization; Production Engineering; Turbine Engines; Turbines

20080037644 National Center for Defense Manufacturing and Machining, Latrobe, PA USA
5-Axis Machining Center for Small Components
Mar 10, 2007; 2 pp.; In English
Contract(s)/Grant(s): Proj-NCDMM-06-0104-07
Report No.(s): AD-A481770; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481770

Letterkenny Army Depot (LEAD), Chambersburg, Pennsylvania, is currently manufacturing a variety of small components using a large 5-axis computer numerical control (CNC) machining center. When these small components are produced, roughly 5 percent of the machining table is used. LEAD also produces various sized threaded holes in armor plate material. Due to the properties of armor plate material, producing the smaller size threaded holes has become a major challenge. This results in additional production time as compared to producing larger threaded holes. Due to the increased

demand for the manufacturing of small components and the threading of small holes in armor plate, LEAD called upon the National Center for Defense Manufacturing and Machining (NCDMM) to research and provide a more efficient solution to their 5-axis machining along with a manufacturing process to produce #10-32 threaded holes in armor plate to specifications required by LEAD.
DTIC
Armor; Holes (Mechanics); Machining; Milling Machines; Production Engineering

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*.

20080037638 Purdue Univ., West Lafayette, IN USA
Design Assessment Using Multizone Simulation to Protect Critical Infrastructure From Internal Chemical and Biological Threats
Nakano, Victor M; Croisant, Jr , William J; Abraham, Dulcy M; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481791; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481791

Previous attacks in Tokyo and Washington, DC, have demonstrated the capability to weaponize and use chemical and biological (CB) agents against critical infrastructure. Critical infrastructure includes the defense industrial base whose primary mission is to design, test, and manufacture weapons systems in support of national defense. The U.S. Army's Future Combat Systems (FCS) Program alone involves 13 major defense contractors and more than 500 suppliers. Each contractor has multiple command and control offices, engineering and laboratory sites, and production facilities. Protection of these structures from an internal CB attack is essential to the successful development and fielding of the FCS. In this paper, a quantitative design assessment methodology is presented that will enable decision makers to assess building designs for CB protection. This methodology uses multizone simulation in combination with analysis of financial implications for different designs. The methodology provides the ability to measure the fraction of the building protected versus cost percent increases for a specific design. A hospital emergency room is used as a case study, but this methodology can be adapted for most buildings. This research project is based on public domain literature and software applications, thereby making it available to all building designers.
DTIC
Biological Weapons; Buildings; Chemical Warfare; Protection; Simulation

20080038759 Georgia Inst. of Tech., Atlanta, GA USA
Application of Chiral Cellular Structures for the Design of Innovative Structural Assemblies
Ruzzene, Massimo; Feb 14, 2008; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0141
Report No.(s): AD-A482370; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482370

The objective of the project is to investigate the potential of cellular structures for the design of structural components with superior, new and multifunctional characteristics. In particular, the project focuses on a new topology, the chiral topology, which provides the cellular assembly with unique mechanical properties which include a negative in-plane Poisson's ratio, a correspondingly high shear modulus, high displacement capabilities in the elastic range of the material, and large design flexibility, whereby properties and behavior of the assembly can be significantly altered through variations in its characteristic geometric parameters. The applications that have so far been considered include sandwich panels with honeycomb core, and truss-core airfoils, and acoustic band gap materials. Advantages with respect to current designs, and multi-functionality are particularly investigated.
DTIC
Chirality; Honeycomb Structures

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*.

20080037745 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Production and Distribution of NASA MODIS Remote Sensing Products
Wolfe, Robert; March 12, 2007; 2 pp.; In English; 10th International Symposium on Physical Measurements and Signatures in Remote Sensing ISPMSRS07, 12-14 Mar. 2007, Davos, Switzerland; No Copyright; Avail.: Other Sources; Abstract Only

The two Moderate Resolution Imaging Spectroradiometer (MODIS) instruments on-board NASA's Earth Observing System (EOS) Terra and Aqua satellites make key measurements for understanding the Earth's terrestrial ecosystems. Global time-series of terrestrial geophysical parameters have been produced from MODIS/Terra for over 7 years and for MODIS/Aqua for more than 4 1/2 years. These well calibrated instruments, a team of scientists and a large data production, archive and distribution systems have allowed for the development of a new suite of high quality product variables at spatial resolutions as fine as 250m in support of global change research and natural resource applications. This talk describes the MODIS Science team's products, with a focus on the terrestrial (land) products, the data processing approach and the process for monitoring and improving the product quality. The original MODIS science team was formed in 1989. The team's primary role is the development and implementation of the geophysical algorithms. In addition, the team provided feedback on the design and pre-launch testing of the instrument and helped guide the development of the data processing system. The key challenges the science team dealt with before launch were the development of algorithms for a new instrument and provide guidance of the large and complex multi-discipline processing system. Land, Ocean and Atmosphere discipline teams drove the processing system requirements, particularly in the area of the processing loads and volumes needed to daily produce geophysical maps of the Earth at resolutions as fine as 250 m. The processing system had to handle a large number of data products, large data volumes and processing loads, and complex processing requirements. Prior to MODIS, daily global maps from heritage instruments, such as Advanced Very High Resolution Radiometer (AVHRR), were not produced at resolutions finer than 5 km. The processing solution evolved into a combination of processing the lower level (Level 1) products and the higher level discipline specific Land and Atmosphere products in the MODIS Science Investigator Lead Processing System (SIPS), the MODIS Adaptive Processing System (MODAPS), and archive and distribution of the Land products to the user community by two of NASA s EOS Distributed Active Archive Centers (DAACs). Recently, a part of MODAPS, the Level 1 and Atmosphere Archive and Distribution System (LAADS), took over the role of archiving and distributing the Level 1 and Atmosphere products to the user community.
Author
MODIS (Radiometry); Earth Observing System (EOS); Onboard Equipment; Spacecraft Equipment; Imaging Spectrometers; Data Acquisition; Onboard Data Processing; Data Processing; Remote Sensing; Data Products

20080037997 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Ongoing Development of NASA's Global Land Data Assimilation System
Rodell, Matthew; Kato, Hiroko; Zaitchik, Ben; May 27, 2008; 1 pp.; In English; 2008 American Geophysical Union Joint Assembly, 27-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA's Global Land Data Assimilation System (GLDAS) produces global fields of land surface states (e.g., soil moisture and temperature) and fluxes (e.g., latent heat flux and runoff) by driving offline land surface models with observation-based inputs, using the Land Information System (LIS) software. Since production began in 2001, GLDAS has supported more than 100 scientific investigations and applications. Some examples are GEWEX and NASA Energy and Water Cycle Study (NEWS) global water and energy budget analyses, interpretations of hydrologic data derived from the Gravity Recovery and Climate Experiment (GRACE) satellite mission, and forecast model initiation studies at NOAA and NASA. At the same time, the GLDAS team has continued improve results through the development of new modeling and data assimilation techniques. Here we describe several recent and ongoing innovations. These include global implementation of a runoff routing procedure, GRACE data assimilation, advanced snow cover assimilation, and irrigation modeling.
Author
Assimilation; Land Management; Soil Moisture; Latent Heat; Spacecraft Models; Grace Mission; Earth Surface

20080038045 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Microwave Soil Moisture Retrieval Under Trees

O'Neill, P.; Lang, R.; Kurum, M.; Joseph, A.; Jackson, T.; Cosh, M.; July 06, 2008; 2 pp.; In English; IEEE Geoscience and Remote Sensing Symposium, 6-11 Jul. 2008, Boston, MA, USA; Copyright; Avail.: CASI: A01, Hardcopy

Soil moisture is recognized as an important component of the water, energy, and carbon cycles at the interface between the Earth's surface and atmosphere. Current baseline soil moisture retrieval algorithms for microwave space missions have been developed and validated only over grasslands, agricultural crops, and generally light to moderate vegetation. Tree areas have commonly been excluded from operational soil moisture retrieval plans due to the large expected impact of trees on masking the microwave response to the underlying soil moisture. Our understanding of the microwave properties of trees of various sizes and their effect on soil moisture retrieval algorithms at L band is presently limited, although research efforts are ongoing in Europe, the USA, and elsewhere to remedy this situation. As part of this research, a coordinated sequence of field measurements involving the ComRAD (for Combined Radar/Radiometer) active/passive microwave truck instrument system has been undertaken. Jointly developed and operated by NASA Goddard Space Flight Center and George Washington University, ComRAD consists of dual-polarized 1.4 GHz total-power radiometers (LH, LV) and a quad-polarized 1.25 GHz L band radar sharing a single parabolic dish antenna with a novel broadband stacked patch dual-polarized feed, a quad-polarized 4.75 GHz C band radar, and a single channel 10 GHz XHH radar. The instruments are deployed on a mobile truck with an 19-m hydraulic boom and share common control software; real-time calibrated signals, and the capability for automated data collection for unattended operation. Most microwave soil moisture retrieval algorithms developed for use at L band frequencies are based on the tau-omega model, a simplified zero-order radiative transfer approach where scattering is largely ignored and vegetation canopies are generally treated as a bulk attenuating layer. In this approach, vegetation effects are parameterized by tau and omega, the microwave vegetation opacity and single scattering albedo. One goal of our current research is to determine whether the tau-omega model can work for tree canopies given the increased scatter from trees compared to grasses and crops, and. if so, what are effective values for tau and omega for trees.

Author

Soil Moisture; Microwave Radiometers; Earth Atmosphere; Grasslands; Canopies (Vegetation); Agriculture; Vegetation; Trees (Plants); Real Time Operation

20080038774 Melbourne Univ., Victoria, Australia

Quantum Computing in Diamond

Prawer, Steven; May 28, 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0284

Report No.(s): AD-A482392; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482392

The aim of this proposal is to demonstrate the key elements needed to construct a logical qubit in diamond by exploiting the remarkable quantum properties of the nitrogen-vacancy (NV) optical centre. Specifically, the focus of the work was to address the materials and fabrication issues. We have demonstrated (i) that individual NV qubits can be fabricated by ion implantation with long coherence times (>350 microseconds at room temperature), (ii) electrical control of the optical output of each individual centre is achievable via the Stark shift, (iii) coherent population trapping of ensembles and single NV centres allowing for all-optical control of qubit operations and (iv) that waveguides, cavities and photonic band-gap structures can be fabricated in single crystal diamond. We have thus demonstrated a nanofabrication tool-kit for diamond which is sufficiently robust and mature to justify future investment in the design and implementation of a scalable quantum computing architecture for diamond.

DTIC

Diamonds; Quantum Computation

20080039126 NASA Stennis Space Center, Stennis Space Center, MS, USA

NASA's Contributions to the Gulf of Mexico Alliance

Glorioso, Mark; August 21, 2008; 32 pp.; In English; NASA SSC Applied Science Program, Gulf of Mexico Initiative, Strategic Planning Session, 21 Aug. 2008, Corpus Christi, TX, USA; Original contains color and black and white illustrations

Report No.(s): SSTI-2220-0170; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080039126

This viewgraph document reviews the contribution that NASA has made and the plans for future missions that will assist the mission of the Gulf of Mexico Alliance (GOMA). Specific reference to the work of the Stennis Space Center is reviewed. Some of the projects are: Coastal Online Assessment and Synthesis Tool (COAST), Regional Sediment Management, Coral

Reef Early Warning System, Harmful Algal Bloom, Hypoxia, Land-Use and Land-Cover (LULC) Change from 1974-2008 around Mobile Bay, AL, Satellite Estimation of Suspended Particulate Loads in and around Mobile Bay, AL, Estimating Relative Nutrient Contributions of Agriculture and Forests Using MODIS Time Series, Coastal Marsh Monitoring for Persistent Saltwater Intrusion, Standardized Remote Sensing PRoduct for Water Clarity estimation within Gulf of Mexico Coastal Waters.
CASI
Coastal Water; Gulf of Mexico; Land Use; Remote Sensing; Earth Observations (From Space); NASA Programs

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*.

20080038964 RAND Corp., Santa Monica, CA USA
A Survey of DoD Facility Energy Management Capabilities
Drezner, Jeffrey A; Bradley, Melissa; Jan 1998; 133 pp.; In English
Contract(s)/Grant(s): DASW01-95-C-0059
Report No.(s): AD-A482639; RAND/MR-875-OSD; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to the constrained budget environment of recent years, DoD has placed increasing emphasis on enhancing installation and infrastructure management capabilities. Energy management is an important component of infrastructure management. DoD currently has a facility energy conservation goal of reducing consumption by 30 percent by the year 2005 (measured on a square-foot basis from a 1985 baseline). However, shrinking defense budgets, downsizing, restructuring, and various management reforms are shifting emphasis away from energy management at DoD installations.
DTIC
Energy Policy; Surveys

45
ENVIRONMENT POLLUTION

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

20080036825 NASA Marshall Space Flight Center, Huntsville, AL, USA
Environmental Public Health Surveilliance for Exposure to Respiratory Health Hazards: A Joint NASA/CDC Project to Use Remote Sensing Data for Estimating Airborne Particulate Matter Over the Atlanta, Georgia Metropolitan Area
Quattrochi, Dale A.; Rickman, Douglas; Mohammad, Al-Hamdan; Crosson, William; Estes, Maurice, Jr.; Limaye, Ashutosh; Qualters, Judith; June 30, 2008; 38 pp.; In English; International Workshop on Earth Observation and Remote Sensing Applications/Institute for Photogrammetry and Remote Sensing, Chinese Academy of Surveying and Mapping, 30 Jun. - 2 Jul. 2008, Beijing, China; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Describes the public health surveillance efforts of NASA, in a joint effort with the Center for Disease Control (CDC). NASA/MSFC and the CDC are partners in linking nvironmental and health data to enhance public health surveillance. The use of NASA technology creates value - added geospatial products from existing environmental data sources to facilitate public health linkages. The venture sought to provide remote sensing data for the 5-country Metro-Atlanta area and to integrate this environmental data with public health data into a local network, in an effort to prevent and control environmentally related health effects. Remote sensing data used environmental data (Environmental Protection Agency [EPA] Air Quality System [AQS] ground measurements and MODIS Aerosol Optical Depth [AOD]) to estimate airborne particulate matter over Atlanta, and linked this data with health data related to asthma. The study proved the feasibility of linking environmental data (MODIS particular matter estimates and AQS) with health data (asthma). Algorithms were developed for QC, bias removal, merging MODIS and AQS particulate matter data, as well as for other applications. Additionally, a Business Associate Agreement was negotiated for a health care provider to enable sharing of Protected Health Information.
Derived from text
Environmental Monitoring; Remote Sensing; MODIS (Radiometry); Public Health; Hazards; Air Pollution

20080037317 New Hampshire Dept. of Environmental Services, Concord, NH, USA
Health Consultation: 8-10 Railroad Avenue, Derry, Rockingham County, New Hampshire
Jun. 18, 2007; 20 pp.; In English
Report No.(s): PB2008-102430; No Copyright; Avail.: CASI: A03, Hardcopy

On February 27-28, 2006, the Environmental Protection Agency (EPA) collected indoor air samples from Lot number 30119, located at 8 Railroad Avenue in Derry, Rockingham County, New Hampshire. The two-story structure consists of a basement, two residential apartments on the first floor and four apartment units on the second floor. The apartment building located at 8 Railroad Avenue is adjacent to a nearby former dry cleaning establishment, Shamrock Cleaners. EPA New England's Office of Site Remediation and Restoration, Removals Program excavated soils containing volatile organic compounds (VOCs) from the Site in April 2007. The February EPA indoor air sampling event was conducted to determine whether VOCs below the Site (in soils & groundwater) were volatizing and migrating into the apartments. EPA specifically collected and analyzed three indoor air samples from the apartment's basement. The DES Environmental Health Program (EHP) used the air samples collected by EPA to complete this health consultation. The purpose of the health consultation is to determine if inhalation of indoor air inside the apartments presents a human health risk. After thorough analysis of all air data collected, EHP has concluded that adverse health effects are not expected to result from inhalation exposure to indoor air at 8 Railroad Avenue.
NTIS
Air Sampling; Health; Indoor Air Pollution; New Hampshire; Public Health; Rail Transportation

20080037318 New Hampshire Dept. of Environmental Services, Concord, NH, USA
Health Consultation: Bear Brook Villa, Allenstown, Merrimack County, New Hampshire
Sep. 30, 2006; 14 pp.; In English
Report No.(s): PB2008-102426; No Copyright; Avail.: CASI: A03, Hardcopy

On July 21, 2006, the New Hampshire Department of Environmental Services (DES), Air Resources Division (ARD) was contacted by a resident of Bear Brook Villa Mobile Home Park (BBV) in Allenstown, Merrimack County, New Hampshire. The resident complained of respiratory and other symptoms (including difficulty breathing, sore throat, and nausea) that might be related to chemical and sewage odors emanating from the septic system leach field servicing the park. Representatives of the ARD Compliance Bureau visited the site to investigate the physical layout of the park, interview residents, and collect ambient air samples. The DES Subsurface Systems Bureau and the Water Supply Engineering Bureau have also responded to this residents complaints. The Environmental Health Program (EHP) was contacted to evaluate ambient air data from BBV for possible connections between air quality and the short-term health problems reported by area residents. EHP evaluated the exposure scenario and the environmental data that the Compliance Bureau collected. This health consultation presents an evaluation of the public health hazard from inhalation of ambient air in the vicinity of BBV. Based on the air sampling data collected, EHP concludes that adverse health effects are not expected to result from inhalation exposure to ambient air at BBV.
NTIS
Air Pollution; Hazards; Health; New Hampshire; Public Health

20080037319 Istituto Superiore di Sanita, Rome, Italy
Salute e Sviluppo: Il Caso dell'Amianto nei Paesi in via di Sviluppo (Health and Development: Asbestos in Developing Countries)
January 2007; 103 pp.; In Italian
Report No.(s): PB2008-102416; ISTISAN-07/20; Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this report is to discuss the health-development relation considering the asbestos case study in developing countries. The impact of health inequalities on the development is discussed considering health as a constitutive dimension of development and the health equity condition as one of the goals of the development process. The report includes the analysis of the impact of health problems concerning life and work environment of socials groups and communities in developing countries caused by the dislocation of the asbestos industry from the developed to the developing countries and by the increasing diffusion of asbestos use in these countries. The socioeconomic analysis of the problems related to asbestos is linked to environmental and occupational epidemiological studies on the health effects of the asbestos exposure and on asbestos exposition levels in developing countries. South America and Ecuador are analyzed in details because this report is connected with the scientific cooperation agreement between ISS and IFA-Corporacion para el Desarrollo de la Produccion y el Medio Ambiente Laboral in Quito; in this framework several finalised cooperation instruments are presented.
NTIS
Asbestos; Developing Nations; Health; International Cooperation; Epidemiology

20080037349 Burns (Greer) and Crain, Chicago, IL, USA

Method for Abatement of VOC in Exhaust Gases by Wet Pulse Corona Discharge

Gutson, A., Inventor; Fridman, A., Inventor; Kennedy, L., Inventor; 24 Mar 03; 12 pp.; In English

Contract(s)/Grant(s): DE-FC07-00ID13868

Patent Info.: Filed Filed 24 Mar 03; US-Patent-Appl-SN-10-531 129

Report No.(s): PB2008-101957; No Copyright; Avail.: CASI: A03, Hardcopy

A method for abatement of volatile organic compounds (VOC) in an exhaust gas stream is disclosed. That method comprises passing an exhaust gas stream (40) through a pulsed corona discharge chamber (10) in the presence of flowing water (30) to form one or more oxidation products that dissolve in the water and provide an effluent water stream (42) containing the oxidized VOC and an effluent gas stream (32) having a deleted amount of VOC. The pulsed corona discharges at a rate of about 0.01 to about 2 kHz. The ratio of the water spray rate to the exhaust gas flow is about 0.2 milliliters/minute at one standard liter per minute of exhaust gas flow, and an expenditure of not more than 50 eV per molecule of VOC is utilized. The method provides a destruction and removal efficiency of about 90 percent or more.

NTIS

Air Pollution; Electric Corona; Electric Discharges; Exhaust Gases; Organic Compounds; Pollution Control

20080037358 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Review of Air-Quality Data from January 2000 Sampling Event Amoco Oil Company Site, Sugar Creek, Missouri. Amoco-Sugar Creek (a/k/a Amoco Oil Company), Sugar Creek, Jackson County, Missouri. EPA Facility ID: MOD007161425

Jun. 22, 2004; 35 pp.; In English

Report No.(s): PB2008-102440; No Copyright; Avail.: National Technical Information Service (NTIS)

The Amoco Oil Company (Amoco) site is located in Sugar Creek, Missouri. The Norledge area of Sugar Creek, adjacent to the sites southern boundary, is an area at particular risk for off-site migration of groundwater contaminants. The Norledge area contains approximately 130 residences. As part of its Property Value Protection (PVP) program for the Norledge neighborhood, Amoco began purchasing homes and preparing them for availability on a rent-to-own basis. The Agency for Toxic Substances and Disease Registry (ATSDR) received a request from Amoco on March 10, 2000, to review January 2000 indoor air sampling results from eight Amoco-owned homes in the Norledge area. An Amoco contractor conducted the air sampling event. This health consultation evaluates only the January 2000 air sampling data from these eight Amoco-owned homes for public health significance. This health consultation is one of many ATSDR activities at this site. Details about other ATSDR evaluations are contained in the public health action plan section of this health consultation.

NTIS

Air Quality; Data Sampling; Environmental Surveys; Health; Missouri; Oils; Public Health; Sugars

20080037392 New Hampshire Dept. of Environmental Services, Concord, NH, USA

Health Consultation: Landmark Apartments, Derry, Rockingham County, New Hampshire

May 03, 2007; 13 pp.; In English

Report No.(s): PB2008-102590; No Copyright; Avail.: National Technical Information Service (NTIS)

In October 2006, the New Hampshire Department of Environmental Services (DES), Waste Management Division was contacted by residents of Landmark Apartments (Landmark) located in Derry, Rockingham County, New Hampshire. Residents were concerned that vapors from a nearby former dry cleaning establishment, Shamrock Cleaners (Site), may be migrating into their apartment units. Sanborn, Head and Associates, Inc. (SHA) was subsequently contracted by DES to conduct indoor air sampling and analysis from the basement, first floor, and second floor of Landmark on February 15-16, 2007. An outdoor ambient air sample was also collected by SHA for background comparison purposes (1). The DES Environmental Health Program (EHP) used the air samples collected by SHA to complete this health consultation. The purpose of the health consultation is to determine if inhalation of indoor air at Landmark presents a human health risk. After thorough analysis of all air data collected, EHP has concluded that adverse health effects are not expected to result from inhalation exposure to indoor air at Landmark.

NTIS

Cleaning; Drying; Health; Landmarks; New Hampshire; Vapors

20080037400 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Air Exposure Pathway Assessment, Fallon Leukemia Cluster Investigation, Fallon, Churchill County, Nevada

Feb. 12, 2003; 172 pp.; In English

Report No.(s): PB2008-102589; No Copyright; Avail.: National Technical Information Service (NTIS)

The Nevada State Health Division has been investigating a childhood leukemia cluster in the area of Fallon, Nevada, in Churchill County since late summer of 2000. The Nevada State Health Division requested technical assistance from the Agency for Toxic Substances and Disease Registry (ATSDR) and the Centers for Disease Control and Preventions National Center for Environmental Health to aid in the investigation. ATSDR was asked to help identify possible chemical releases, to evaluate environmental data, and determine whether environmental exposures are associated with the childhood leukemia cluster in Fallon, Nevada. The area evaluated is larger than the city of Fallon, but smaller than Churchill County. Because of the extensive work involved in conducting an exposure pathway analysis for such an area, ATSDR divided its pathway analysis into segments according to environmental media. This report specifically addresses the exposure pathway analysis for air.

NTIS

Exposure; Health; Leukemias; Nevada

20080037525 Idaho Univ., Moscow, ID, USA

Characterization of Catalytic Igniter Performance and Emissions

Boles, J.; Cordon, D.; Olberding, J.; Harper, M.; Lounsbury, R.; Feb. 2006; 72 pp.; In English

Contract(s)/Grant(s): DTRS98-G-0027

Report No.(s): PB2008-101710; No Copyright; Avail.: CASI: A04, Hardcopy

Work on this project was focused in three main areas. Continuation of emissions and performance characterization of the ethanol/water fueled transit van was done by improving the cold-start ability, changing to a more powerful Engine Control Unit (ECU), and five-gas emissions were collected using a modal test cycle. Further data reduction was performed on the Yanmar diesel conversion that yields more accurate results of brake-specific fuel consumption and emissions. Lastly, in preparation for creating the new laboratory space in the University of Iowa Boise Center a state-of-the-art literature review was conducted on ethanol/water fuel and catalytic ignition. Initial setup of the laboratory space has already been undertaken.

NTIS

Ethyl Alcohol; Exhaust Emission; Igniters; Ignition; Water

20080037528 Government Accountability Office, Washington, DC, USA

Hazardous Waste: Information on How DOD and Federal and State Regulators Oversee the Off-Site Disposal of Waste from DOD Installation

Nov. 2007; 43 pp.; In English

Report No.(s): PB2008-101594; GAO-08-74; No Copyright; Avail.: CASI: A03, Hardcopy

Military installations operated by the Department of Defense (DOD) can generate hazardous waste during routine operations, such as the repair and maintenance of weapon systems and equipment, or during an environmental cleanup related to past operations. The proper disposal of hazardous waste, especially when it is taken to an off-site location, is essential to ensuring the health and safety of communities across the country. This report describes (1) DOD's procedures for selecting hazardous waste transporters and treatment, storage, and disposal facilities, and ensuring that they properly dispose of hazardous waste; (2) the role of the Environmental Protection Agency (EPA) and state agencies in ensuring hazardous waste is disposed of safely and in accordance with laws and regulations; and (3) the information that facilities and regulators must publicly report regarding a release of hazardous waste and the enforcement actions taken against facilities found in violation of the applicable laws and regulations. GAO reviewed applicable laws, regulations, and policies, and interviewed federal and state officials. GAO does not make any recommendations in this report. EPA generally agreed with the report, while DOD did not comment on the report. Both agencies provided technical comments which were incorporated. DOD primarily relies on private contractors to handle the off-site disposal of hazardous waste generated by its installations and has procedures aimed at ensuring that its contractors select appropriate transporters and treatment, storage, and disposal facilities.

NTIS

Defense Program; Hazardous Wastes; Installing; Regulators; Waste Disposal

20080037529 Government Accountability Office, Washington, DC, USA

Securing U.S. Nuclear Material: DOE Has Made Little Progress Consolidating and Disposing of Special Nuclear Material

Oct. 2007; 33 pp.; In English

Report No.(s): PB2008-101593; GAO-08-72; No Copyright; Avail.: CASI: A03, Hardcopy

The Department of Energy (DOE) recognizes that a terrorist attack on a DOE site containing material that can be used in a nuclear weapon could have devastating consequences. DOE currently stores special nuclear material at 10 sites in 8 states. To reduce security costs, DOE plans to consolidate the material at fewer sites and dispose of material that it no longer needs. In 2005, DOE chartered the Nuclear Material Disposition and Consolidation Coordination Committee (the committee) to plan for consolidation and disposition of DOE's special nuclear material. GAO was asked to (1) examine DOE's progress in consolidating and disposing of special nuclear material and (2) determine if DOE's plans to consolidate and dispose of special nuclear material can be implemented on schedule and within cost. To do this, GAO reviewed the committee's plans and discussed consolidation and disposition with DOE officials. Factors that have contributed to DOE's limited progress in finalizing plans include leadership changes on the committee and uncertainty over who in the department has final approval authority for the committee's plans. Because of such factors, DOE is unlikely to meet its goal of completing all eight implementation plans by December 2008. DOE cannot ensure that its plans are carried out on schedule and within cost because the plans drafted to date have only limited descriptions of organizational roles and responsibilities and lack performance measures to monitor the department's progress toward meeting its consolidation and disposition goals.

NTIS

Disposal; Radioactive Wastes; Security

20080037706 National Inst. for Occupational Safety and Health, Pittsburgh, PA, USA

Water Well Safety Bits: Health and Safety Information for the Water Well Industry

Reinke, D. C.; Sep. 2005; 15 pp.; In English

Report No.(s): PB2008-102547; DHHS/PUB/NIOSH-2005-160; No Copyright; Avail.: National Technical Information Service (NTIS)

Water well drillers are exposed to high levels of noise while working. NIOSH researchers have found that water well drillers are exposed to levels above 85 dB(A) while performing certain tasks during a typical drilling job. Noise levels consistently over 85 dB(A) during an 8-hour work shift are hazardous and lead to hearing loss in workers. Finding ways to reduce noise exposure is difficult because of many factors. The work environment is constantly changing because of the location of jobs and environmental factors. Drillers and owners can work together to prevent noise-induced hearing loss, and measures can be taken to reduce exposure to hazardous noise. A water well drilling site is full of potential hazards. Most common among these hazards is electricity, which was the cause of 21 fatalities among water well drillers during 1992-2000. Nineteen of these fatalities occurred while workers were drilling and/or servicing a water pump or when the rig contacted overhead power lines. Owners and employees should work together to create jobsite and task-specific electrical safety guidelines. The water well industry has a workforce with many years of experience. Members of the 'Baby Boomer' generation have filled drillers' ranks over the past 20 years. As these Boomers start to retire, company owners need to pass on these workers' experiences to inexperienced workers. Today's younger workers learn and think about their jobs differently than their parents or grandparents. To help train younger workers, companies need to know more about these workers and their preferred learning styles.

NTIS

Auditory Defects; Drilling; Health; Industries; Safety; Water; Wells

20080037723 National Energy Technology Lab., Pittsburgh, PA USA

Carbon Dioxide Separation with Supported Ionic Liquid Membranes

Luebke, D.; Iiconich, J. B.; Myers, C.; Pennline, H. W.; January 2007; 7 pp.; In English

Report No.(s): DE2007-913401; DOE/NETL-IR-2007-124; No Copyright; Avail.: Department of Energy Information Bridge

Supported liquid membranes are a class of materials that allow the researcher to utilize the wealth of knowledge available on liquid properties as a direct guide in the development of a capture technology. These membranes also have the advantage of liquid phase diffusivities higher than those observed in polymeric membranes which grant proportionally greater permeabilities. The primary shortcoming of the supported liquid membranes demonstrated in past research has been the lack of stability caused by volatilization of the transport liquid. Ionic liquids, which possess high carbon dioxide solubility relative to light gases such as hydrogen, are an excellent candidate for this type of membrane since they have negligible vapor pressure

and are not susceptible to evaporation. A study has been conducted evaluating the use of several ionic liquids, including 1-hexyl-3-methyl-imidazolium bis(trifuoromethylsulfonyl)imide, 1-butyl-3-methyl-imidazolium nitrate, and 1-ethyl-3-methyl-imidazolium sulfate in supported ionic liquid membranes for the capture of carbon dioxide from streams containing hydrogen.
NTIS
Carbon Dioxide; Liquids; Membranes

20080037724 California Univ., Berkeley, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Seasonal Perspective on Regional Air Quality in Central California - Phase 1
Harley, R. A.; Dec. 2006; 126 pp.; In English
Report No.(s): DE2007-913278; No Copyright; Avail.: National Technical Information Service (NTIS)

Central California spans a wide variety of urban, agricultural, and natural terrain, including the San Francisco Bay area, the Central Valley, and the Sierra Nevada Mountains. Population within this region is growing rapidly, and there are persistent, serious air pollution problems including fine particulate matter (PM2.5) and ozone. Summertime photochemical air pollution is the focus of the present study, which represents a first phase in the development and application of a modeling capability to assess formation and transport of ozone and its precursors within Central California over an entire summer season. This contrasts with past studies that have examined pollutant dynamics for a few selected high-ozone episodes each lasting 3-5 days. The Community Multiscale Air Quality model (CMAQ) has been applied to predict air pollutant formation and transport in Central California for a 15-day period beginning on July 24, 2000. This period includes a 5-day intensive operating period (July 29 to August 2) from the Central California Ozone Study (CCOS). Day-specific meteorological conditions were modeled by research collaborators at NOAA using a mesoscale meteorological model (MM5). Pollutant emissions within the study domain were based on CARB emission inventory estimates, with additional efforts conducted as part of this research to capture relevant emissions variability including (1) temperature and sunlightdriven changes in biogenic VOC, (2) weekday/weekend and diurnal differences in lightduty (LD) and heavy-duty (HD) motor vehicle emissions, (3) effects of day-specific meteorological conditions on plume rise from point sources such as power plants.
NTIS
Air Pollution; Air Quality; Pollution Monitoring

20080037725 Los Alamos National Lab., NM USA
2006 LANL Radionuclide Air Emissions Report
Fuehne, D. P.; Jun. 2007; 50 pp.; In English
Report No.(s): DE2007-913269; LA-14339; No Copyright; Avail.: National Technical Information Service (NTIS)

This report describes the impacts from emissions of radionuclides at Los Alamos National Laboratory (LANL) for calendar year 2006. This report fulfills the requirements established by the Radionuclide National Emissions Standards for Hazardous Air Pollutants (Rad-NESHAP). This report is prepared by LANL's Rad-NESHAP compliance team, part of the Environmental Protection Division. The information in this report is required under the Clean Air Act and is being reported to the U.S. Environmental Protection Agency (EPA). The highest effective dose equivalent (EDE) to an off-site member of the public was calculated using procedures specified by the EPA and described in this report. LANL's EDE was 0.47 mrem for 2006. The annual limit established by the EPA is 10 mrem per year.
NTIS
Air Pollution; Migration; Pollution Control; Radioactive Isotopes

20080037727 National Energy Technology Lab., Pittsburgh, PA USA; National Energy Technology Lab., Morgantown, WV, USA
Stability Regimes of Turbulent Nitrogen-Diluted Hydrogen Jet Flames
Weiland, N.; Strakey, P.; January 2007; 8 pp.; In English
Report No.(s): DE2007-913258; DOE/NETL-IR-2007-099; No Copyright; Avail.: National Technical Information Service (NTIS)

One option for combustion in zero-emission Integrated Gasification Combined Cycle (IGCC) power plants is non-premixed combustion of nitrogen-diluted hydrogen in air. An important aspect to non-premixed combustion is flame stability or anchoring, though only a few fundamental stability studies of these flames have taken place to date. The following paper presents the results of experiments investigating the effects of nitrogen diluent fraction, jet diameter, and exit velocity

on the static stability limits of a turbulent hydrogen jet flame issuing from a thin-lipped tube into a quiescent atmosphere. Four different stability limits are observed: detachment from the burner lip, reattachment to the burner lip, transition from a laminar lifted flame base to blowout or to a turbulent lifted flame, and transition from a turbulent lifted flame to blowout. The applicability of existing theories and correlations to the stability results is discussed. These results are an important step in assessing the viability of a non-premixed combustion approach using hydrogen diluted with nitrogen as a fuel.
NTIS
Dilution; Flames; Gas Jets; Hydrogen; Jet Flow; Nitrogen; Nitrogen Oxides; Stability; Turbulence

20080037768 Energy Information Administration, Washington, DC, USA
Emissions of Greenhouse Gases in the USA, 2006
Nov. 2007; 62 pp.; In English
Report No.(s): PB2008-103337; DOE/EIA-0573(2006); No Copyright; Avail.: National Technical Information Service (NTIS)

This report fifteenth annual report presents the Energy Information Administrations latest estimates of emissions for carbon dioxide, methane, nitrous oxide, and other greenhouse gases. Most of these estimates are based on activity data and applied emissions factors and not on measured or metered emissions. A limited number of emissions estimates, such as for methane from coal mine ventilation, are obtained through direct measurement.
NTIS
Greenhouse Effect; United States; Statistics

20080037769 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Health Consultation: State of Kentucky Mercury Contamination in Indoor Air, Villa Hills, Kenton County, Kentucky
Mar. 15, 2005; 10 pp.; In English
Report No.(s): PB2008-103259; No Copyright; Avail.: CASI: A02, Hardcopy

On March 8, 2005, the Agency for Toxic Substances and Disease Registry (ATSDR) received a request from the U.S. Environmental Protection Agency (EPA) to evaluate mercury vapor levels detected in a home in Villa Hills, Kenton County, Kentucky. The site owners reported to EPA that mercury vials had been in the home for about 8 to 10 years. Based on air monitoring performed by EPA, it is suspected that those playing with the vials had contaminated some areas of the home with mercury. EPA asked ATSDR to: Evaluate the public health significance of exposures to indoor mercury vapor air concentrations within this home, and determine whether a clean-up goal of 0.3 microgram per cubic meter (ig/m 3) of mercury vapor in this homes indoor air would be protective of public health.
NTIS
Contamination; Hazards; Health; Indoor Air Pollution; Kentucky; Mercury (Metal)

20080037824 Los Alamos National Lab., NM USA
Environmental Continuous Air Monitor Inlet with Combined Preseparator and Virtual Impactor
Rodgers, J. C., Inventor; 18 Oct 04; 7 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 18 Oct 04; US-Patent-Appl-SN-10-967 568
Report No.(s): PB2008-102795; No Copyright; Avail.: CASI: A02, Hardcopy

An inlet for an environmental air monitor is described wherein a pre-separator interfaces with ambient environment air and removes debris and insects commonly associated with high wind outdoors and a deflector plate in communication with incoming air from the pre-separator stage, that directs the air radially and downward uniformly into a plurality of accelerator jets located in a manifold of a virtual impactor, the manifold being cylindrical and having a top, a base, and a wall, with the plurality of accelerator jets being located in the top of the manifold and receiving the directed air and accelerating directed air, thereby creating jets of air penetrating into the manifold, where a major flow is deflected to the walls of the manifold and extracted through ports in the walls. A plurality of receiver nozzles are located in the base of the manifold coaxial with the accelerator jets, and a plurality of matching flow restrictor elements are located in the plurality of receiver nozzles for balancing and equalizing the total minor flow among all the plurality of receiver nozzles, through which a lower, fractional flow extracts large particle constituents of the air for collection on a sample filter after passing through the plurality of receiver nozzles and the plurality of matching flow restrictor elements.
NTIS
Air Intakes; Dust; Fouling; Impactors; Monitors; Patent Applications

20080038073 Lawrence Livermore National Lab., Livermore, CA USA
Chemical Thermal Desorption System
Eckels, J. D., Inventor; Koester, C., Inventor; Alcaraz, A., Inventor; 26 Oct 04; 6 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 26 Oct 04; US-Patent-Appl-SN-10-974 211
Report No.(s): PB2008-101609; No Copyright; Avail.: CASI: A02, Hardcopy

A field portable chemical thermal desorption system. The system comprises a desorption tube, an injection needle operatively connected to the desorption tube, a needle valve operatively connected to the injection needle, a heater operatively connected to the desorption tube, heater controller operatively connected to the heater, a gas supply operatively connected to the desorption tube, and a pressure regulator operatively connected to the gas supply.
NTIS
Air Pollution; Air Sampling; Chemical Composition; Desorption; Monitors; Patent Applications

20080038075 Ingersoll (Buchanan) LLP, San Diego, CA, USA; California Inst. of Tech., Pasadena, CA USA
Use of Spatiotemporal Response Behavior in Sensor Arrays to Detect Analytes in Fluids
Lewis, N. S., Inventor; Freund, M. S., Inventor; Briglin, S. M., Inventor; 8 Feb 05; 26 pp.; In English
Contract(s)/Grant(s): DAAK60-97-K-9503
Patent Info.: Filed Filed 8 Feb 05; US-Patent-Appl-SN-11-054 055
Report No.(s): PB2008-101610; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, systems and sensor arrays are provided implementing techniques for detecting an analyte in a fluid. The techniques include providing a sensor array including at least a first sensor and a second sensor in an arrangement having a defined fluid flow path, exposing the sensor array to a fluid including an analyte by introducing the fluid along the fluid flow path, measuring a response for the first sensor and the second sensor, and detecting the presence of the analyte in the fluid based on a spatio-temporal difference between the responses for the first and second sensors.
NTIS
Patent Applications; Detection; Arrays

20080038650 Idaho National Engineering Lab., Idaho Falls, ID, USA
Center for Advanced Energy Studies (CAES) Strategic Plan
Kostelnik, K.; Perry, K.; Jul. 01, 2007; 13 pp.; In English
Contract(s)/Grant(s): DE-AC07-05ID14517
Report No.(s): DE2007-915539; INL/EXT-07-12950; No Copyright; Avail.: Department of Energy Information Bridge

Twenty-first century energy challenges include demand growth, national energy security, and global climate protection. The Center for Advanced Energy Studies (CAES) is a public/private partnership between the State of Idaho and its academic research institutions, the federal government through the U.S. Department of Energy (DOE) and the Idaho National Laboratory (INL) managed by the Battelle Energy Alliance (BEA). CAES serves to advance energy security for our nation by expanding the educational opportunities at the Idaho universities in energy-related areas, creating new capabilities within its member institutions, and delivering technological innovations leading to technology-based economic development for the intermountain region. CAES has developed this strategic plan based on the Balanced Scorecard approach. A Strategy Map (Section 7) summarizes the CAES vision, mission, customers, and strategic objectives. Identified strategic objectives encompass specific outcomes related to three main areas: Research, Education, and Policy. Technical capabilities and critical enablers needed to support these objectives are also identified. This CAES strategic plan aligns with and supports the strategic objectives of the four CAES institutions.
NTIS
Energy Conservation; Management Planning

20080038724 Houston Univ., TX USA
Improved Pinning Morphology in HTS with Order of Magnitude Increase in Jc and Pinned Field
Mayes, Bill W; Weinstein, Roy; Jan 27, 2008; 16 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0215
Report No.(s): AD-A482327; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482327

In 2004 most scientists working to increase Jc in HTS believed that continuous columnar pinning centers (CCPCs) were

ideal. This was based upon elegant ionic radiation studies yielding increased Jc. Our contrary evidence augered for performing an experiment comparing Jc for a wide range of pinning center (PC) continuities and diameters (including CCPCs) produced by high energy ions. (Increased discontinuity correlated with lower diameter.) Multiple-in-line-damage (MILD) PCs had not been systematically studied before this. Results showed an increase in Jc by a factor of 17, for discontinuity near 67%, with PC diameter ~ 6.8 nm and fluence of 10*12/cm*2. Analysis, assuming that the Jc enhancement was caused by the over 10-fold decrease in MILD PC/ CCPC damage, matched the data well except for a Jc fishtail effect, and Jc increase vs. fluence. Analysis of the discontinuities showed they enhanced vortex wandering, and produced entanglement which increased at higher fields, resulting in a fishtail. Wandering vortices jump from gaps in ion tracks to adjacent continuous tracks, diminishing pinning losses. At higher fluence, closer tracks leave less unpinned vortex length. Thus, discontinuities encourage entanglement while restoring pinned vortex length. Both effects increase vortex binding and Jc, while CCPCs suppress entanglement.
DTIC
High Temperature Superconductors; Morphology; Pinning

20080038769 Army Engineer Research and Development Center, Vicksburg, MS USA
Investigations of the Controlling Factors for Air Emissions Associated With the Dredging of Indiana Harbor and Canal (IHC) and CDF Operations
Thibodeaux, Louis J; Valsaraj, Kalliat T; Ravikrishna, Raghunathan; Fountain, Kenneth; Price, Cynthia L; Apr 2008; 142 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482382; ERDC/EL-TR-08-17; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482382

This report describes a series of investigations conducted examining a number of specific factors that control air emissions associated with the dredging of Indiana Harbor and Canal (IHC) and associated IHC Confined Disposal Facility (CDF) operations. Three primary objectives were addressed: (1) measurement of Henry's Law constants and sediment-water desorption constants for various chemicals in the IHC sediment, (2) measurement of volatile emissions from IHC sediments exposed to air, and (3) reformulation of models for air emissions from dredging of contaminated sediment and handling of dredged materials. Equilibrium sediment-water partition constants for PAHs and PCBs in IHC sediments were measured in laboratory investigations. These values are presented and compared to literature values. Laboratory experiments measuring the water-air partition constant (Henry's Law constant) were conducted using IHC pore water. Experimentally determined Henry's constants for PAHs and PCBs are presented and compared to literature values. Investigations from wind tunnel studies measuring semi-volatile emissions from IHC sediments are summarized. A model for estimating emissions from mechanical or hydraulic delivery of dredged IHC sediments is presented. Chemical volatilization models for emissions from dredging operations associated with IHC sediment and site conditions are discussed.
DTIC
Air Pollution; Canals; Dredged Materials; Dredging; Emission; Harbors; Mathematical Models

46
GEOPHYSICS

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

20080037489 Atmospheric and Environmental Research, Inc., Lexington, MA USA
An Alternative Method of Computing Altitude Adjustment Corrected Geomagnetic Coordinates as Applied to IGRF Epoch 2005
Heres, William; Bonito, Nelson A; Jul 20, 2007; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-04-C-0069; Proj-1010
Report No.(s): AD-A482074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An updated set of altitude adjusted corrected geomagnetic coordinates has been calculated. The coordinates are based on the 10th generation IGRF model coefficients for Epoch 2005. The corrected geomagnetic coordinates at ground level are available as a lookup table, and a corresponding set of spherical harmonic coefficients for use in computing altitude adjusted corrected geomagnetic coordinates at various altitudes (after Baker and Wing [1998]) are also available. Both products are geared towards replacing the tables and coefficients used in Hein and Bhavnani [1996]. An alternative algorithm is introduced

that assists in solving discontinuity problems found near the South Atlantic Anomaly and the dip equator when calculating geomagnetic coordinates from a geographic coordinate basis.
DTIC
Altitude; Coordinates; Geomagnetism

20080037580 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spatial and Temporal Inter-Relationship between Anomalies and Trends of Temperature, Moisture, Cloud Cover and OLR as Observed by AIRS/AMSU on Aqua
Susskind, Joel; Molnar, Gyula; [2009]; 1 pp.; In English; American Meteorological Society 89th Annual Meeting, 11-15 Jan. 2009, Phoenix, AZ, USA; No Copyright; Avail.: Other Sources; Abstract Only

AIRS/AMSU is the advanced IR/MW atmospheric sounding system launched on EOS Aqua in May 2002. Products derived from AIRS/AMSU by the AIRS Science Team include surface skin temperature and atmospheric temperature profiled; atmospheric humidity profiles, fractional cloud clover and cloud top pressure, and OLR. Products covering the period September 2002 through the present have been derived from AIRS/AMSU using the AIRS Science Team Version 5 retrieval algorithm. In this paper, we will show results covering the time period September 2006 - November 2008. This time period is marked by a substantial warming trend of Northern Hemisphere Extra-tropical land surface skin temperatures, as well as pronounced El Nino - La Nina episodes. These both influence the spatial and temporal anomaly patterns of atmospheric temperature and moisture profiles, as well as of cloud cover and Clear Sky and All Sky OLR. The relationships between temporal and spatial anomalies of these parameters over this time period, as determined from AIRS/AMSU observations, will be shown with particular emphasis on which contribute significantly to OLR anomalies in each of the tropics and extra-tropics. Results will also be shown to evaluate the anomalies and trends of temperature profiles and OLR as determined from analysis of AIRS/AMSU data. Global and regional trends during the 6 1/3 year time period are not necessarily indicative of what has happened in the past, or what may happen in the future. Nevertheless, the inter-relationships of spatial and temporal anomalies of atmospheric geophysical parameters with those of surface skin temperature are indicative of climate processes, and can be used to test the performance of climate models when driven by changes in surface temperatures.
Author
Atmospheric Sounding; Atmospheric Temperature; Atmospheric Moisture; Cloud Cover; Geophysics

20080037618 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Plasmaspheric Plumes Observed by the CLUSTER and IMAGE Spacecraft
Fung, S. F.; Benson, R. F.; Garcia, L. N.; Adrian, M. L.; Sandel, B.; Goldstein, M. L.; September 22, 2008; 1 pp.; In English; Dynamical Processes in Space Plasmas, 22-27 Sep. 2008, Portsmouth, NH, USA; Copyright; Avail.: Other Sources; Abstract Only

Global IMAGE/EUV observations have revealed complex changes in plasmaspheric structures as the plasmasphere responds to geomagnetic activity while remaining under varying degrees of influence by co-rotation, depending on the radial distance. The complex plasmaspheric dynamics, with different scales of variability, is clearly far from being well understood. There is now renewed interest in the plasmasphere due to its apparent connections with the development of the ring current and radiation belt, and loss of ionospheric plasmas. Early in the mission, the Cluster spacecraft only crossed the plasmapause (L - 4) occasionally and made measurements of the outer plasmasphere and plasmaspheric drainage plumes. The study by Darrouzet et al. [2006] provided detailed analyses of in situ Cluster observations and IMAGE EUV observations of three plasmaspheric plumes detected in April-June, 2002. Within the next couple of years, Cluster orbit will change, causing perigee to migrate to lower altitudes, and thus providing excellent opportunities to obtain more detailed measurements of the plasmasphere. In this paper, we report our analyses of the earlier Cluster-IMAGE events by incorporating the different perspectives provided by the IMAGE Radio Plasma Imager (RPI) observations. We will discuss our new understanding of the structure and dynamics of the Cluster-IMAGE events.
Author
Plasmasphere; Satellite Observation; Plumes; Geomagnetism; Plasma Dynamics

20080037744 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Technology 5 Multi-Point Observations of Temporal Variability of Field-Aligned Currents
Le, Guan; Wang, Yongli; Slavin, James A.; Strangeway, Robert J.; June 16, 2008; 1 pp.; In English; 2008 Asia Oceania Geosciences Society (AOGS), 16-20 Jun. 2008, Busan, Korea, Republic of; Copyright; Avail.: Other Sources; Abstract Only

Space Technology 5 (ST5) is a three micro-satellite constellation deployed into a 300 x 4500 km, dawn-dusk,

sun-synchronous polar orbit from March 22 to June 21, 2006, for technology validations. In this paper, we present a study of the temporal variability of field-aligned currents using multi-point magnetic field measurements from ST5. The data demonstrate that meso-scale current structures are commonly embedded within large-scale field-aligned current sheets. The meso-scale current structures are very dynamic with highly variable current density and/or polarity in time scales of approximately 10 min. They exhibit large temporal variations during both quiet and disturbed times in such time scales. On the other hand, the data also shown that the time scales for the currents to be relatively stable are approximately 1 min for meso-scale currents and approximately 10 min for large scale current sheets. These temporal features are obviously associated with dynamic variations of their particle carriers (mainly electrons) as they respond to the variations of the parallel electric field in auroral acceleration region. The characteristic time scales for the temporal variability of meso-scale field-aligned currents are found to be consistent with those of auroral parallel electric field.
Author
Field Aligned Currents; Temporal Distribution; Variability; Magnetic Fields; Earth Magnetosphere

20080038044 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Vegetation Correction Methodology for Time Series Based Soil Moisture Retrieval From C-band Radar Observations
Joseph, Alicia T.; O'Neil, P. E.; vanderVelde, R.; Gish, T.; July 06, 2008; 2 pp.; In English; IEEE Geoscience and Remote Sensing Symposium, 6-11 Jul. 2008, Boston, MA, USA; Copyright; Avail.: Other Sources; Abstract Only

A methodology is presented to correct backscatter (sigma(sup 0)) observations for the effect of vegetation. The proposed methodology is based on the concept that the ratio of the surface scattering over the total amount of scattering (sigma(sup 0)(sub soil)/sigma(sup 0)) is only affected by the vegetation and can be described as a function of the vegetation water content. Backscatter observations sigma(sup 0) from the soil are not influenced by vegetation. Under bare soil conditions (sigma(sup 0)(sub soil)/sigma(sup 0)) equals 1. Under low to moderate biomass and soil moisture conditions, vegetation affects the observed sigma(sup 0) through absorption of the surface scattering and contribution of direct scattering by the vegetation itself. Therefore, the contribution of the surface scattering is smaller than the observed total amount of scattering and decreases as the biomass increases. For dense canopies scattering interactions between the soil surface and vegetation elements (e.g. leaves and stems) also become significant. Because these higher order scattering mechanisms are influenced by the soil surface, an increase in (sigma(sup 0)(sub soil)/sigma(sup 0)) may be observed as the biomass increases under densely vegetated conditions. This methodology is applied within the framework of time series based approach for the retrieval of soil moisture. The data set used for this investigation has been collected during a campaign conducted at USDA's Optimizing Production Inputs for Economic and Environmental Enhancement OPE-3) experimental site in Beltsville, Maryland (USA). This campaign took place during the corn growth cycle from May 10th to 0ctober 2nd, 2002. In this period the corn crops reached a vegetation water content of 5.1 kg m(exp -2) at peak biomass and a soil moisture range varying between 0.00 to 0.26 cubic cm/cubic cm. One of the deployed microwave instruments operated was a multi-frequency (C-band (4.75 GHz) and L-band (1.6 GHz)) quad-polarized (HH, HV, VV, VH) radar which was mounted on a 20 meter long boom. In the OPE-3 field campaign, radar observations were collected once a week at nominal times of 8 am, 10 am, 12 noon and 2 pm. During each data run the radar acquired sixty independent measurements within an azimuth of 120 degrees from a boom height of 12.2 m and at three different incidence angles (15,35, and 55 degrees). The sixty observations were averaged to provide one backscatter value for the study area and its accuracy is estimated to be 51.0 dB. For this investigation the C-band observations have been used. Application of the proposed methodology to the selected data set showed a well-defined relationship between (sigma(sup 0)(sub soil)/sigma(sup 0)) and the vegetation water content. It is found that this relationship can be described with two experimentally determined parameters, which depend on the sensing configuration (e.g. incidence angle and polarization). Through application of the proposed vegetation correction methodology and the obtained parameterizations, the soil moisture retrieval accuracy within the framework of a time series based approach is improved from 0.033 to 0.032 cubic cm/cubic cm, from 0.049 to 0.033 cubic cm/cubic cm and from 0.079 to 0.047 cubic cm/cubic cm for incidence angles of 15,35 and 55 degrees, respectively. Improvement in soil moisture retrieval due to vegetation correction is greater at larger incidence angles (due to the increased path length and larger vegetation effects on the surface signal at the larger angles).
Author
Biomass; Moisture Content; Soil Moisture; Soils; Time Series Analysis; Vegetation; Estimating

20080039157 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The 'Weekend Effect' in Tropospheric NO2 Seen from the Ozone Monitoring Instrument
Bucsela, E.; Wenig, M.; Celarier, E.; Gleason, J.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The Ozone Monitoring Instrument has gathered daily global data on NO2 and other atmospheric trace gases since its

launch on the EOS Aura satellite in 2004. The large accumulated data set makes it possible to monitor changes of both meteorological and anthropogenic origin in tropospheric NOz amounts. In particular, averages on time scales on the order of a year show a distinct 'weekend effect' in NO2 variation, with smaller NO2 amounts seen on Saturday and/or Sunday than on the remaining weekdays. Using the OMI NO2 Standard Product (SP), we examine this effect in relation to geopolitical boundaries and investigate implications for identifying sources. We also use the SP data to find evidence for other short-term anthropogenic changes in NO2 emissions over heavily polluted regions including the USA, Europe and China.
Author
Troposphere; Nitrogen Dioxide; Variations; Atmospheric Chemistry

20080039170 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Alaska: Glaciers of Kenai Fjords National Park and Katmai National Park and Preserve (Chapter 12)
Giffen, Bruce A.; Hall, Dorothy K.; Chien, Janet Y.L.; [2007]; 20 pp.; In English; 64th Annual Meeting of the Eastern Snow Conference (ESC), 29 May - 1 Jun. 2007, St. John's, Newfoundland, Canada; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Much recent research points to the shrinkage of the Earth's small glaciers, however, few studies have been performed to quantify the amount of change over time. We measured glacier-extent changes in two national parks in southeastern Alaska. There are hundreds of glaciers in Kenai Fjords National Park (KEFJ) and Katmai National Park and Preserve (KATM) covering over 2373 sq km of parkland. There are two primary areas of glaciation in KEFJ - the Harding Icefield and the Grewingk-Yalik Glacier Complex, and three primary areas of glaciation in KATM - the Mt. Douglas area, the Kukak Volcano to Mt. Katmai area and the Mt. Martin area. We performed glacier mapping using satellite imagery, from the 1970s, 1980s, and from 2000. Results of the analysis show that there has been a reduction in the amount of glacier ice cover in the two parks over the study period, of approximately 22 sq km of ice, approximately - 1.6% from 1986 to 2000 (for KEFJ), and of approximately 76 sq km of glacier ice, or about -7.7% from 1986187 to 2000 (for KATM). In the future, measurements of surface elevation changes of these ice masses should be acquired; together with our extent-change measurements, the volume change of the ice masses can then be determined to estimate their contribution to sea-level rise. The work is a continuation of work done in KEFJ, but in KATM, our measurements represent the first comprehensive study of the glaciers in this remote, little-studied area.
Author
Alaska; Glaciers; Melting

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080037368 Pennsylvania State Univ., University Park, PA, USA
Virtual Tall Tower Network for Understanding Continental Sources and Sinks of CO2. Report from September 15, 2003 to September 14, 2006
January 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-FG02-03ER63654
Report No.(s): DE2007-900564; No Copyright; Avail.: National Technical Information Service (NTIS)

Lack of continental mixing ratio data is a primary limit to our ability to infer continental sources and sinks of CO2 via atmospheric inversions. The project examines the hypothesis that relatively lowcost, well-calibrated CO2 mixing ratio measurements, deployed on existing flux towers, will substantially improve our ability to determine sources and sinks of CO2 from North American terrestrial ecosystems. Both the accuracy of estimates of the net annual North American carbon balance and the spatial resolution of these estimates will be improved. These overarching hypotheses cannot be addressed by this project alone. This project, however, represents an essential contribution to these broader goals. In particular, this project aims to establish the network of well-calibrated CO2 mixing ratio measurements utilizing a subset of the AmeriFlux towers. Further, we hypothesize that the value of the mixing ratio data will be enhanced by collocation with flux measurements, serving to regionalize the flux data and encourage the integration of flux measurements into continental-scale carbon budget analyses. NTIS
Carbon; Carbon Cycle; Carbon Dioxide; Sinks; Towers

20080037527 Government Accountability Office, Washington, DC, USA

Hurricane Katrina: Ineffective FEMA Oversight of Housing Maintenance Contracts in Mississippi Resulted in Millions of Dollars of Waste and Potential Fraud

Nov. 2007; 57 pp.; In English

Report No.(s): PB2008-101596; GAO-08-106; No Copyright; Avail.: CASI: A04, Hardcopy

Hurricane Katrina destroyed or damaged 134,000 homes and 10,000 rental units in Mississippi alone. The Federal Emergency Management Agency (FEMA) in part responded by providing displaced individuals with temporary housing in the form of mobile homes and travel trailers, placed on both private property and at FEMA-constructed group sites. In 2006, FEMA awarded 10 contracts in Mississippi to maintain and deactivate (MD) the housing units and 5 for group site maintenance (GSM). GAO was asked to investigate whether there were indications of fraud, waste, and abuse related to FEMA's oversight of these 15 contracts. GAO analyzed FEMA's issuance of task orders, tested a representative sample of monthly maintenance inspections payments, prepared case studies detailing the costs related to trailers placed at group sites, and investigated improper activity related to the contracts. FEMA's ineffective oversight resulted in an estimated $30 million in wasteful and improper or potentially fraudulent payments to the MD contractors from June 2006 through January 2007 and likely led to millions more in unnecessary spending beyond this period.

NTIS

Emergencies; Hurricanes; Maintenance

20080037546 Army Research Lab., White Sands Missile Range, NM USA

Addendum to ARL-TR-4005 Adding Weather to Wargames

O'Brien, Sean G; Shirkey, Richard C; May 2008; 44 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482026; ARL-TR-4460; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This addendum presents updated graphical representations of the selected Target Acquisition Weapons Software (TAWS) output and also the coefficients for the third order polynomial fits that originally appeared in appendices B and

DTIC

Target Acquisition; War Games; Weather

20080037566 NASA Langley Research Center, Hampton, VA, USA

High Vertically Resolved Atmospheric and Surface/Cloud Parameters Retrieved with Infrared Atmospheric Sounding Interferometer (IASI)

Zhou, Daniel K.; Liu, Xu; Larar, Allen M.; Smith, WIlliam L.; Taylor, Jonathan P.; Schluessel, Peter; Strow, L. Larrabee; Mango, Stephen A.; March 24, 2008; 1 pp.; In English; Progress in Electromagnetics Research Symposium (PIERS 2008), 24-28 Mar. 2008, Hangzhou, China; Original contains color illustrations

Contract(s)/Grant(s): WBS 534173.02.07.9438.02; Copyright; Avail.: CASI: A01, Hardcopy

The Joint Airborne IASI Validation Experiment (JAIVEx) was conducted during April 2007 mainly for validation of the IASI on the MetOp satellite. IASI possesses an ultra-spectral resolution of 0.25/cm and a spectral coverage from 645 to 2760/cm. Ultra-spectral resolution infrared spectral radiance obtained from near nadir observations provide atmospheric, surface, and cloud property information. An advanced retrieval algorithm with a fast radiative transfer model, including cloud effects, is used for atmospheric profile and cloud parameter retrieval. This physical inversion scheme has been developed, dealing with cloudy as well as cloud-free radiance observed with ultraspectral infrared sounders, to simultaneously retrieve surface, atmospheric thermodynamic, and cloud microphysical parameters. A fast radiative transfer model, which applies to the cloud-free and/or clouded atmosphere, is used for atmospheric profile and cloud parameter retrieval. A one-dimensional (1-d) variational multi-variable inversion solution is used to improve an iterative background state defined by an eigenvector-regression-retrieval. The solution is iterated in order to account for non-linearity in the 1-d variational solution. It is shown that relatively accurate temperature and moisture retrievals are achieved below optically thin clouds. For optically thick clouds, accurate temperature and moisture profiles down to cloud top level are obtained. For both optically thin and thick cloud situations, the cloud top height can be retrieved with relatively high accuracy (i.e., error < 1 km). Preliminary retrievals of atmospheric soundings, surface properties, and cloud optical/microphysical properties with the IASI observations are obtained and presented. These retrievals will be further inter-compared with those obtained from airborne FTS system, such as the NPOESS Airborne Sounder Testbed - Interferometer (NAST-I), dedicated dropsondes, radiosondes, and ground based Raman Lidar. The capabilities of satellite ultra-spectral sounder such as the IASI are investigated indicating a high vertical structure of atmosphere is retrieved.

Derived from text

Meteorological Parameters; Atmospheric Sounding; Cloud Physics; Infrared Interferometers; Optical Properties; Thermodynamic Properties; Surface Properties; Optical Radar; Spectral Resolution

20080037567 NASA Langley Research Center, Hampton, VA, USA

Remote Sensing of Tropospheric Pollution from Space

Fishman, Jack; Bowman, Kevin W.; Burrows, John P.; Chance, Kelly V.; Edwards, David P.; Martin, Randall V.; Morris, Gary A.; Pierce, R. Bradley; Ziemke, Jerald R.; Al-Saadi, Jassim A.; Schaack, Todd K.; Thompson, Anne M.; [2008]; 59 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 281945.02.32.01.10; Copyright; Avail.: CASI: A04, Hardcopy

We review the progress of tropospheric trace gas observations and address the need for additional measurement capabilities as recommended by the National Academy of Science (NAS, 2007). Tropospheric measurements from current and earlier instruments show pollution in the Northern Hemisphere as a result of fossil fuel burning and a strong seasonal dependence with the largest amounts of photochemically-generated ozone in summer. At low latitudes, where photon flux is stronger throughout the year, trace gas concentrations are driven by the abundance of the emissions, where the largest source, biomass burning, is readily seen in carbon monoxide measurements, but lightning and biogenic trace gases may also contribute to trace gas variability. Although substantive progress has been achieved in seasonal and global mapping of a few tropospheric trace gases, satellite trace-gas observations with considerably better temporal and spatial resolution are essential to forecasting air quality at scales required by policy-makers. The concurrent use of atmospheric composition measurements for both scientific and operational purposes is a new paradigm for the atmospheric chemistry community. The examples presented illustrate both the promise and challenge of merging satellite information with in situ observations in state-of-the-art data assimilation models.

Author

Trace Elements; Atmospheric Composition; Meteorological Parameters; Photochemical Reactions; Troposphere; Trace Contaminants; Spatial Resolution; Remote Sensing; Gas Composition

20080037570 NASA Langley Research Center, Hampton, VA, USA

Retrieval with Infrared Atmospheric Sounding Interferometer and Validation during JAIVEx

Zhou, Daniel K.; Liu, Xu; Larar, Allen M.; Smith, William L.; Taylor, Jonathan P.; Schluessel, Peter; Strow, L. Larrabee; Mango, Stephen A.; May 07, 2008; 32 pp.; In English; International TOVS Study Conferences, 7-13 May 2008, Angra Dos Reis, Brazil; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 534173.02.07.9438.02; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037570

A state-of-the-art IR-only retrieval algorithm has been developed with an all-season-global EOF Physical Regression and followed by 1-D Var. Physical Iterative Retrieval for IASI, AIRS, and NAST-I. The benefits of this retrieval are to produce atmospheric structure with a single FOV horizontal resolution (approx. 15 km for IASI and AIRS), accurate profiles above the cloud (at least) or down to the surface, surface parameters, and/or cloud microphysical parameters. Initial case study and validation indicates that surface, cloud, and atmospheric structure (include TBL) are well captured by IASI and AIRS measurements. Coincident dropsondes during the IASI and AIRS overpasses are used to validate atmospheric conditions, and accurate retrievals are obtained with an expected vertical resolution. JAIVEx has provided the data needed to validate the retrieval algorithm and its products which allows us to assess the instrument ability and/or performance. Retrievals with global coverage are under investigation for detailed retrieval assessment. It is greatly desired that these products be used for testing the impact on Atmospheric Data Assimilation and/or Numerical Weather Prediction.

Author

Cloud Physics; Atmospheric Sounding; Meteorology; Algorithms; Dropsondes

20080037571 NASA Langley Research Center, Hampton, VA, USA

Inter-comparison between AIRS and IASI through Retrieved Parameters

Zhou, Daniel K.; Larar, Allen M.; Smith, William L.; Taylor, Jonathan P.; Schluessel, Peter; Strow, L. Larrabee; Mango, Steve; July 29, 2008; 1 pp.; In English; 2008 Western Pacific Geophysics Meeting, 29 Jul. - 1 Aug. 2008, Cairns, Australia; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 509496.02.01.01.03

Report No.(s): A25B-02; Copyright; Avail.: CASI: A01, Hardcopy

A State-of-the-art retrieval algorithm dealing with all-weather conditions has been applied to satellite/aircraft instruments retrieving cloud/surface and atmospheric conditions. High quality retrievals have been achieved from IASI data. Surface, cloud, and atmospheric structure and variation are well captured by IASI measurements and/or retrievals. The same retrieval algorithm is also applied to AIRS for retrieval inter-comparison. Both AIRS and IASI have a similar FOV size but AIRS has a higher horizontal resolution. AIRS data can be interpolated to IASI horizontal resolution for inter-comparison at the same

geophysical locations, however a temporal variation between AIRS and IASI observations need to be considered. JAIVEx has employed aircraft to obtain the atmospheric variation filling the temporal gap between two satellites. First results show that both AIRS and IASI have a very similar vertical resolving power, atmospheric conditions are well captured by both instruments, and radiances are well calibrated. AIRS data shown in retrievals (e.g., surface emissivity and moisture) have a relatively higher noise level. Since the this type of retrieval is very sensitive to its radiance quality, retrieval products inter-comparison is an effective way to identify/compare their radiance quality, in terms of a combination of spectral resolution and noise level, and to assess instrument performance. Additional validation analyses are needed to provide more-definitive conclusions.
Author
Surface Properties; Spectral Resolution; Cloud Physics; Emissivity; Algorithms; Meteorology; Temporal Distribution

20080037578 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Improved Determination of Surface and Atmospheric Temperatures Using Only Shortwave AIRS Channels
Susskind, Joel; Blaisdell, John; [2008]; 1 pp.; In English; American Meteorological Society 89th Annual Meeting, 11-15 Jan. 2009, Phoenix, AZ, USA; Copyright; Avail.: Other Sources; Abstract Only

The Goddard DAAC has been analyzing AIRS/AMSU sounding data using the AIRS Science Team Version 5 retrieval algorithm. The AIRS Version 5 retrieval algorithm produces significantly better temperature profiles under more difficult cloud conditions than does the AIRS Version 4 algorithm, because, following theoretical considerations, it employs 15 micron CO2 tropospheric sounding channels only for the purpose of generating cloud cleared radiances for all AIRS channels, and determines temperature profiles using only 4.2 micron AIRS observations. This approach works equally well during both daytime and night time conditions. The AIRS Version 6 retrieval algorithm takes this approach one step further, and now also determines surface skin temperatures over both land and ocean, using only shortwave AIRS window channel cloud cleared radiances. Shortwave surface spectral emissivity and spectral bi-directional reflectance are solved for simultaneously along with the surface skin temperature. Longwave surface spectral emissivity is determined in a subsequent step using only AIRS longwave window channels, using the previously determined surface skin temperature. The methodology to do this will be described, and results will be presented demonstrating significant improvement in retrieved surface skin temperatures and surface spectral emissivities compared to those obtained using Version 5, both day and night.
Author
Atmospheric Temperature; Bidirectional Reflectance; Spectral Reflectance; Surface Temperature; Emissivity; Temperature Profiles; Carbon Dioxide; Algorithms; Spectral Emission

20080037579 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Data Assimilation Experiments Using Quality Controlled AIRS Version 5 Temperature Soundings
Susskind, Joel; Reale, Oreste; [2009]; 1 pp.; In English; American Meteorological Society 89th Annual Meeting, 11-15 Jan. 2009, Phoenix, AZ, USA; Copyright; Avail.: Other Sources; Abstract Only

The AIRS Science Team Version 5 retrieval algorithm has been finalized and is now operational at the Goddard DAAC in the processing and reprocessing of all AIRS data. The AIRS Science Team Version 5 retrieval algorithm contains a number of significant improvements over Version 4. Two very significant improvements are described briefly below. 1) The AIRS Science Team Radiative Transfer Algorithm (RTA) has now been upgraded to accurately account for effects of non-local thermodynamic equilibrium on the AIRS observations. This allows for use of AIRS observations in the entire 4.3 micron CO2 absorption band in the retrieval algorithm during both day and night. Following theoretical considerations, the,AIRS Version 5 temperature profile retrieval step uses only 15 micron CO2 radiances for those channels sensitive to atmospheric emission in the stratosphere. Tropospheric temperature profile information is obtained almost exclusively from clear column radiances in the 4.3 micron CO2 band. These clear column radiances are a derived product that are indicative of radiances AIRS channels would have seen if the field of view were completely clear. Tropospheric sounding 15 micron CO2 observations are used heavily in the determination of the parameters necessary to generate for all sounding channels. This approach allows for the generation of accurate values of and T(p) under most cloud conditions.
Author
Atmospheric Sounding; Temperature Profiles; Local Thermodynamic Equilibrium; Radiative Transfer; Atmospheric Temperature; Algorithms; Radiance; Carbon Dioxide

20080037770 Forest Service, Portland, OR USA

Running Dry: Where Will the West Get Its Water. Science Findings, Issue Ninety Seven, October 2007

Oct. 2007; 6 pp.; In English

Report No.(s): PB2008-103255; No Copyright; Avail.: CASI: A02, Hardcopy

and central Oregon and northern California is almost exclusively due to immense groundwater storage in the Cascade Range. The volume of water stored in permeable lava flows in the Cascades is seven times that stored as snow. Nonetheless, until recently, virtually all examinations of streamflow trends under future climates in the West have focused on the anticipated loss of snowpack. This has painted an incomplete picture of the looming water resource crisis that is expected because of global warming. Researchers at the PNW Research Station have recently completed an analysis showing that variation in geology across the West is going to influence regional sensitivity to global warming.

NTIS

Water; Water Resources

20080037983 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Observations and Modeling of Composition of Upper Troposphere/Lower Stratosphere (UTILS): Isentropic Mixing Events and Morphology of HNO3 as Observed by HIRDLS and Comparison with Results from Global Modeling Initiative

Rodriquez, J. M.; Douglass, A.R.; Yoshida, Y.; Strahan, S.; Duncan, B.; Olsen, M.; Gille, J.; Yudin, V.; Nardi, B.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

isentropic exchange of air masses between the tropical upper troposphere and mid-latitude lowermost stratosphere (the so-called 'middle world') is an important pathway for stratospheric-tropospheric exchange. A seasonal, global view of this process has been difficult to obtain, in part due to the lack of the vertical resolution in satellite observations needed to capture the laminar character of these events. Ozone observations at a resolution of about 1 km from the High Resolution Dynamic Limb Sounder (HIRDLS) on NASA's Aura satellite show instances of these intrusions. Such intrusions should also be observable in HN03 observations; however, the abundances of nitric acid could be additionally controlled by chemical processes or incorporation and removal into ice clouds. We present a systematic examination of the HIRDLS data on O3 and HNO3 to determine the seasonal and spatial characteristics of the distribution of isentropic intrusions. At the same time, we compare the observed distributions with those calculated by the Global Modeling Initiative combined tropospheric-stratospheric model, which has a vertical resolution of about I km. This Chemical Transport Model (CTM) is driven by meteorological fields obtained from the GEOS-4 system of NASA/Goddard Global Modeling and Assimilation Office (GMAO), for the Aura time period, at a vertical resolution of about 1 km. Such comparison brings out the successes and limitations of the model in representing isentropic stratospheric-tropospheric exchange, and the different processes controlling HNO3 in the UTAS.

Author

Atmospheric Models; Chemical Reactions; Stratosphere; Troposphere; Meteorological Parameters; Ozone; Spatial Distribution; Assimilation; Nitric Acid

20080037988 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Broadband Lidar Technique for Precision CO2 Measurement

Heaps, William S.; September 15, 2008; 10 pp.; In English; SPIE Europe Remote Sensing 2008, 15-18 Sep. 2008, Cardiff Wales, UK; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037988

Presented are preliminary experimental results, sensitivity measurements and discuss our new CO2 lidar system under development. The system is employing an erbium-doped fiber amplifier (EDFA), superluminescent light emitting diode (SLED) as a source and our previously developed Fabry-Perot interferometer subsystem as a detector part. Global measurement of carbon dioxide column with the aim of discovering and quantifying unknown sources and sinks has been a high priority for the last decade. The goal of Active Sensing of CO2 Emissions over Nights, Days, and Seasons (ASCENDS) mission is to significantly enhance the understanding of the role of CO2 in the global carbon cycle. The National Academy of Sciences recommended in its decadal survey that NASA put in orbit a CO2 lidar to satisfy this long standing need. Existing passive sensors suffer from two shortcomings. Their measurement precision can be compromised by the path length uncertainties arising from scattering within the atmosphere. Also passive sensors using sunlight cannot observe the column at night. Both of these difficulties can be ameliorated by lidar techniques. Lidar systems present their own set of problems however. Temperature changes in the atmosphere alter the cross section for individual CO2 absorption features while the different atmospheric pressures encountered passing through the atmosphere broaden the absorption lines. Currently proposed

lidars require multiple lasers operating at multiple wavelengths simultaneously in order to untangle these effects. The current goal is to develop an ultra precise, inexpensive new lidar system for precise column measurements of CO2 changes in the lower atmosphere that uses a Fabry-Perot interferometer based system as the detector portion of the instrument and replaces the narrow band laser commonly used in lidars with the newly available high power SLED as the source. This approach reduces the number of individual lasers used in the system from three or more to one - considerably reducing the risk of failure. It also tremendously reduces the requirement for wavelength stability in the source putting this responsibility instead on the Fabry-Perot subsystem.
Author
Carbon Dioxide; Infrared Radar; Optical Radar; Broadband; Fabry-Perot Interferometers; Light Emitting Diodes; Erbium; Doped Crystals

20080037994 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mesospheric H2O Concentrations Retrieved from SABER/TIMED Measurements
Feofilov, A. G.; Marshall, B. T.; Garcia-Comas, M.; Kutepov, A. A.; Lopez-Puertas, M.; Manuilova, R. O.; Yankovsky, V.A.; Goldberg, R. A.; Gordley, L. L.; Petelin, S.; Russell, J. M., III; April 13, 2008; 1 pp.; In English; European Geosciences Union (EGU) General Assembly 2008, 13-18 Apr. 2008, Vienna, Austria; Copyright; Avail.: Other Sources; Abstract Only

The SABER instrument on board the TIMED Satellite is a limb scanning infrared radiometer designed to measure temperature and minor constituent vertical profiles and energetics parameters in the mesosphere and lower thermosphere (MLT). The H2O concentrations are retrieved from 6.3 micron band radiances. The populations of H2O(v2) vibrational levels are in non-Local Thermodynamic Equilibrium (non-LTE) above approximately 55 km altitude and the interpretation of 6.3 micron radiance requires utilizing non-LTE H2O model that includes various energy exchange processes in the system of H2O vibrational levels coupled with O2, N2, and CO2 vibrational levels. We incorporated these processes including kinetics of O2/O3 photolysis products to our research non-LTE H2O model and applied it for the development and optimization of SABER operational model. The latter has been validated using simultaneous SCISAT1/ACE occultation measurements. This helped us to estimate CO2(020)-O2(X,v=I), O2(X,v=I)- H2O(010), and O2(X,v=1) O rates at mesopause temperatures that is critical for an adequate interpretation of non-LTE H2O radiances in the MLT. The first distributions of seasonal and meridional H2O concentrations retrieved from SABER 6.3 micron radiances applying an updated non-LTE H2O model are demonstrated and discussed.
Author
Mesopause; Water; Water Vapor; Atmospheric Composition

20080037996 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Differences and Similarities in MaCWAVE Summer and Winter Temperatures and Winds
Schmidlin, F. J.; Goldberg, R. A.; April 13, 2008; 1 pp.; In English; European Geosciences Union (EGU) General Assembly 2008, 13-18 Apr. 2008, Vienna, Austria; No Copyright; Avail.: Other Sources; Abstract Only

Small meteorological rockets released inflatable falling spheres during the MaCWAVE Campaign. The Mountain and Convective Waves Ascending Vertically Experiment (MaCWAVE) was carried out in two parts, a summer sequence from Andoya Rocket Range (69N) during July 2002 to examine convective initiation of gravity waves and a winter sequence from ESRANGE (68N) during January 2003 to examine mountain-terrain initiated gravity waves. The sphere-tracked data provided significant information about the variation of temperature and wind from 70 km and above. The changes observed may be considered akin to tidal motion; unfortunately the launch activity was restricted to 12-hour periods, thus the observation of a full diurnal cycle was not possible. During summer, temperature variation was smaller than that observed during winter when peak to null differences reached 15-20 K at 80-85 km. Variation in the zonal winds varied up to 100+mps in summer and winter. Examination of the times of peak wind vs altitude showed that the peak zonal wind occurred approximately two hours ahead of the peak meridional wind. We provide details about the measurements and observed variations.
Author
Wind (Meteorology); Atmospheric Temperature; Diurnal Variations; Gravity Waves; Meteorological Flight; Meridional Flow

20080038000 United Nations Educational, Scientific and Cultural Organization, Delft, Netherlands
Modeling of Hurricane Impacts
Roelvink, Dano; Reniers, Ad; van Dongeren, Ap; van Thiel de Vries, Jaap; Lescinski, Jamie; McCall, Robert; May 2008; 14 pp.; In English
Contract(s)/Grant(s): N62558-06-C-2006
Report No.(s): AD-A482044; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This interim report describes activities in the second quarter of the second year of the project Modeling of Hurricane

Impacts. In agreement with the funding agency, the work was carried out over the period August-December 2007. Three main lines of work are described in this report, viz. dissemination of model and results, model improvements and testing.
DTIC
Hurricanes; Impact; Models

20080038047 NASA Goddard Space Flight Center, Greenbelt, MD, USA
DEMETER Observations of Highly Structured Plasma Density and Associated ELF Electric Field and Magnetic Field Irregularities at Middle and Low Latitudes
Pfatt, R.; Liebrecht, C.; Berthelier, J.-J.; Parrot, M.; Lebreton, J.-P.; August 11, 2008; 1 pp.; In English; 2008 USRI General Assembly, 11-14 Aug. 2008, Chicago, IL, USA; Copyright; Avail.: Other Sources; Abstract Only

The DEMETER spacecraft frequently encounters structured plasma and electric field irregularities associated with equatorial spread-F. However, during severe geo~nagnetic storms, the spacecraft detects broader regions of density structures that extend to higher latitudes, in some instances to the sub-auroral regions. In addition to the electric field irregularities, ELF magnetic field irregularities are sometimes observed. for example, on the walls of the density structures, and appear related to finely-structured spatial currents and/or Alfven waves. The mid-latitude irregularities are compared with those of equatorial spread-F as well as wit11 intense irregularities associated with the trough region observed at sub-auroral latitudes.
Author
Electric Fields; Irregularities; Geomagnetic Latitude; Magnetic Fields; Auroral Zones; Storms (Meteorology); Plasma Density

20080038645 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Availability of High Quality TRMM Ground Validation Data from Kwajalein, RMI: A Practical Application of the Relative Calibration Adjustment Technique
Marks, David A.; Wolff, David B.; Silberstein, David S.; Tokay, Ali; Pippitt, Jason L.; Wang, Jianxin; [2008]; 50 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG07EJ50C; Copyright; Avail.: CASI: A03, Hardcopy

Since the Tropical Rainfall Measuring Mission (TRMM) satellite launch in November 1997, the TRMM Satellite Validation Office (TSVO) at NASA Goddard Space Flight Center (GSFC) has been performing quality control and estimating rainfall from the KPOL S-band radar at Kwajalein, Republic of the Marshall Islands. Over this period, KPOL has incurred many episodes of calibration and antenna pointing angle uncertainty. To address these issues, the TSVO has applied the Relative Calibration Adjustment (RCA) technique to eight years of KPOL radar data to produce Ground Validation (GV) Version 7 products. This application has significantly improved stability in KPOL reflectivity distributions needed for Probability Matching Method (PMM) rain rate estimation and for comparisons to the TRMM Precipitation Radar (PR). In years with significant calibration and angle corrections, the statistical improvement in PMM distributions is dramatic. The intent of this paper is to show improved stability in corrected KPOL reflectivity distributions by using the PR as a stable reference. Inter-month fluctuations in mean reflectivity differences between the PR and corrected KPOL are on the order of 1-2 dB, and inter-year mean reflectivity differences fluctuate by approximately 1 dB. This represents a marked improvement in stability with confidence comparable to the established calibration and uncertainty boundaries of the PR. The practical application of the RCA method has salvaged eight years of radar data that would have otherwise been unusable, and has made possible a high-quality database of tropical ocean-based reflectivity measurements and precipitation estimates for the research community.
Author
Meteorological Radar; Rain; TRMM Satellite; Ground Truth; Precipitation (Meteorology)

20080038646 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evaluation of Long-Term Cloud-Resolving Model Simulations Using Satellite Radiance Observations and Multi-Frequency Satellite Simulators
Matsui, Toshihisa; Zeng, Xiping; Tao, Wei-Kuo; Masunaga, Hirohiko; Olson, William S.; Lang, Stephen; [2008]; 37 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper proposes a methodology known as the Tropical Rainfall Measuring Mission (TRMM) Triple-Sensor Three-step Evaluation Framework (T3EF) for the systematic evaluation of precipitating cloud types and microphysics in a cloud-resolving model (CRM). T3EF utilizes multi-frequency satellite simulators and novel statistics of multi-frequency radiance and backscattering signals observed from the TRMM satellite. Specifically, T3EF compares CRM and satellite

observations in the form of combined probability distributions of precipitation radar (PR) reflectivity, polarization-corrected microwave brightness temperature (Tb), and infrared Tb to evaluate the candidate CRM. T3EF is used to evaluate the Goddard Cumulus Ensemble (GCE) model for cases involving the South China Sea Monsoon Experiment (SCSMEX) and Kwajalein Experiment (KWAJEX). This evaluation reveals that the GCE properly captures the satellite-measured frequencies of different precipitating cloud types in the SCSMEX case but underestimates the frequencies of deep convective and deep stratiform types in the KWAJEX case. Moreover, the GCE tends to simulate excessively large and abundant frozen condensates in deep convective clouds as inferred from the overestimated GCE-simulated radar reflectivities and microwave Tb depressions. Unveiling the detailed errors in the GCE s performance provides the best direction for model improvements.
Author
Atmospheric Models; Brightness Temperature; Clouds (Meteorology); Meteorological Radar; Precipitation (Meteorology); Satellite Observation; Satellite-Borne Instruments; Temperature Profiles; TRMM Satellite

20080038648 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mapping Snow Grain Size over Greenland from MODIS
Lyapustin, Alexei; Tedesco, Marco; Wang, Yujie; Kokhanovsky, Alexander; [2008]; 34 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents a new automatic algorithm to derive optical snow grain size (SGS) at 1 km resolution using Moderate Resolution Imaging Spectroradiometer (MODIS) measurements. Differently from previous approaches, snow grains are not assumed to be spherical but a fractal approach is used to account for their irregular shape. The retrieval is conceptually based on an analytical asymptotic radiative transfer model which predicts spectral bidirectional snow reflectance as a function of the grain size and ice absorption. The analytical form of solution leads to an explicit and fast retrieval algorithm. The time series analysis of derived SGS shows a good sensitivity to snow metamorphism, including melting and snow precipitation events. Preprocessing is performed by a Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm, which includes gridding MODIS data to 1 km resolution, water vapor retrieval, cloud masking and an atmospheric correction. MAIAC cloud mask (CM) is a new algorithm based on a time series of gridded MODIS measurements and an image-based rather than pixel-based processing. Extensive processing of MODIS TERRA data over Greenland shows a robust performance of CM algorithm in discrimination of clouds over bright snow and ice. As part of the validation analysis, SGS derived from MODIS over selected sites in 2004 was compared to the microwave brightness temperature measurements of SSM\I radiometer, which is sensitive to the amount of liquid water in the snowpack. The comparison showed a good qualitative agreement, with both datasets detecting two main periods of snowmelt. Additionally, MODIS SGS was compared with predictions of the snow model CROCUS driven by measurements of the automatic whether stations of the Greenland Climate Network. We found that CROCUS grain size is on average a factor of two larger than MODIS-derived SGS. Overall, the agreement between CROCUS and MODIS results was satisfactory, in particular before and during the first melting period in mid-June. Following detailed time series analysis of SGS for four permanent sites, the paper presents SGS maps over the Greenland ice sheet for the March-September period of 2004.
Author
Atmospheric Correction; Microwave Radiometers; Snow Cover; Temperature Measurement; Metamorphism (Geology); MODIS (Radiometry); Temperature Profiles; Water Vapor

20080038649 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The South American Land Data Assimilation System (SALDAS) 5-Year Retrospective Atmospheric Forcing Datasets
deGoncalves, Luis Gustavo G.; Shuttleworth, William J.; Vila, Daniel; Larroza, Elaine; Bottino, Marcus J.; Herdies, Dirceu L.; Aravequia, Jose A.; De Mattos, Joao G. Z.; Toll, David L.; Rodell, Matthew; Houser, Paul; [2008]; 31 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX06AG91G; Copyright; Avail.: CASI: A03, Hardcopy

The definition and derivation of a 5-year, 0.125deg, 3-hourly atmospheric forcing dataset for the South America continent is described which is appropriate for use in a Land Data Assimilation System and which, because of the limited surface observational networks available in this region, uses remotely sensed data merged with surface observations as the basis for the precipitation and downward shortwave radiation fields. The quality of this data set is evaluated against available surface observations. There are regional difference in the biases for all variables in the dataset, with biases in precipitation of the order 0-1 mm/day and RMSE of 5-15 mm/day, biases in surface solar radiation of the order 10 W/sq m and RMSE of 20 W/sq m,

positive biases in temperature typically between 0 and 4 K, depending on region, and positive biases in specific humidity around 2-3 g/Kg in tropical regions and negative biases around 1-2 g/Kg further south.
Author
Radiation Distribution; Remote Sensing; Solar Radiation; Assimilation; Humidity; Bias; Land Management

20080038942 Naval Research Lab., Stennis Space Center, MS USA
An Interactive Parallel Coordinates Technique Applied to a Tropical Cyclone Climate Analysis
Steed, Chad A; Fitzpatrick, Patrick J; Jankun-Kelly, T J; Yancey, Amber N; Swan II, J E; Jun 6, 2008; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482595; NRL/MR/7440--06-9126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An enhanced interactive variant to the parallel coordinates visualization technique is presented. An example of its capabilities is demonstrated on a hurricane climate dataset. Its capabilities include focus+context filtering, dynamic visual queries with sliders, statistical displays, relocatable axes, axis inversion, details-on-demand, a pop-up menu interface, and aerial perspective shading. Furthermore, parallel coordinates can visually depict the same correlations that weather scientists find meaningful. It is demonstrated that these interactive parallel coordinates enhancements provide a deeper understanding when used in conjunction with traditional multiple regression analysis.
DTIC
Climate; Coordinates; Cyclones; Data Processing; Display Devices; Hurricanes; Regression Analysis; Tropical Storms

20080038990 Miami Univ., Miami, FL USA
A NOPP Partnership for Skin Sea-Surface Temperature
Minnett, Peter J; Reynolds, R M; Wentz, Frank J; Jessup, Andrew T; Emery, William J; Wick, Gary A; Cummings, James A; May, Doug; Jan 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As a result of the heat flow between the ocean and overlying atmosphere, the surface of the ocean is nearly always somewhat cooler than the water at a depth of a millimeter or more. The temperature difference across the thermal conductive layer at the sea surface is called the thermal skin effect. During the day, solar heating may cause vertical temperature gradient in the uppermost several meters of the ocean, especially in conditions of low wind speed, which further decouple the bulk SSTs, conventionally measured by thermometers at a depth of a meter or so, from the skin SST, which is the temperature that controls the exchange of heat, momentum, and gases between the ocean and atmosphere. Furthermore, it is the skin temperature that gives rise to the signal measured by space-borne radiometers. Thus, the uncertainties in the satellite-derived SST fields determined by comparisons with sub-surface bulk temperature include a component due to the variability in the temperature gradients in the upper few meters and across the skin layer. The objectives are to provide accurate skin SSTs using autonomous radiometers, to establish the accuracy of satellite-derived skin SSTs, and to demonstrate the changes in the coupling between ocean and atmosphere in forecast models that help scientists understand the physical behavior of the skin layer. The project has three components: (1) deploying at sea instruments for measuring skin and bulk SST, and telemetering the measurements for use in an operational environment in near real-time; (2) using the skin temperature measurements to demonstrate the accuracy of the skin SSTs derived from a variety of satellite-borne radiometers operating in both the infrared and the microwave; and (3) demonstrating the use of the skin SST in an operational program as a precursor to the widespread use of skin SSTs.
DTIC
Detection; Marine Environments; Ocean Surface; Radiometers; Remote Sensing; Scientific Satellites; Sea Surface Temperature; Surface Temperature

20080038991 Miami Univ., Miami, FL USA
A NOPP Partnership for Skin Sea-Surface Temperature
Minnett, Peter J; Reynolds, R M; Wentz, Frank J; Jessup, Andrew T; Emery, William J; Wick, Gary A; Cummings, James A; May, Doug; Jan 2005; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482691; No Copyright; Avail.: Defense Technical Information Center (DTIC)

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DTIC

Detection; Marine Environments; Ocean Surface; Radiometers; Remote Sensing; Scientific Satellites; Sea Surface Temperature; Surface Temperature

20080038992 Miami Univ., Miami, FL USA

A NOPP Partnership for Skin Sea-Surface Temperature

Minnett, Peter J; Reynolds, R M; Wentz, Frank J; Jessup, Andrew T; Kearns, Edward J; Emery, William J; Wick, Gary A; Cummings, James A; May, Doug; Jan 2004; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482692; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As a result of the heat flow between the ocean and overlying atmosphere, the surface of the ocean is nearly always somewhat cooler than the water at a depth of a millimeter or more. The temperature difference across the thermal conductive layer at the sea surface is called the thermal skin effect. During the day, solar heating may cause vertical temperature gradient in the uppermost several meters of the ocean, especially in conditions of low wind speed, which further decouple the bulk SSTs, conventionally measured by thermometers at a depth of a meter or so, from the skin SST, which is the temperature that controls the exchange of heat, momentum, and gases between the ocean and atmosphere. Furthermore, it is the skin temperature that gives rise to the signal measured by space-borne radiometers. Thus, the uncertainties in the satellite-derived SST fields determined by comparisons with sub-surface bulk temperature include a component due to the variability in the temperature gradients in the upper few meters and across the skin layer. The objectives are to provide accurate skin SSTs using autonomous radiometers, to establish the accuracy of satellite-derived skin SSTs, and to demonstrate the changes in the coupling between ocean and atmosphere in forecast models that help scientists understand the physical behavior of the skin layer. The project has three components: (1) deploying at sea instruments for measuring skin and bulk SST, and telemetering the measurements for use in an operational environment in near real-time; (2) using the skin temperature measurements to demonstrate the accuracy of the skin SSTs derived from a variety of satellite-borne radiometers operating in both the infrared and the microwave; and (3) demonstrating the use of the skin SST in an operational program as a precursor to the widespread use of skin SSTs.

DTIC

Detection; Marine Environments; Ocean Surface; Radiometers; Remote Sensing; Scientific Satellites; Sea Surface Temperature; Surface Temperature

20080039141 NASA Goddard Space Flight Center, Greenbelt, MD, USA

TRMM's Contribution to Our Knowledge of Climatology, Storms and Floods

Adler, Robert; December 2007; 1 pp.; In English; TRMM 10 Year Symposium, 1-9 Dec. 2007, Tokyo, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The Tropical Rainfall Measuring Mission (TRMM) has successfully completed nearly ten years in orbit. A brief review of the history and accomplishments of this joint mission between the U.S. and Japan is presented. Research highlights will focus on the seasonal cycle of a TRMM-based rainfall climatology, which takes advantage of the multiple rain estimates available from TRMM. Examples will be given of the use of TRMM data to diagnose the impact of man on precipitation patterns through urbanization and the effect of pollution. Use of TRMM data for tropical cyclone operational analysis in the U.S. will also be shown. Methods for generating 3-hourly rainfall information from multiple satellites using TRMM to calibrate all the information will be described as will application of such information to study extreme rainfall events and associated floods and landslides. These results will emphasize the breadth of science success achieved with the 10-year record

of observations from the only rain radar and passive microwave instrument combination in space. The outlook for continued operation of the TRMM satellite and progress in TRMM science and applications will be addressed.
Author
TRMM Satellite; Climatology; Rain; Meteorological Radar; Tropical Storms; Storms; Floods

20080039142 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sensitivity of Passive Microwave Snow Depth Retrievals to Weather Effects and Snow Evolution
Markus, Thorsten; Powell, Dylan C.; Wang, James R.; IEEE Transactions on Geosciences and Remote Sensing; January 2006; ISSN 0196-2892; Volume 44, Issue 1, pp. 68-77; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/TGRS.2005.860208

Snow fall and snow accumulation are key climate parameters due to the snow's high albedo, its thermal insulation, and its importance to the global water cycle. Satellite passive microwave radiometers currently provide the only means for the retrieval of snow depth and/or snow water equivalent (SWE) over land as well as over sea ice from space. All algorithms make use of the frequency-dependent amount of scattering of snow over a high-emissivity surface. Specifically, the difference between 37- and 19-GHz brightness temperatures is used to determine the depth of the snow or the SWE. With the availability of the Advanced Microwave Scanning Radiometer (AMSR-E) on the National Aeronautics and Space Administration's Earth Observing System Aqua satellite (launched in May 2002), a wider range of frequencies can be utilized. In this study we investigate, using model simulations, how snow depth retrievals are affected by the evolution of the physical properties of the snow (mainly grain size growth and densification), how they are affected by variations in atmospheric conditions and, finally, how the additional channels may help to reduce errors in passive microwave snow retrievals. The sensitivity of snow depth retrievals to atmospheric water vapor is confirmed through the comparison with precipitable water retrievals from the National Oceanic and Atmospheric Administration's Advanced Microwave Sounding Unit (AMSU-B). The results suggest that a combination of the 10-, 19-, 37-, and 89-GHz channels may significantly improve retrieval accuracy. Additionally, the development of a multisensor algorithm utilizing AMSR-E and AMSU-B data may help to obtain weather-corrected snow retrievals.
Author
Snow; Meteorology; Thermal Insulation; Microwave Radiometers; Atmospheric Moisture; Earth Observing System (EOS); Atmospheric Sounding

20080039143 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Polar Summer MLT Plasma Environment as Seen by the DROPPS Sounding Rockets
Assis, Michael P.; Goldberg, Richard A.; Webb, Phillip A.; Pesnell, William D.; Voss, H. D.; December 10, 2006; 2 pp.; In English; Fall 2006 American Geophysical Union (AGU) Meeting, 10-16 Dec. 2006, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

During early July, 1999, the DROPPS (Distribution and Role of Particles in the Polar Summer Mesosphere) campaign launched two rocket payloads whose purpose was to study the polar summer MLT (mesosphere and lower thermosphere), particularly PMSEs (polar mesospheric summer echoes) and PMCs (polar mesospheric clouds). The rockets were launched from the Anderya Rocket Range in Norway the nights of the 5th and 14th of July. Both payloads included a front-mounted PID (Particle Impact Detector) consisting of charge and mass telescopes to measure aerosol and dust mass distributions. Ice particles of nanometer size are believed to be responsible for PMSEs through the process of electron scavenging. Evidence for this process is suggested, for example, by the presence of an electron 'biteout' simultaneously measured by several instruments at an altitude of approx. 82 - 87km during the first DROPPS launch. This presentation will characterize similarities and differences between both flights as seen by the charge and mass telescopes, starting at launch until the loss of data on the downleg of each flight. Various stages of the flights will be considered in detail, such as the PMSE layer and the apogee at 117 km, as well as the calibration of the data before launch.
Author
Mesosphere; Thermosphere; Sounding Rockets; Aerosols; Apogees; Plasmas (Physics); Dust; Mass Distribution

20080039144 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Sources, Propagators, and Sinks of Space Weather
Pesnell, William D.; December 10, 2006; 1 pp.; In English; Fall 2006 American geophysical Union (AGU) Meeting, 10-16 Dec. 2006, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Space Weather is a complex web of sources, propagators, and sinks of energy, mass, and momentum. A complete

understanding of Space Weather requires specifying, and an ability to predict, each link in this web. One important problem in Space Weather is ranking the importance of a particular measurement or model in a research program. One way to do this ranking is to examine the simplest linked diagram of the sources, propagators, and sinks and produce. By analyzing only those components that contribute to a particular area the individual contributions can be better appreciated. Several such diagrams will be shown and used to discuss how long-term effects of Space Weather can be separated from the impulsive effects.
Author
Space Weather; Sinks

20080039169 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Assessment and Consequences of the Delayed Breakup of the Antarctic Polar Vortex in Two Versions of the GEOS Chemistry-Climate Model
Hurwitz, M.M.; Newman, P.A.; Li, F.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

In mid-winter, winds circle the globe at speeds greater than 200 km/hr (approximately 130mph) in the middle atmosphere. This strong jet bounds the region known as the polar vortex. The presence of the Antarctic polar vortex is a key ingredient in the formation of the 'ozone hole', because the air inside the vortex is cold and isolated from lower latitudes, creating ideal conditions for large-scale chemical ozone depletion. Many atmospheric models are not able to reproduce observed winds in the middle atmosphere. Specifically, the polar vortices tend to break down too late and peak wind speeds are higher than observed. Hurwitz et al. find that the delayed break-up of the Antarctic polar vortex is due to weaker-than-observed wave driving from the lower atmosphere during the October-November period. The delayed break-up of the Antarctic polar vortex changes the temperature structure of the middle atmosphere, which biases the amount of chemical ozone depletion that can occur in late winter and spring. Also, the extended lifetime of the polar vortex strengthens the 'overturning' circulation cell in the middle atmosphere, changing the amount of ozone, methane and other chemical species that is transported from low to high latitudes. As greenhouse gas concentrations continue to rise, the atmospheric temperature structure and resulting wind structure are expected to change. Clearly, if models cannot duplicate the observed late 20th century high-latitude winds, their ability to simulate the polar vortices in future must be poor. Understanding model weaknesses and improving the modeled polar vortices will be necessary for accurate predictions of ozone recovery in the coming century.
Author
Antarctic Regions; Polar Regions; Climate Models; Atmospheric Chemistry; Vortices; Polar Meteorology

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OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20080037577 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA
The Use of Simulated Visible/Infrared Imager/Radiometer Suite (VIIRS) and Landsat Data Continuity Mission (LDCM) Imagery for Coral Reef Monitoring
Estep, L.; Spruce, J.; Blonski, S.; Moore, R.; July 07, 2008; 1 pp.; In English; 11th International Coral Reef Symposium (Poster), 7-11 Jul. 2008, Fort Lauderdale, FL, USA; Original contains color illustrations
Contract(s)/Grant(s): NNS04AB54T
Report No.(s): SSTI-2220-0137; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037577

Coral reefs are some of the most biologically rich and economically important ecosystems on Earth. Coral reefs are Earth's largest biological structures and have taken thousands of years to form. Coral reefs not only provide important habitat for many marine animals and plants, but they also provide humanity with food, jobs, chemicals, protection against storms, and life-saving pharmaceuticals. Severe bleaching events have occurred that have dramatic long-term ecological impacts to corals, including loss of reef-building corals, changes in benthic habitat, and, in some cases, changes in larval fish populations (Holden and Ledrew, 1998). Some researchers suggest that 10 percent of Earth s coral reefs have already been destroyed and that another 60 percent are in danger. Scientists have proposed that as much as 95 percent of Jamaica's reefs are dying or dead. This poster reports on a Rapid Prototyping Capability (RPC) experiment done to determine whether future NASA sensors - the Visible/Infrared Imager/Radiometer Suite (VIIRS) and Landsat Data Continuity Mission (LDCM) - could generate key

data products for the Integrated Coral Reef Observation Network (ICON)/Coral Reef Early Warning System (CREWS) Decision Support Tool (DST) operated by the National Oceanic and Atmospheric Administration (NOAA).
Derived from text
Coral Reefs; Ecosystems; Marine Biology; Habitats; Ocean Bottom; Satellite Imagery; Landsat Satellites

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*.

20080037330 Army Research Lab., Frederick, MD USA
A Software Pipeline for Protein Structure Prediction
Lee, Michael S; Yeh, In-Chul; Zavaljevski, Nela; Wilson, Paul; Reifman, Jaques; Nov 2006; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed a software suite to predict protein structures from sequence through the integration of multiple non-commercial programs. The Army and DoD medical and scientific communities will be able to use this software to annotate structures of sequenced pathogenic and host genomes. Such structural predictions can be used in therapeutic and vaccine design as well as many areas of basic biological research. In this work, initial assessments of the software are made. Most importantly, these tests include evaluation of the quality of predicted structural models as a function of sequence similarity to known protein structures.
DTIC
Molecular Structure; Pipelines; Proteins

20080038007 California Univ., Santa Barbara, CA USA
Unraveling the BvgAS Phosphorelay
Lampoudi, Sotiria; Hulbert, Robin; Cotter, Peggy; Petzold, Linda; Nov 2006; 3 pp.; In English
Report No.(s): AD-A482014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bacteria sense and respond to environmental stimuli using pairs of proteins called two-component systems. These are composed of a histidine kinase sensor protein, which autophosphorylates in the presence of the signal being sensed, and a response regulator protein, which is typically involved in binding DNA and controlling gene transcription. The information that a signal is being sensed is relayed from the sensor to the response regulator via a phosphotransfer step. A more sophisticated variant of the two-component system, the phosphorelay, contains two additional signaling domains and two additional phosphotransfer steps. The BvgAS phosphorelay controls virulence in the Bordetella family of respiratory pathogens. Bordetella pertussis is the strictly human-adapted etiological agent of whooping cough, and causes acute infections. Bordetella bronchiseptica causes chronic respiratory infections in a variety of four-legged mammals. BvgAS employs a four step His-Asp-His-Asp phosphorelay from the sensor protein BvgS to the response regulator BvgA. We have developed a family of computational models and simulations of the BvgAS signal transduction and gene expression pathway, which we use to explore both quantitative and qualitative questions. The ultimate goal is to unravel how the phosphorelay works and what are its advantages over the more simple two-component systems.
DTIC
Bacteria; Proteins; Pathogens; Infectious Diseases; Deoxyribonucleic Acid

20080038059 Kentucky Univ., Lexington, KY USA
Genotyping of Global Yersinia Pestis Isolates by Using IS285
Bobrov, A G; Huang, X -Z; Garcia, E; Lindler, L E; Filippov, A A; Nov 1, 2006; 6 pp.; In English
Report No.(s): AD-A481533; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481533

Yersinia pestis is the etiologic agent of bubonic and pneumonic plague, one of the most dangerous bacterial infections. Plague is a re-emerging disease displaying current tendency to increasing reports of human cases, including the affliction with multidrug-resistant strains of Y. pestis. The plague bacterium is a potential agent of biowarfare and bioterrorism. Therefore, both military and civilian specialists should have efficient methods of molecular identification of Y. pestis strains and their

assignment to certain ecological variants. In this work, we consider literature data, as well as our previous and new results on genotyping of global Y. pestis strains. We come to conclusion that a mobile genetic element, IS285, is one of the most powerful molecular tools allowing to trace the circulation of epidemic clones and to detect their geographical/animal origin.
DTIC
Genetics; Bacteria; Infectious Diseases

20080038692 Oregon Univ., Portland, OR USA
Mechanisms of Disease Persistence in Chronic Myelogenous Leukemia
Defoe, Richard L; Druker, Brian J; Oct 2007; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0606
Report No.(s): AD-A482232; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482232

Disease persistence is the main issue faced by CML patients on therapy with imatinib and eradication of persistent malignant cells will be critical for the long-term success of kinase inhibitor therapy. Mechanisms underlying acquired resistance to imatinib have been extensively studied and the manner by which mutations of the Bcr-Abl kinase domain can reduce or eliminate sensitivity of CML cells to imatinib has been well characterized. Disease persistence in responding patients, in contrast,is still poorly understood. We sought to identify and extensively characterize hematopoietic stem cells responsible for disease persistence and explore their mechanisms of imatinib resistance. Using in vitro culture of primary CML progenitor cells, we identified both quiescent and cycling cells capable of surviving in the presence of imatinib. We observed inhibition of tyrosine phosphorylation by imatinib in phenotypically-defined CML stem cells and quiescent stem cells, and cells surviving in vitro culture, suggesting a Bcr-Abl independent mechanism of survival. To apply information gained from in vitro culture to persistent cell populations in treated CML patients, we attempted to isolate Bcr-Abl positive cells from patients in cytogenetic remission. Although persistent CML cells may reside within the stem cell compartment, techniques of stem cell enrichment did not lead to enrichment of CML cells. We therefore explored techniques for Bcr-Abl-specific detection to facilitate these studies, including creation of a Bcr-Abl junction-specific antibody, development of a Bcr-Abl mRNA junction-specific molecular beacon and analysis of potential markers of CML cells. The detailed analysis of primary samples is technically challenging, but is essential for an understanding of disease persistence and may allow identification of novel drug targets or methods to sensitize resistant cells to imatinib or alternative Bcr-Abl kinase inhibitors.
DTIC
Diseases; Leukemias

20080038693 Massachusetts Univ., Worcester, MA USA
MT 2A Phosphorylation by PKC Mu/PKD Influences Chemosensitivity to Cisplatin in Prostate Cancer
Kethandapatti, Balaji C; Nov 2007; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482255; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482255

The metallothioneins (MT) are a family of small molecular weight trace metal and free radical scavenging proteins well established to play a role in resistance to chemotherapy and radiation in human cancer. MT gene expression is up regulated in response to the presence of heavy metal ions such as zinc. The activation of MT gene expression in response to zinc treatment in LNCaP and C4-2 prostate cancer (PC) cells was shown by western blotting and DNA microarray analysis. Chemotherapy and radiation sensitivity assays of cells following treatment with cisplatin or radiation were performed in the presence or absence of 150 micron M ZnSO4 and cell viability measured after 72 hours by MTS viability clonogenic and flow cytometry assays. Increasing concentrations of ZnSO4 up regulated MT expression in a dose dependent manner. Microarray analysis demonstrated specific increase in MT expression. Cells treated with zinc demonstrated a significantly decreased sensitivity to cisplatin compared to controls ($p < 0.05$). We have established a physiological in vitro cell line model of MT induction using Zn which is significantly associated with resistance to cisplatin chemotherapy in PC. Immunohistochemistry (IHC) analysis for MT expression in human prostate cancer specimens confirmed nuclear and cytoplasmic expression of MT in majority of specimens. However there was no significant difference in expression between various grades of PC.
DTIC
Cancer; Phosphorylation; Prostate Gland

20080038700 Texas Univ., Arlington, TX USA

A Randomized Trial of Musculoskeletal Pain Treatment in a Military Population

Gatchel, Robert J; Feb 2008; 66 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0055

Report No.(s): AD-A482286; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482286

Musculoskeletal system conditions are the leading cause of hospitalization and disability for the U.S. Armed Forces. The Department of Defense pays over $1.5 billion per year to disabled service members, and musculoskeletal conditions account for 40-50% of this amount. This study investigates the effectiveness of an interdisciplinary functional restoration approach to the treatment of Active Duty military from all 4 branches suffering from chronic musculoskeletal pain (CMP). The primary aims of this Functional and Occupational Rehabilitation Treatment (FORT) Program include restoring physical function, retaining soldiers on active duty, and increasing the participants abilities to effectively manage their pain. These outcomes, as well as socioeconomic variables, are evaluated immediately following treatment, and at 6, 12, and 18 months follow-up.

DTIC

Musculoskeletal System; Pain; Populations

20080038701 American Registry of Pathology, Washington, DC USA

The Significance of Focal Basal Cell Layer Disruptions-Induced Immuno-Cell Infiltration in Prostate Cancer Invasion

Man, Yan-gao; Mar 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0382

Report No.(s): AD-A482287; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482287

It is commonly held belief that prostate tumor invasion is triggered by the overproduction of proteolytic enzymes mainly by tumor cells which cause degradation of the basement membrane. This theory is consistent with data from cell cultures and animal models but results from recent worldwide clinical trials with enzyme inhibitors have been very disappointing casting doubt on the validity of the enzyme theory. Based on our own studies we have proposed that prostate tumor invasion is triggered by localized degeneration of aged or injured basal cells and the resultant auto-immunoreactions which selectively favor aberrant proliferation and subsequent invasion of tumor stem or progenitor cells overlying focal basal cell layer disruptions. Our hypothesis differs from the traditional proteolytic enzyme theory in multiple aspects including the stage of invasion the precursor of invasive lesions the roles of stromal and immunoreactive cells and the potential approaches for prevention of invasion. Our hypothesis has been published in multiple peer-reviewed journals.

DTIC

Cancer; Disrupting; Enzyme Inhibitors; Enzymes; Epithelium; Infiltration; Peptides; Prostate Gland

20080038702 Johns Hopkins Univ., Baltimore, MD USA

Development of Artificial Antigen Presenting Cells for Prostate Cancer Immunotherapy

Schneck, Jonathan P; Oelke, Mathias; May 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0370

Report No.(s): AD-A482290; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482290

While adoptive immunotherapy holds promise as a treatment for cancer, development of adoptive immunotherapy has been impeded by the lack of a reproducible and economically viable method for generating therapeutic numbers of antigen-specific CTL. The issues of reproducibility and cost, in large part, relate to the use of cellular dendritic cells (DC) for expansion of CTL. Underlying disease and pretreatment often affect the number of and efficacy of DC. Induction of DC takes time and is dependent on costly cytokine mixtures. Our preliminary data indicates that HLA-Ig complexes coupled to beads (HLA-Ig based artificial Antigen Presenting Complexes, aAPC) can induce and expand antigen-specific T cells and possibly be used to replace standard DC-based ex vivo expansion of CTL. Potential advantages of aAPC over cellular DC not only relate to the variability in function and viability of DC, but also using aAPC one can load all HLA complexes with the specific antigenic peptide(s) of choice, modulate the costimulatory signals, and enrich/sort for the antigen-specific cells of interest.

DTIC

Antigens; Cancer; Lymphocytes; Prostate Gland

20080038703 British Columbia Univ., Vancouver, British Columbia Canada

TAF1, From a General Transcription Factor to Modulator of Androgen Receptor in Prostate Cancer

Tavassoli, Peyman; Rennie, Paul; Feb 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0131

Report No.(s): AD-A482291; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482291

The androgen receptor (AR) is a ligand-activated transcription factor that binds androgen response elements (ARE) in the promoters of target genes. When bound to AREs, the receptor recruits chromatin-remodeling complexes, components of the general transcription machinery, and coregulator proteins. Using the N-terminus of AR as bait in the repressed transactivator yeast two-hybrid system, TATA binding protein-associated factor 1 (TAF1) was identified. TAF1, a multifunctional protein that contains acetylation, ubiquitin activating and kinase domains, can interact with several proteins to promote or suppress gene transcription. We showed that AR and TAF1 co-immunoprecipitated in nuclear extracts from LNCaP cells, an AR-containing prostate cancer cell line. Furthermore, using ChIP assays with LNCaP cells, we found that both AR and TAF1 associated with an ARE in the proximal promoter of the PSA gene. To assess if TAF1 can modulate AR transcription, we performed transfection assays with androgen responsive luciferase reporters. Our results indicate that overexpression of TAF1 enhances AR activity several fold in LNCaP cells, whereas siRNA knockdown of TAF1 decreases AR transactivation. To differentiate between the direct effects of TAF1 on AR activity from general effects on transcription and to determine which TAF1 domains are involved in AR transactivation, we cloned and tested various functional domains of TAF1. Comparing AR-regulated and generic promoters, our results indicate that both the ubiquitin activating and the N-terminal kinase domains of TAF1 differentially enhance AR activity, but unlike full-length TAF1, have no effect on general gene transcriptional activity.
DTIC

Cancer; Modulators; Prostate Gland; Proteins

20080038704 New York Univ., New York, NY USA

Prostate Cell-Specific Regulation of Androgen Receptor Phosphorylation In Vivo

Taneja, Samir S; Nov 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0068

Report No.(s): AD-A482292; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482292

We propose that AR phosphorylation at serines 213 and 650 regulate differential target gene expression and recruitment to gene promoters via altered interaction with other cellular transcription factors. To test this hypothesis we have conducted yeast two-hybrid analysis with the N-terminus of wild type AR as well as AR S213A and AR S213E variants. Our preliminary analysis indicates that the screen is preferentially isolating proteins with a known role in gene transcription and we are currently assessing the phosphorylation-dependence of the putative AR interacting proteins. Additionally, we have generated PC3 cells stably transfected with wild type, S650A and S650E AR. We have shown that the cells activate endogenous target genes in response to androgens and are currently investigating classes of genes affected by differential AR phosphorylation. Further, we have optimized conditions to isolate pools of hyper- and hypo-phosphorylated AR in order to isolate proteins that interact with AR in a phosphorylation-dependent manner. These proteins will be identified via mass spectrometry.
DTIC

Cancer; Gene Expression; Genes; Hormones; In Vivo Methods and Tests; Males; Phosphorylation; Prostate Gland

20080038705 Functional Genetics, Inc., Rockville, MD USA

TSG101 Based Antibody Therapeutic for Ebola and Related Viruses

Duan, Roxanne; Nov 16, 2006; 6 pp.; In English

Contract(s)/Grant(s): W911NF-04-C-0039

Report No.(s): AD-A482294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482294

Functional Genetics received a contract from DARPA, No. W911NF04-C-0039, from April 2004 to October 2006, to study TSG101 Based Antibody Therapeutic for Ebola and Related Viruses . We had set an overall goal for this contract to discover anti-TSG101 antibody therapeutics that would inhibit the budding of Ebola and related viruses which rely on TSG101 to exit infected cells. TSG101 is normally an intracellular protein and belongs to the endosomal ESCRT-I protein sorting complex. TSG101 is hijacked by Ebola, HIV, and other viruses for budding out of the infected cells to produce new viral particles. Because TSG101 binds directly to Ebola VP40 protein and HIV p6 though the same protein motif, PTAP, on these viral proteins, we have proposed to use HIV as a surrogate of Ebola due to the similarity in budding mechanisms and the

difficulty in performing Ebola experiments. After extensive screening of mouse monoclonal antibodies by traditional immunological assays, unlike the results from the polyclonal antibodies, we have not found monoclonal antibodies that directly inhibited viral budding and the consequent infection. Although we have not obtained antibody therapeutics for Ebola based on direct inhibition of budding through TSG101, we did make major progress in demonstrating that TSG101 was exposed extracellularly in virus infected cells but not in uninfected cells. Previous literature has demonstrated the general movement of intracellular TSG101 to the cytoplasmic membrane location but has not demonstrated the extracellular exposure of TSG101. We have therefore devised a new approach to use TSG101 to specifically mark viral infected cells for antibody-mediated killing or clearance , instead of finding antibodies that directly inhibit budding as a result of binding to TSG101.
DTIC
Antibodies; Blood Cells; Immunology; Infectious Diseases; Therapy; Viruses

20080038706 General Hospital Corp., Boston, MA USA
Investigating the Functional Role of Prostate-Specific Membrane Antigen and its Enzymatic Activity in Prostate Cancer Metastasis
Lin, Sharron X; Feb 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0229
Report No.(s): AD-A482295; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482295

It is fundamentally important to understand the underlying mechanisms regulating prostate caner (PCa) metastasis. Despite the increased PSMA expression found in more advanced stage of PC a little is known about the functional role of PSMA in PCa progression. Work accomplished for the period of the report has (1) generated the fluorescently labeled anti-PSMA antibodies for monitoring PSMA expressions in live PCa cells (2) established the cell model systems with reduced PSMA expression for studying PSMA functions (3) identified fibronetin as a specific extracellular matrix for enhanced LNCaP attachment and (4) performed 2-D wound healing assays to examine the role of PSMA in PCa cell migration. Results from these studies demonstrated and further supported the idea that PSMA is involved in PCa cell adhesion and migration therefore will enhance our understanding of molecular regulatory mechanisms of PCa. Knowledge about the action of PSMA in cell adhesion and migration during PCa metastasis will have a direct impact on the improvement for design better-targeted approaches for treating patients suffering from metastatic prostate cancer.
DTIC
Antigens; Cancer; Enzyme Activity; Enzymes; Membranes; Metastasis; Prostate Gland

20080038710 Clark-Atlanta Univ., GA USA
The Study and Development of Metal Oxide Reactive Adsorbents for the Destruction of Toxic Organic Compounds
Mitchell, Mark B; Apr 15, 2008; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0377
Report No.(s): AD-A482303; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482303

The achievements realized during the course of this project provide an important alternative method for mitigating the effects of the exposure of personnel and systems to chemical warfare agents and other toxic organic compounds. The research program that was developed built upon earlier results achieved in the room temperature oxidative decomposition of a chemical warfare agent simulant, dimethyl methylphosphonate (DMMP), on solid reactive adsorbents and examined ways of improving those results by modifying the nature of the reactive adsorbent itself and by adding an energetic co-reactant.
DTIC
Adsorbents; Destruction; Metal Oxide Semiconductors; Metal Oxides; Methyl Compounds; Organic Compounds; Oxidation; Radicals; Reactivity; Toxicity

20080038712 Benaroya Research Inst., Seattle, WA USA
Humanized in vivo Model for Autoimmune Diabetes
Nepom, Gerald T; Gebe, John A; Feb 2008; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0121
Report No.(s): AD-A482306; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482306

The CD4+ T cell response is critical for cellular autoimmunity in human T1D, but incomplete understanding of issues of

specific cell frequency, avidity, function, and correlation with disease status presents major obstacles to improved therapies. This research study entails using humanized mice manifesting type 1 diabetes (T1D)-associated human HLA molecules to address the fate and pathogenicity of high and low avidity T cells reactive to the putative autoantigen glutamic acid decarboxylase 65 (GAD65). By modeling the dominant human anti-GAD65 response in HLA- and TCR-transgenic mice, we proposed to determine whether pathogenic and/or regulatory responses correspond to high or low avidity profiles at different points during disease course. These ongoing studies indicate that the tolerance mechanisms used to prevent self-antigen GAD65 reactive T cells from eliciting autoimmunity in humanized DR4 HLA mice are diverse and that no single mechanism is exclusively used to maintain immune tolerance and prevent diabetes.
DTIC
Diseases; Immunity; Immunology; In Vivo Methods and Tests; Metabolic Diseases

20080038728 General Accounting Office, Washington, DC USA
Review of the President's Fiscal Year 2009 Budget Request for the Defense Health Program's Private Sector Care Budget Activity Group
Fantone, Denise M; Pickup, Sharon; May 28, 2008; 24 pp.; In English
Report No.(s): AD-A482331; GAO-08-721R; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482331
The Conference Report accompanying the Fiscal Year 2008 Department of Defense Appropriations bill directed us to review the President's fiscal year 2009 budget request for the Defense Health Program's Private Sector Care BAG. To do this, we reviewed (1) DOD's justification for the request for the Private Sector Care BAG, including the underlying estimates and the extent to which DOD considered historical information; and (2) changes between this request and the request for fiscal year 2008 and factors causing these changes. To conduct our work, we analyzed the methodologies that DOD used to develop the budget requests for the Private Sector Care BAG in fiscal years 2008 and 2009. We also interviewed officials and analyzed documents from DOD's Office of the Under Secretary of Defense (Comptroller) and TRICARE Management Activity, which were the offices responsible for developing budget requests for the Private Sector Care BAG. We also relied on prior GAO work, particularly past work in which we analyzed DOD's projected savings from planned increases in beneficiary cost sharing. In addition, we reviewed budget and obligation data related to the Defense Health Program but we did not validate these data. We have raised concerns about the quality of DOD's financial data in previous reports. However, we determined that these data were sufficiently reliable to understand DOD's budget formulation process and the underlying assumptions used to develop the President's budget request.
DTIC
Defense Program; Estimates; Health

20080038736 Tufts Univ., Medford, MA USA
Detecting Natural Versus Unnatural DNA
Brodley, Carla; Cowen, Lenore; Slonim, Donna; Eisen, Jonathan; Oct 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-06-1-0478
Report No.(s): AD-A482341; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482341
We have developed computational pipeline that compares a target genome with related genomes and find regions that have been potentially engineered. Our pipeline compares the target genome with related genomes and finds 'unique' genes that have no homologs. These 'unique genes' can then be tested for other criteria like DNA composition to narrow down the list of potential engineered genes.
DTIC
Deoxyribonucleic Acid; Detection; Genetic Engineering; Genome; Microorganisms; Pathogens

20080038739 Michigan Univ., Ann Arbor, MI USA
Differential Mechanisms of Androgen Resistance
O'Mahony, Orla A; Dec 2007; 41 pp.; In English
Contract(s)/Grant(s): W81X-WH-05-1-0105
Report No.(s): AD-A482347; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482347
We proposed to study the mechanisms of androgen resistance by focusing on androgen receptor mutations that may arise

due to selective pressures of antiandrogen treatment. We have utilized xenograft models and a humanized mouse model (h/mAR xTRAMP) of prostate cancer. Novel AR mutations were found throughout the entire coding region of AR although they did not segregate into distinct regions based on hormonal treatment as was previously reported. Functional analysis of some of these mutations was carried out. Preliminary analysis suggests some AR variants show differential action on different promoters and in different cell types suggesting promoter and cell specific effects. Interestingly a high number of mutations occurred in treated mice when compared to non treated mice supporting a role for treatment in AR variant generation. Analysis of tumor progression in the h/mAR X TRAMP mice have highlighted differences in disease course between antiandrogen treated and hormone deplete (castrated) mice. Utilization of m/hARxTRAMP mice provided us with a tool to better understand the mechanisms of androgen resistance in prostate cancer and will aid research into more effective treatments.
DTIC
Cancer; Hormones; Males; Prostate Gland

20080038778 Wisconsin Univ., Madison, WI USA
Cannabinoid Receptors: A Novel Target for Therapy for Prostate Cancer
Mukhtar, Hasan; Afaq, Farrukh; Sarfaraz, Sami; Feb 2008; 69 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0217
Report No.(s): AD-A482403; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482403

We have shown that the expression levels of both cannabinoid receptors CB1 and CB2 are higher in human prostate cancer cells than in normal prostate epithelial cells and treatment of LNCaP cells with WIN-55,212-2 (WIN) resulted in inhibition of cell growth and induction of apoptosis. Next study was conducted to understand the mechanistic basis of these effects. Treatment of LNCaP cells with WIN resulted in i) an arrest of the cells in the G0/G1 phase of the cell cycle; ii) an induction of p53 & p27/KIP1; iii) down-regulation of cyclins decrease in the expression of cdks; iv) decrease in protein expression of pRb; v) down-regulation of E2F (1-4); and vi) decrease in the protein expression of DP1 and DP2. Similar effects were also observed when androgen-independent PC3 cells were treated with WIN(5-30 microM). We further observed sustained up regulation of ERK1/2, and inhibition of PI3k/Akt pathways in WIN-55,212-2 treated cells. Inhibition of ERK1/2 abrogated WIN indued cell death suggesting that sustained activation of ERK1/2 leads to cell-cycle dysregulation and arrest of cells in G0/G1 phase subsequently leading to an induction of apoptosis. Further, WIN treatment of cells resulted in a dose-dependent increase in Bax/Bcl-2 ratio in such a way that favors apoptosis. The induction of apoptosis proceeded through down regulation of caspases 3, 6, 7, and 9 and cleavage of PARP. To establish in vivo relevance of these in vitro findings, we implanted athymic nude mice with androgen-responsive CWR22R 1 cells which form rapid tumors and secrete PSA in the blood stream of the host. As compared to untreated animals, WIN treated mice (0.5 mg/kg b.wt, i.p, alternate day) exhibited significant inhibition in the tumor growth with significant reduction in PSA secretion in the serum. In animals without WIN treatment, targeted tumor volume of 1200 mm3 was reached at 35 days post-tumor inoculation; whereas this tumor volume was attained in 51 days in WIN treated.
DTIC
Cancer; Prostate Gland; Targets; Therapy

20080038783 Cincinnati Univ., OH USA
Multiscale Modeling of Complex Systems Conformational Transitions in Proteins
Beck, Thomas; Wijesekera, Nimal; Rogers, David; Petrenko, Roman; Oct 14, 2006; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0381
Report No.(s): AD-A482429; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482429

This project concerns development of new simulation methods for modeling protein conformational changes. The purpose is to develop accurate methods for generating a coarse Hamiltonian for use in Monte Carlo simulation. Our method is unique in that we derive the coarse scale energy function based on fine scale (all atom) simulation. We are developing a general scheme which employs both replica exchange (multiple temperatures) with resolution exchange (multiple scales). The method will lead to order-of-magnitude speedup in accurate simulations of loop conformations and protein folding more generally.
DTIC
Complex Systems; Models; Proteins

20080038865 Maryland Univ., College Park, MD USA

Nucleobase Orientation and Ordering in Films of Single-Stranded DNA on Gold

Petrovykh, Dmitri Y; Perez-Dieste, V; Opdahl, Aric; Kimura-Suda, Hiromi; Sullivan, J M; Tarlov, Michael J; Himpsel, F J; Whitman, Lloyd J; Apr 2005; 3 pp.; In English

Report No.(s): AD-A482470; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Understanding the structure of single-stranded DNA (ssDNA) immobilized on surfaces is critical for applications exploiting the molecular recognition function of nucleic acids. Here we show how the structure of ssDNA monolayers can be characterized using complementary spectroscopies that probe electronic and vibrational states of nucleobasessX-ray photoelectron (XPS), Fourier transform infrared (FTIR), and near-edge X-ray absorption fine structure (NEXAFS) spectroscopies. XPS reveals core-level shifts sensitive to DNA surface chemistry; NEXAFS probes electron transitions between core levels and empty valence orbitals that are sensitive to nucleobase orientation; and FTIR provides vibrational fingerprints sensitive to orientation and molecular interactions., Existing approaches for using these surface analysis methods to characterize self-assembled monolayers (SAMs) are not directly applicable to studies of ssDNA monolayers, which share very few properties with prototypical SAMs. Whereas van der Waals attraction drives the assembly and ordering in typical SAMs, DNA immobilization is subject to strong electrostatic repulsion. Strands of ssDNA are also much longer and more flexible than typical molecules in SAMs; therefore, lateral spacing is length-dependent, and long-range lateral ordering is not observed in DNA monolayers. The main type of local ordering that may be present in a DNA film is nucleobase stacking. Nucleobase stacking largely determines the structure and interactions of DNA (including DNA hybridization); therefore, development of methods to detect the associated orientational ordering is a major objective in characterization of DNA films. Such methods will also help to study other biointerfaces (e.g., surface-bound proteins)1 and to elucidate the correspondence of structures determined ex situ to those in aqueous solutions. We use thymine homo-oligonucleotides [oligo(dT)] on polycrystalline

DTIC

Deoxyribonucleic Acid; Fourier Transformation; Gold; Infrared Radiation; Nucleic Acids

20080038867 Maryland Univ., College Park, MD USA

Quantitative Characterization of DNA Films by X-ray Photoelectron Spectroscopy

Petrovykh, Dmitri Y; Kimura-Suda, Hiromi; Tarlov, Michael J; Whitman, Lloyd J; Sep 2003; 13 pp.; In English

Report No.(s): AD-A482472; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe the use of self-assembled films of thiolated (dT)25 single-stranded DNA (ssDNA) on gold as a model system for quantitative characterization of DNA films by X-ray photoelectron spectroscopy (XPS). We evaluate the applicability of a uniform and homogeneous overlayer-substrate model for data analysis, examine model parameters used to describe DNA films (e.g., density and electron attenuation length), and validate the results. The model is used to obtain quantitative composition and coverage information as a function of immobilization time. We find that when the electron attenuation effects are properly included in theXPSdata analysis, excellent agreement is obtained with Fourier transform infrared (FTIR) measurements for relative values of the DNA coverage, and the calculated absolute coverage is consistent with a previous radiolabeling study. Based on the effectiveness of the analysis procedure for model (dT)25 ssDNA films, it should be generally valid for direct quantitative comparison of DNA films prepared under widely varying conditions.

DTIC

Deoxyribonucleic Acid; Photoelectron Spectroscopy; Radioactive Isotopes; X Ray Spectroscopy

20080038869 Maryland Univ., College Park, MD USA

Quantitative Analysis and Characterization of DNA Immobilized on Gold

Petrovykh, Dmitri Y; Kimura-Suda, Hiromi; Whitman, Lloyd J; Tarlov, Michael J; Jan 2003; 9 pp.; In English

Report No.(s): AD-A482474; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe the complementary use of X-ray photoelectron spectroscopy (XPS) and Fourier transform infrared (FTIR) spectroscopy to quantitatively characterize the immobilization of thiolated (dT)25 single-stranded DNA (ssDNA) on gold. When electron attenuation effects are accurately accounted for in the XPS analysis, the relative coverage values obtained by the two methods are in excellent agreement, and the absolute coverage can be calculated on the basis of the XPS data. The evolution of chemically specific spectral signatures during immobilization indicates that at lower coverages much of the DNA lies flat on the surface, with a substantial fraction of the thymine bases chemisorbed. At higher immobilization densities, the (dT)25 film consists of randomly coiled ssDNA molecules each anchored via the thiol group and at possibly one or two other bases. We use two examples to demonstrate how the quantitative analysis can be applied to practical problems: the effects of different buffer salts on the immobilization efficiency; the immobilization kinetics. Buffers with divalent salts dramatically

increase the efficiency of immobilization and result in very high surface densities (>5 x 10(exp 13)/sq cm), densities that may only be possible if the divalent counterions induce strong attractive intermolecular interactions. In contrast with previous reports of alkanethiol adsorption kinetics on gold, ssDNA immobilization in 1 M phosphate buffer does not occur with Langmuir kinetics, a result attributable to rearrangement within the film that follows the initial adsorption.
DTIC
Deoxyribonucleic Acid; Fourier Transformation; Gold; Photoelectron Spectroscopy; Quantitative Analysis; Thiols; X Ray Spectroscopy

20080038886 Army Research Inst. of Environmental Medicine, Natick, MA USA
Hemoglobin P50 During a Simulated Ascent of Mt. Everest, Operation Everest II
Wagner, Peter D; Wagner, Harrieth E; Groves, Bertron M; Cymerman, Allen; Houston, Charles S; Jan 2007; 12 pp.; In English
Report No.(s): AD-A482503; M06-42; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The amount of O2 available to tissues is essentially the product of cardiac output, [Hb], and O2 saturation. Saturation depends on P(O2) and the O2Hb dissociation curve. With altitude, increased [2,3-DPG] shifts the dissociation curve rightward, but hypocapnia and alkalosis move it leftward. We determined both standard and in vivo P(50) in 5 fit subjects decompressed over 42 days in an altitude chamber to the equivalent of the Mt. Everest summit (Operation Everest II). Arterial and venous blood was sampled at five 'altitudes' (P(B) 760, 429, 347, 282, 253 mmHg), and P0(2), Pco2, pH , O2 saturation, [Hb] and [2,3-DPG] were measured. As reported previously, 2,3-DPG levels increased from 1.7 (P(B) 760) to 3.8 mmol/L (P(B) 282). Standard P(50) also increased (from 28.2 mmHg at sea level to 33.1 on the summit, $p < 0.001$). Alone, this would have lowered saturation by 12 percentage points at a summit arterial P(O2) of approx. 30 mmHg. However, in vivo P(50) remained between 26 and 27 mmHg throughout due to progressive hypocapnia and alkalosis. Calculations suggest that the increase in standard P(50) did not affect summit V(O2MAX), alveolar, arterial and venous P(O2's), but reduced arterial and venous O2 saturations by 8.4 and 17.4 points, respectively, and increased O2 extraction by 7.9 percentage points. Reduced saturation was balanced by increased extraction, resulting in no significant overall O2 transport benefit, thus leaving unanswered the question of the purpose of increased [2,3- DPC] concentrations at altitude.
DTIC
Ascent; Hemoglobin; Himalayas; Mountains; Oxygen; Simulation; Supports

20080038890 University of Southern Illinois, Springfield, IL USA
Mechanism of Tumor Metastasis Suppression by the KAI1 Gene
Watabe, Kounosuke; Feb 2008; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-01-0193
Report No.(s): AD-A482508; No Copyright; Avail.: Defense Technical Information Center (DTIC)

KAl1 is a tumor metastases suppressor gene which is capable of blocking the metastatic process without affecting the primary tumorigenesis. In this project we tested the hypothesize that the KAl1 protein on tumor cells interacts with gp-Fy (DARC) on the endothelial cells which activates a signal pathway of the KAl1 molecule and that this activation eventually leads to cell growth arrest of tumor cells. We originally planned to examined whether the interaction of KAl1 and DARC leads to suppression of tumor metastasis in vivo (Task 1) and identify specific peptide sequences that activate KAl1 and to assess the efficacy of the peptides on tumor growth in an animal model (Task 2). We have successfully completed Task 1 and published the results in Nature Medicine. Task 2 has been partly accomplished but there are some tasks remained. However we consider that our project has been overall quite successful and our original idea has been fully developed. The results of this project have led to successful ROl funding and we will continue to develop and expand our research.
DTIC
Metastasis; Neoplasms; Tumors

20080038894 University of Pittsburgh Medical Center, PA USA
Ft. Sam 91 Whiskey Combat Medic Medical Simulation Training Quantitative Integration Enhancement Program
Phrampus, Paul; Love, Kimberly; Apr 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-2-0049
Report No.(s): AD-A482512; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document includes the primary accomplishments for the reporting period 4/1/07 - 3/31/08. Primary accomplishments

during this period: the continued development and validation of the project foundation materials logistical planning and the purchase of medical simulators.
DTIC
Alcohols; Augmentation; Combat; Education; Simulation

20080038898 Naval Research Lab., Washington, DC USA
A DNA Array Sensor Utilizing Magnetic Microbeads and Magnetoelectronic Detection
Miller, M M; Sheehan, P E; Edelstein, R L; Tamanaha, C R; Zhong, L; Bounnak, S; Whitman, L J; Colton, R J; Jan 2001; 8 pp.; In English
Report No.(s): AD-A482516; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe a multi-analyte biosensor that uses magnetic microbeads as labels to detect DNA hybridization on a micro-fabricated chip. The beads are detected by giant magnetoresistance (GMR) magnetoelectronic sensors embedded in the chip. The prototype device is a tabletop unit containing electronics, a chip carrier with a microfluidic flow cell, and a compact electromagnet and is capable of simultaneous detection of eight different analytes.
DTIC
Deoxyribonucleic Acid; Electromagnets; Magnetoresistivity

20080038899 California Univ., Davis, CA USA
Improving Blood Monitoring of Enzymes as Biomarkers of Risk from Anticholinergic Pesticides and Chemical Warfare Agents
Wilson, Barry W; Oct 2006; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0772
Report No.(s): AD-A482517; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Blood biomarkers are an important way to monitor exposure to anticholinergic pesticides and chemical warfare agents and to establish whether some personnel are at greater risk than others from exposure. Many clinical and research laboratories use the colorimetric Ellman assay based on the hydrolysis of acetylthiocholine. CHPPM (US Army Center for Health Promotion and Preventive Medicine) uses a slower delta pH method based on that of Michel to monitor 16,000 DOD personnel each year. Two different approaches of ours yielded conversion factors for expressing delta pH AChE in terms of Ellman assay units. We also converted the normal range of AChE activities from the CHPPM delta pH assay to Ellman units generating important benchmarks for clinical laboratory determinations in the absence of baseline data. Future work includes determining conversion factors for the Test Mate cholinesterase measurements to the delta pH and Ellman methods, and examining the feasibility of monitoring serum BChE and PON1 activities in collaboration with the CRL laboratory of CHPPM.
DTIC
Anticholinergics; Biomarkers; Blood; Chemical Analysis; Chemical Warfare; Enzymes; Pesticides; Risk

20080038900 Temple Univ., Philadelphia, PA USA
Role of CDK4 in Breast Development and Cancer
Reddy, Haritha; Apr 2008; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0262
Report No.(s): AD-A482519; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cdk4 is an important regulator of GI/S cell cycle progression in mammalian cells. In humans the Cdk4 gene is amplified in 16% of sporadic breast tumors. In mice the loss of Cdk4 affects the development of the mammary glands. Our studies to determine the role of Cdk4 in Neu Wnt-1 and Ras-induced breast tumorigenesis indicated that the absence of Cdk4 impairs Neu and Ras-induced mammary tumorigenesis but not that induced by Wnt-1. Specifically while the tumor incidences in Cdk4-null MMTV-Ras and MMTV-Neu mice were dramatically reduced when compared to their respective wild-type transgenic counterparts (0% versus 70% and 14% versus 97% respectively) the loss of Cdk4 did not affect the tumor incidence in the MMTV-Wnt-1 mouse model. In addition to Cdk4 null models we also assessed the role of the Cdk4R24C mutation played in mammary tumorigenesis. Interestingly the onset of tumors is significantly delayed in MMTV-Ras transgenic mice that express the hyperactive Cdk4R24C mutated allele when compared to those mice that express wild-type Cdk4. Analysis of the tumors and normal tissues suggests that the Cdk4 gene may play a role in modulating oncogenic stress-induced DNA damage checkpoint responses.
DTIC
Breast; Cancer; Mammary Glands

20080038901 Georgetown Univ., Washington, DC USA

Interaction of A1B1 and BRCA1 in the Development of Breast Cancer

Lahusen, John T; Mar 2008; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0250

Report No.(s): AD-A482520; No Copyright; Avail.: Defense Technical Information Center (DTIC)

AIB1 (SRC3) belongs to the p160 family of steroid receptor coactivators including SRC-1 and SRC-2. AIB1 interacts with several nuclear receptors including estrogen and progesterone receptors in a ligand-dependent manner and enhances their transcriptional activity. AIB1 is amplified and/or overexpressed in approximately 30% of breast cancers and can increase the sensitivity of breast cancer cells to estrogen and to growth factor signaling. BRCA1 regulates cell cycle progression apoptosis induction transcription and DNA repair. From 5-10% of total breast cancers are due to germ-line BRCA1 mutations that lead to a deficiency in the BRCA1 protein. We have observed that AIB1 can partially reverse BRCA1 mutated repression of ER-dependent transcriptional activity in breast cancer. This research will identify if there is a functional consequence of an interaction between AIB1 and BRCA1 in breast cancer.

DTIC

Breast; Cancer; Genes; Mammary Glands

20080038902 Stottler Henke Associates, Inc., San Mateo, CA USA

Medical Emergency Team Tutored Learning Environment

Domeshek, Eric A; May 2008; 133 pp.; In English

Contract(s)/Grant(s): W81XWH-04-C-0067

Report No.(s): AD-A482521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Stottler Henke investigated the design and implementation of a simulation-based Intelligent Tutoring System to teach appropriate decision-making and team-coordination skills focused on patient diagnosis, treatment, and management. Our Medical Emergency Team Tutored Learning Environment (METTLE) tutors individual medical personnel on the decisions and team interactions appropriate to their roles in front-line medicine. To enable any-time/any-where use, METTLE has been built as a rich web application that requires only standard web browser capabilities. To enable use by individual students, METTLE simulates other team members, including especially discussions with other actors. To address decision-making, METTLE exploits Socratic-style dialogs that elicit decision rationale. The main products of this effort include (1) software tools that support medical decision-making training scenarios, and applications in other decision-making domains emphasizing data-gathering and discussion, (2) a proof-of-concept training scenario that demonstrates the applicability of our technology to medical decision making in the context of Chemical, Biological, and Radiological emergencies, and (3) a methodology, tools, and set of content assets that can be used to speed construction of additional medical training scenarios. With increasing threats to U.S. military and civilians, deployable computer-based simulations with embedded intelligent tutors can lower costs, increase availability, and ensure uniformity of critical medical training.

DTIC

Computerized Simulation; Emergencies; Medical Personnel; Teams

20080038903 Yale Univ., New Haven, CT USA

Molecular Basis for BRCA2-mediated DNA Repair and Breast Tumor Suppression

Etchin, Julia; Oct 2007; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0782

Report No.(s): AD-A482522; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In eukaryotes, homologous recombination and the homology-directed repair of DNA double-strand breaks are mediated by the RAD51 recombinase. In catalyzing recombination reactions, RAD51 must first form a right-handed helical filament, termed the presynaptic filament, on single-stranded DNA. Emerging evidence indicates that BRCA2 acts a recombination mediator by promoting the assembly of the RAD51 presynaptic filament. BRCA2 binds DNA and associates with RAD51. Our laboratory has established biochemical systems to examine the recombination mediator function of BRCA2. The main focus of my fellowship project is to define the role of DNA binding in this BRCA2 function. The BRCA2 DNA-binding domain (DBD) represents a highly conserved region within BRCA2-like molecules and harbors a significant portion of tumor-derived missense mutations, underscoring the importance of addressing the functional significance of this BRCA2 domain.

DTIC

Breast; Cancer; Deoxyribonucleic Acid; Genes; Mammary Glands; Suppressors; Tumors

20080038904 Vanderbilt Univ., Nashville, TN USA

Development of an Automated Modality-Independent Elastographic Image Analysis System for Tumor Screening

Ou, Jao J; Feb 2008; 65 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0221

Report No.(s): AD-A482523; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective or this project is to further develop modality-independent elastography as a system that is able to reproducibly detect regions or increased stiffness within the breast based on pre- and post- compression input images or the anatomy. As stated in the proposal, the original specific aims are concerned with enhancement of the method, investigation of texture and statistical analyses for evaluating the success of the method, and engineering of a device that can generate proper forces on mock setups within current available clinical imaging systems. To date, progress on each of these aims has been made in handling increased computational complexity, developing and testing metrics for the evaluation of reconstructions, and the fabrication of a compression chamber tested on a tissue-like polymer phantom.

DTIC

Image Analysis; Neoplasms; Tumors

20080038905 Mount Sinai School of Medicine, New York, NY USA

Evaluating an Interactive, Multimedia Education and Decision Program for Early-Stage Prostate Cancer Patients in a Randomized Controlled Trial

Diefenbach, Michael A; Feb 2008; 10 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0179

Report No.(s): AD-A482524; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This 3-arm randomized controlled trial evaluates the efficacy of a CD-ROM based multimedia prostate cancer education system (PIES). PIES is an educational software that provides patients with information about prostate cancer and its treatment through an intuitive interface, using video, animation, text, and voice-over text. All text is tailored to a person's information seeking preference. Participants (N = 86) are patients diagnosed with localized prostate cancer who will be randomized into three experimental conditions: a) Standard care, involving the provision of standard NCI print material about prostate cancer, Group 1; b) PIES software without tailoring component, Group 2; c) and PIES software with tailoring component, Group 3. Assessments will be taken prior to exploring the software/brochures, immediately after completing the software/brochure, and 6-weeks post baseline. The study design allows for the evaluation of the efficacy of the multimedia intervention against traditional care; the influence of tailoring versus not tailoring information within a multimedia context; and for an evaluation of the moderating effect of monitoring on the efficacy of the groups.

DTIC

Cancer; Computer Programs; Decision Making; Education; Multimedia; Patients; Prostate Gland

20080038906 Rutgers - The State Univ., Piscataway, NJ USA

Role of MicroRNA Genes in Breast Cancer Progression

Padgett, Richard W; Aug 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0483

Report No.(s): AD-A482525; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this proposal we asked if miRNA expression is altered as cells progress through the different stages of cancer. Through our microarray experiments we have shown that many miRNAs are differentially regulated as cells progress through cancer stages. A general trend in miRNA expression emerges from this work. As cells progress toward a metastatic state more miRNAs are down regulated rather than up regulated. This suggests that many cellular proteins are up regulated in these cells and this could be involved in promoting tumor growth. We propose that the mouse if a good model system for the study of breast cancer since several miRNAs are similarly regulated in both mouse and human. Finally we are beginning to gain insights into the mechanism of how miRNAs are involved in cell growth--studies show that some regulated miRNAs control cell death. The mis-regulation of cell death could allow cells to escape normal regulatory mechanisms for removing tumorous cells.

DTIC

Breast; Cancer; Diseases; Genes; Genetics; Mammary Glands

20080038909 Harvard Medical School, Boston, MA USA

RhoGTPase Involvement in Breast Cancer Migration and Invasion

Simpson, Kaylene J; Mar 2008; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0360

Report No.(s): AD-A482528; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using a high throughput small interfering RNA approach (siRNA) I screened 1081 human genes (kinases, phosphatases and a library of migration and adhesion related genes) using an automated wound healing assay to identify genes that regulate cell migration using the normal mammary epithelial cell line MCF10A. After extensive validation using other siRNAs and shRNAs I identified 66 High Confidence (HC) genes that Accelerate or Inhibit cell motility. Of these genes, 42 have no prior association with cell motility or adhesion and of these, 12 are uncharacterized with respect to any biological process. The migration pattern for the 66 HC genes were established using time-lapse video microscopy and revealed that a significant proportion of the genes that accelerate migration do so by disruption of cell-cell adhesion and adoption of highly erratic and random cell motility. These represent novel targets for future studies relating to breast carcinoma progression.

DTIC

Breast; Cancer; Mammary Glands; Migration; Ribonucleic Acids

20080038911 Duke Univ., Durham, NC USA

Development and Optimization of a Dedicated, Hybrid Dual-Modality SPECT-CmT System for Improved Breast Lesion Diagnosis

Madhav, Priti; Jan 2008; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-01-0791

Report No.(s): AD-A482530; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of this project is to implement a dual-modality single photon emission computed tomography (SPECT) and x-ray computed mammotomography (CmT) system for the detection and staging of breast cancer monitoring of treatment therapies and improving surgical biopsy guidance. The sequential acquisition with emission (nuclear) and transmission (x-ray) 3D imaging systems can aid in localizing the radioactive uptake of a tumor from the emission image by using the anatomical structure from the transmission image. In the first year both systems were integrated onto a single platform with a customized patient bed to allow emission and transmission imaging of a pendant uncompressed breast during a single session. Further investigation was done to ensure that each system was positioned such that it could fit over the patient bed and completely sample the breast. Physical constraints of each system were examined. A data acquisition sequence was designed for SPECT and CmT. Imaging feasibility with geometric phantoms and breast phantoms were performed to study the resolution/sampling properties and fusion of functional-anatomical images. One hybrid patient study was also carried out. In the next two years of this grant corrections due to the CmT offset geometry x-ray scatter and attenuation will be applied to increase contrast decrease noise and improve quantitative accuracy in the images. In addition to research clinical experience in other areas of breast cancer detection was explored.

DTIC

Breast; Cancer; Diagnosis; Lesions; Mammary Glands

20080038912 Pennsylvania Univ., Philadelphia, PA USA

Role of the Chemokine MCP-1 in Sensitization of PKC-Medicated Apoptosis in Prostate Cancer Cells

Kazanietz, Marcelo G; Feb 2008; 15 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0119

Report No.(s): AD-A482531; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main conclusion from the research in the first year of funding is that PKC isozymes play a role in the control of the release of death factors from prostate cancer cells. It is clear that PKCs control the expression of mRNA for death factors in prostate cancer cells and therefore there is great potential that PKC isozymes modulate either their transcription or mRNA stability. We succeeded in establishing the kinetics of CCL2 mRNA expression and release from LNCaP in prostate cancer cells in response to the phorbol ester PMA. We also found that CCL2 release occurs also in androgen-independent prostate cancer cells and that this effect is mediated by PKC alpha and PKC delta isozymes. We also established a role for p38 MAPK in the release of CCL2 from LNCaP cells induced by PMA. Importantly our research during the last year allowed to establish a novel paradigm which suggest that androgens regulate apoptotic factor release from prostate cancer cells in response to PKC activation.

DTIC

Apoptosis; Cancer; Prostate Gland

20080038914 Loma Linda Veterans Association for Research and Education, Loma Linda, CA USA

Molecular Mechanisms of Soft Tissue Regeneration and Bone Formation in Mice: Implication in Fracture Repair and Wound Healing in Humans

Mohan, Subburaman; Apr 2008; 201 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9571

Report No.(s): AD-A482533; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary goal of the proposed work is to identify genes which play an anabolic role in bone and soft tissue function and to clarify the function of these genes. Three hypotheses have been proposed: I) The high bone density gene in chromosome I in our CAST/B6 congenic mice can be cloned; 2) Genes that regulate soft- and hard-tissue regeneration can be identified by using appropriate mouse strains that exhibit differences in regeneration; and 3) ENU mutagenesis, applied to our mouse model, will lead to the identity of genes that regulate soft and hard tissue function. During the last funding period, we have proposed several specific objectives for each of the above-mentioned hypotheses. As disclosed in the progress report, we have successfully accomplished all of the specific objectives. Our work during the first year of the funding period has resulted in two manuscripts in press, two published manuscripts, and three abstracts. We believe that the successful accomplishment of the proposed studies will provide a better understanding of the molecular mechanisms involved in hard- and soft-tissue regeneration and will provide a framework for future development of therapies for hard and soft tissue injuries.

DTIC

Bones; Fracturing; Genes; Wound Healing

20080038915 Fox Chase Cancer Center, Philadelphia, PA USA

MR Imaging Based Treatment Planning for Radiotherapy of Prostate Cancer

Chen, Lili; Feb 2008; 19 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0023

Report No.(s): AD-A482537; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this investigation is to develop an integrated system based on MRI simulation to improve target delineation, target localization and target motion correction for 3-dimensional conformal radiation therapy (3DCRT) and intensity-modulated radiation therapy (IMRT) of prostate cancer. We have performed studies on the effect of intra-fraction prostate motion using MR cine images and we also have been evaluating the accuracy of a stereotactic body frame for patient immobilization using MRI. We have confirmed that treatment planning dose calculations using MRI-derived homogenous geometry are adequate for patient sizes within 38 cm using the gradient distortion correction (GDC) software (Chen et al 2004a 2004b). We have quantified the residual distortions and developed computer software to reduce them using point-by point corrections for large patients (lateral dimension up to 42 cm, (Chen et al 2006)). We have verified dosimetric accuracy and consistency for MR based IMRT treatment planning for prostate cancer using the Monte Carlo method (Chen et al 2007). We have developed a technique to create MR-based digitally reconstructed radiographs (DRR) for patient initial setup for clinical applications of MR-based treatment planning for prostate IMRT (Chen et al 2007).

DTIC

Cancer; Imaging Techniques; Prostate Gland; Radiation Therapy

20080038916 Scripps Research Inst., La Jolla, CA USA

Protein ISG15 Modification in the Development and the Treatment of Chronic Myeloid Leukemia

Zhang, Dong-Er; Jun 2007; 81 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0269

Report No.(s): AD-A482538; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Interferons are useful drugs in treating chronic myeloid leukemia (CML). One of the cellular responses of interferon treatment is the activation of protein modification by ISG15. We have cloned a novel gene encoding a protease UBP43 that specifically removes ISG15 from ISG15 modified proteins. Furthermore, we have generated UBP43 knockout mice. UBP43 deficient hematopoietic cells have much higher levels of ISG15 modified proteins upon interferon stimulation and are hypersensitive to interferon treatment. This grant is to demonstrate that protein ISG15 modification is crucial for interferon function in CML treatment and to analyze the effect of UBP43 on CML development. In the past funding period, we have characterized BCR-ABL positive leukemia cell lines that have higher than normal or lower than normal levels of ISG15 conjugation. Furthermore, we have completed the studies on UBP43 knockout mice in the resistance to BCR/ABL induced

CML development and demonstrated that interferon plays a critical role in the process. One important finding is that the effect of UBP43 in interferon signaling is independent of its function in protein ISGylation.
DTIC
Leukemias; Proteins

20080038917 Burdick and Jackson Labs., Inc., Muskegon, MI USA
A BCR-ABL Kinase Activity-Independent Signaling Pathway in Chronic Myelogenous Leukemia
Li, Shaoguang; Feb 2008; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0239
Report No.(s): AD-A482539; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The BCR-ABL tyrosine kinase inhibitor imatinib mesylate (Gleevec) is the preferred treatment for human chronic myeloid leukemia (CML) but does not cure mice with BCR-ABL-induced acute lymphoblastic leukemia (ALL) similar to CML lymphoid blast crisis. The inability of imatinib to cure CML in mice leads us to hypothesize that a BCR-ABL kinase activity-independent pathway also plays a critical role in the development of this disease. We identified Src kinases as key molecules in this BCR- ABL kinase activity-independent pathway and they are essential for leukemic cells to survive imatinib treatment and for CML transition to lymphoid blast crisis. Inhibition of both SRC and BCR-ABL kinase activities affords complete B-ALL remission. However leukemic stem cell pathways must be targeted for curative therapy of Ph+ leukemia. We have identified CML stem cells in mice and found that these cells are insensitive to imatinib therapy. Our study suggests that Src kinases may be effective in inhibiting leukemic stem cells and combination therapy using a BCR-ABL/Src inhibitor and an anti-stem cells agent would be beneficial to CML patients. Our work will provide a new therapeutic strategy for CML.
DTIC
Enzyme Activity; Leukemias; Stem Cells

20080038920 Michigan Univ., Ann Arbor, MI USA
XIAP as a Molecular Target for Therapeutic Intervention in Prostate Cancer
Duckett, Colin S; Oct 2007; 76 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0891
Report No.(s): AD-A482544; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the final report of our CDMRP-funded research grant. Our study comprised of two research aims to validate and examine the therapeutic potential of targeting XIAP for the treatment of prostate cancer. In the first of the two Aims, we generated cell lines in which XIAP was suppressed, using lentiviral-based RNA interference delivery system. Additionally, we reconstituted these lines with a panel of XIAP variants lacking either the caspase inhibitory or the E3 ubiquitin ligase properties of this molecule. In functional studies, we have obtained important. We have made very significant progress towards the completion of the goals proposed in this award. In the first of the two Aims, we experimental data concerning the relative contribution of these different aspects of XIAP to the cytoprotective effects of this protein, although for technical reasons the use of these lines in xenograft studies generated excessive variation. In the second Aim, we have examined XIAP expression in the TRAMP transgenic murine model of prostate cancer. These studies have revealed an interesting trend towards Xiap-deficient animals being more susceptible to tumors, which correlates with some recent clinical data on XIAP expression in prosate cancer patients. Thus, these data have significant implications for the clinical use of XIAP antagonists as anti-cancer agents. Finally, the data described above are included in three manuscripts are currently in review.
DTIC
Apoptosis; Cancer; Prostate Gland; Targets; Therapy

20080038922 Arkansas Univ., Little Rock, AR USA
Non-Invasive Phosphorus-31 Magnetic Resonance Spectral Characterization of Breast Tissue Anomalies Using Pattern Recognition and Artificial Intelligence
Darsey, Jerry A; Lindquist, Diana; Buzatu, Dan; Walker, Ronald; Harms, Steven; Aug 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0491
Report No.(s): AD-A482556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It is highly desirable to develop a non-invasive spectroscopic and pattern recognition technique that can detect and reliably interpret images or spectral data from small volumes of the breast. Due to the pervasive nature of breast cancer in society today, and the consequent need of a highly accurate, early diagnostic tool, this is a very timely proposal that could have

a significant impact on women's health. Patient ROtating Delivery of Excitation Off-resonance (RODEO) MRI data has been obtained from Dr. Diana Lindquist at the University of Arkansas for Medical Sciences. These patients, which flagged suspicious regions in breast tissue, have undergone needle biopsies from these suspect regions for pathological examination. With the patient's permission, Dr. Lindquist obtained P-31 MR scans of the flagged suspect tissue and healthy tissue in the same session. Access to data from 6 patients were obtained and made available for analysis in this study. We proposed to use a combination of pattern recognition techniques, including Artificial Neural Networks (ANN), to develop in vivo methods that use breast P-31 MR scans (suspicious and nonsuspicious regions) to diagnose potential malignant tissue. The MR scan data will be paired with the known biopsy results to create a supervised training set. Unfortunately two events occurred to prevent us from completing this study.
DTIC
Anomalies; Artificial Intelligence; Breast; Cancer; Excitation; Imaging Techniques; Magnetic Resonance; Mammary Glands; Pattern Recognition; Phosphorus Isotopes; Physical Examinations; Rotation; Spectra

20080038923 Colorado Univ., Aurora, CO USA
Validation of a Pre-Clinical Model for the Investigation of Menarcheal Age on Breast Cancer Risk
Schedin, Pepper J; Sep 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0499
Report No.(s): AD-A482557; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Validation of a Pre-Clinical Model for the Investigation of Menarcheal Age on Breast Cancer Risk. Beginning Date 09-01-2005, with a one year extension granted for an ending date of 08-31-2007. A one year extension was granted because the PI, Dr. Pepper Schedin, moved her lab from AMC Cancer Research Center in Denver, CO to the University of Colorado Health Sciences Center. This move resulted in a 6 month delay in finalizing the grant award. As a result, work on this grant was delayed until June 2006 and thus this final report represents work accomplished over an 18 month period from June 2006-January 2008.
DTIC
Breast; Cancer; Mammary Glands; Risk

20080038924 Massachusetts General Hospital, Boston, MA USA
'Joint Workshop on High Confidence Medical Devices, Software, and Systems (HCMDSS) and Medical Device Plug-and-Play (MD PnP) Interoperability'
Goldman, Julian M; May 2008; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0512
Report No.(s): AD-A482559; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Partial support was requested from TATRC, with joint funding from NSF, for a joint workshop to bring together the synergistic efforts and communities of the High Confidence Medical Devices, Software, and Systems (HCMDSS) program and the Medical Device Plug-and-Play (MD PnP) Interoperability program to provide a forum to exchange and learn from new research and development results by these groups. The three-day workshop drew 145 participants from academia, industry, government, and health care, including researchers, developers, regulators, users, and manufacturers of medical devices, as well as interested government agencies. The opening keynote address was given by Dr. Robert Kolodner, the National Coordinator for Health IT, and the program included refereed papers, panels on the Clinical Need and on Government Perspectives on Interoperability, a session of posters and scientific demonstrations in the MD PnP Lab, and breakout sessions on selected topics. The workshop proceedings were published by the IEEE Computer Society. Results included broadened perspectives and an expanded network of collaborators and stakeholders for both programs, presentations of meeting results in multiple venues, and new collaborations, as well as streaming video of all talks on the web.
DTIC
Computer Programs; Medical Equipment; Medical Services; Plugs; Software Engineering

20080038927 Nebraska Univ., Omaha, NE USA
New Therapeutic Strategies for Antibiotic-Resistant Select Agents
Hinrichs, Steven H; Griep, Mark; Dec 31, 2007; 81 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0275
Report No.(s): AD-A482564; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project was to establish the scientific basis for a new class of antibiotics that are needed to combat the

development of resistance to currently available medications or the engineering of resistance into biological select agents. A multidisciplinary team of microbiologists, biochemists, molecular biologists and drug discovery experts was established to explore the hypothesis that disruption of bacterial primase activity will provide the basis for antimicrobial discovery and further, that the modular components of primase will provide for the discovery of broad- and narrow-spectrum antibiotics. The experimental model examined the functional activities of the Gram positive Staphylococcus aureus with the Gram negative E.

DTIC

Antibiotics; Antiinfectives and Antibacterials; Bacteria; Microorganisms; Therapy

20080038928 California Inst. of Tech., Pasadena, CA USA

Intelligent Therapeutics and Metabolic Programming Through Tailormade, Ligand-Controlled RNA Switches

Smolke, Christina D; Feb 5, 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0281

Report No.(s): AD-A482566; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cells employ sensor biomolecules to dynamically evaluate their environments and trigger appropriate metabolic responses. The ability to program cells with engineered molecules that sense structural and chemical events and translate these events to controlled cellular behavior is a critical technology for challenges present in medical research and biotechnology. Recent studies have demonstrated the prevalence and diversity of nucleic acids that function as sensors and regulators of gene expression. Recent efforts in nucleic acid engineering have succeeded in the generation of synthetic nucleic acid molecules that regulate gene expression through diverse mechanisms. The goal of this proposal is to develop a platform for the design of nucleic acid molecules that will program and control targeted cellular behavior Specific aims include to: (i) Design ligand-controlled RNA switches that regulate gene expression in mammalian systems; (ii) Construct engineered RNA switches that program cellular fates; (iii) Construct RNA switches that sense and respond to endogenous signals; (iv) Design RNA switches that detect viral infections in model systems; (v) Apply engineered RNA switches to the inhibition of expression of key viral and host proteins. The long-term objective is to develop enabling tools for programming cellular response for applications in intelligent therapeutics and metabolic reprogramming.

DTIC

Ligands; Metabolism; Ribonucleic Acids; Switches

20080038932 RAND Corp., Santa Monica, CA USA

A Comparison of the Health Systems in China and India

Ma, Sai; Sood, Neeraj; Jan 2008; 61 pp.; In English

Report No.(s): AD-A482571; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we compare the health systems of China and India the world's two most populous countries, each of which is undergoing dramatic demographic, societal, and economic transformations to determine what approaches to improving health in these two countries do and do not work. In particular, we compare the health systems of China and India along three dimensions: policy levers, intermediate outcomes, and ultimate ends. Policy levers are policies or behaviors that affect the financing, organization, and regulation of health care. Intermediate outcomes are the efficiency, quality, and level of access to care. The ultimate ends of a health care system are to promote better health, reduce the financial risks associated with medical care, and increase consumer satisfaction. We conclude that both China and India have achieved substantial gains in life expectancy and disease prevention since independence; these gains are more substantial in China. However, both countries health systems provide little protection against financial risk, and patient satisfaction is a lower priority than it should be. This paper identifies priority areas for reform in each country that can help improve the performance of each health system. Both countries must * restructure health care financing to reduce the burden of out-of-pocket medical care costs on individual patients * increase access to care, especially in rural areas * reduce dependence on fee-for-service contracts that promote overutilization of medical care * build capacity for addressing and monitoring emerging diseases * match hospital capabilities with local needs.

DTIC

China; Health; India; Medical Services; Policies

20080038934 Beth Israel Deaconess Medical Center, Boston, MA USA

Determination of the Dynamics, Structure, and Orientation of the Transmembrane Segment of ErbB2 in Model Membranes Using Solid-State NMR Spectroscopy

Tiburu, Elvis K; Mar 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0756

Report No.(s): AD-A482577; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the proposed research was to investigate the structural properties of the transmembrane helix of the ErbB2 receptor utilizing solid-state nuclear magnetic resonance (NMR) spectroscopy and Molecular dynamics (MD) simulations. 15N Solid-state NMR results demonstrated that TM-ErbB2 has a transmembrane helical domain and that the orientation of the transmembrane domain is 24 5 in shorter chain dimyristoylphosphocholine and 11 3 in palmitoyloleoyphosphocholine. The orientation is dictated by the hydrophobic thickness of the synthetic phospholipid bilayers. Molecular dynamics simulations analysis demonstrated that in shorter chain lipids TM-ErbB2 also makes a tilt angle of about 28 5 with respect to the bilayer normal whereas in longer chain lipids, the tilt angle was found to be 14 4. We also conducted dimeirzation studies with the wild type TM-ErbB2 within the membrane bilayer environments. One of the motifs responsible for dimerization (SAVVG) was mutated to alanines whereas the other motif (GVVFG) was left intact. The GVVFG motif still had the ability to dimerize indicating that homodimerization is dictated by at least one of these motifs in full length receptor.

DTIC

Membranes; Nuclear Magnetic Resonance; Solid State; Spectroscopy

20080038935 Integrated Biotherapeutics, Frederick, MD USA

Therapeutic Human Hyperimmune Polyclonal Antibodies Against Staphylococcal Enterotoxin B

Aman, M J; May 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-08-C-0004

Report No.(s): AD-A482581; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This SBIR project aims to develop hyperimmune human polyclonal antibody that neutralizes the toxic activity of staphylococcal enterotoxin B (SEB) as treatment for toxic shock induced by SEB disseminated as aerosol in a biowarfare scenario. The primary goal of Phase I was to demonstrate the feasibility of therapeutic intervention with immunoglobulin enriched with antibodies against SEB. Feasibility of the approach was demonstrated in cellular assays and a mouse model of SEB induced toxic shock. IVIG and specific human anti-SEB antibodies purified from IVIG was used as a surrogate for hyperimmune globulin. It was demonstrated that human polyclonal antibodies can potently inhibit the toxicity of SEB. Antibodies were also able to protect mice from lethal challenge with SEB. Several cell based assays and respective SOPs were developed for testing the neutralizing activity of human polyclonal antibodies toward SEB. These assays will be used in Phase II to test the activity of sera from individuals vaccinated with IBT's recombinant SEB vaccine (STEBVax). Immunoglobulin will be purified from plasmapheresed vaccinated individuals to conduct preclinical efficacy studies in animal models of SEB toxic shock. It is anticipated that the Phase II project will result in a strong candidate for clinical development.

DTIC

Antibodies; Staphylococcus; Therapy; Toxicity

20080038936 Oregon Health Sciences Univ., Portland, OR USA

Development of a Novel Vaccine Vector for Multiple CDC Category A Pathogens

Nelson, Jay A; Wong, Scott W; Jarvis, Michael A; Apr 2008; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0046

Report No.(s): AD-A482582; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Specific Aim 1 was to generate a panel of RhCMV/MPV vectors expressing MPV antigens A29L, A35R, M1R and B6R in either the wild type RhCMV vector, or in a vector lacking MHC immunomodulatory genes. To date, two vectors have been constructed and characterized, and we have subsequently selected one WT RhCMV vector (WTRhCMV/A35R) for immunogical characterization in rhesus macaques. Specific Aims 2 and 3 were to establish the pathobiology of WT MPV infection in RMs, and to monitor the immunological consequences of WT MPV infection. To date, eight RMs have been experimentally inoculated intrabronchially with MPV Zaire strain (MPVZ) to define a lethal dose by this route of infection and to characterize the virus/host interactions. Together, completion of these three specific aims will form the foundation for future studies designed to determine the efficacy of the RhCMV/MPV vectors at inducing a protective immune response to

MPV challenge in RMs, and to identify viral determinants of pathogenesis.
DTIC
Infectious Diseases; Microorganisms; Pathogens; Vaccines

20080038937 RAND Corp., Santa Monica, CA USA
Invisible Wounds of War: Summary of Key Findings on Psychological and Cognitive Injuries
Jaycox, Lisa H; Jun 11, 2008; 14 pp.; In English
Report No.(s): AD-A482583; CT-307; No Copyright; Avail.: Defense Technical Information Center (DTIC)

My testimony will briefly discuss the prevalence of post-traumatic stress disorder and depression, as well as the incidence of traumatic brain injury among service members returning from Operations Enduring Freedom and Iraqi Freedom; the costs to society associated with these conditions and of providing care to those afflicted with these conditions, and the gaps in the care systems designed to treat these conditions among our nation's service members and veterans. These findings form the basis of several recommendations which will be presented in the testimony of my colleague, Terri Tanielian. Together, Ms. Tanielian and I co-directed more than 30 researchers at RAND in the completion of this study and our testimony is drawn from the same body of work.
DTIC
Central Nervous System Depressants; Injuries

20080038938 Functional Genetics, Inc., Rockville, MD USA
Genetic Screening of Cells with Enhanced Antibody Production
Duan, Roxanne; Jan 22, 2007; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-C-0059
Report No.(s): AD-A482585; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Here we report the progress made for grant No. W911NF-05-C-0059 between the entire funding period, 6/1/05 and 8/31/06. We have completed the study proposed: to use Functional Genetics' proprietary technology, Randon Homozygous Knock Out (RHKO) to increase antibody production from a production cell line, in this case CHO cells, as measured by Specific Productivity Rate (SPR). We also identified 2 candidate RHKO genes that cause increased SPR. Finally, we report the validation of one of these two genes.
DTIC
Antibodies; Genetics

20080038940 RAND Corp., Santa Monica, CA USA
Invisible Wounds of War: Recommendations for Addressing Psychological and Cognitive Injuries
Tanielian, Terri; Jun 11, 2008; 15 pp.; In English
Report No.(s): AD-A482591; RAND-CT-308; No Copyright; Avail.: Defense Technical Information Center (DTIC)

My testimony will briefly discuss several recommendations for addressing the psychological and cognitive injuries among servicemembers returning from deployments to Operations Enduring Freedom and Iraqi Freedom. Dr. Jaycox shared with you our findings about the prevalence of post-traumatic stress disorder and depression, as well as the incidence of traumatic brain injury among servicemembers returning from Operations Enduring Freedom and Iraqi Freedom; the costs to society associated with these conditions and of providing care to those afflicted with these conditions, and the gaps in the care systems designed to treat these conditions among our nation's servicemembers and veterans. Together, Dr. Jaycox and I co-directed more than 30 researchers at RAND in the completion of this study and our testimony is drawn from the same body of work. The purpose of these recommendations is to close the gaps in access and quality for our nation's veterans that Dr. Jaycox briefly described in her testimony.
DTIC
Brain Damage; Injuries; Medical Services; Mental Health; Military Personnel

20080038941 California Univ., San Francisco, CA USA
Biological Function of Plasma Kallikrein in Mammary Gland Stromal Development and Tumor Metastasis
Lilla, Jennifer N; Mar 1, 2008; 84 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0272
Report No.(s): AD-A482593; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The plasminogen cascade of serine proteases has been affiliated in the mammary gland with both development and

tumorigenesis. We have found that the dominant plasminogen activator during mammary gland stromal involution is plasma kallikrein (PKal), and that active PK appears in connective tissue-type mast cells in the mammary stroma during different phases of development. Examination of the extrahepatic expression of PKal has shown that PKal message is present in the mammary gland, and that increased expression levels correlate to periods of stromal remodeling. Additionally, an inhibitor of PKal that has been demonstrated to diminish mammary gland involution may be used to characterize PKal expression in the mammary gland as well as to identify targets of PKal activity during involution. Furthermore, mast cells are required for normal mammary duct branching morphogenesis during puberty. Lastly, attempts to produce a PKal knockout mouse were unsuccessful.
DTIC
Breast; Cancer; Cells (Biology); Mammary Glands; Metastasis; Plasmas (Physics); Protease; Stem Cells; Tumors

20080038943 RAND Corp., Santa Monica, CA USA
Invisible Wounds of War: Quantifying the Societal Costs of Psychological and Cognitive Injuries
Eibner, Christine; Jun 12, 2008; 16 pp.; In English
Report No.(s): AD-A482596; RAND-CT-309; No Copyright; Avail.: Defense Technical Information Center (DTIC)
My testimony will discuss the costs and consequences of PTSD, depression, and TBI among servicemembers returning from Operations Enduring Freedom and Iraqi Freedom, as well as several recommendations for better understanding and reducing these costs. These recommendations stem from a large study conducted at the RAND Corporation entitled Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery (Tanielian and Jaycox [Eds.], 2008). I served on the management team for this report, and co-led the analysis of economic costs undertaken for the study.
DTIC
Brain Damage; Costs; Injuries; Military Personnel

20080038949 Minnesota Univ., Duluth, MN USA
Hibernation Strategies to Improve Recovery from Hemorrhagic Shock
Andrews, Matthew T; Drewes, Lester R; Jan 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0432
Report No.(s): AD-A482609; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The ultimate goal of this project is to protect the warfighter from pathology that occurs as a result of significant blood loss. The overall strategy is to develop an effective fast-acting hemorrhagic shock protection fluid based on the molecular mechanisms used by hibernating mammals to survive reduced blood flow and avoid the consequences of ischemia and reperfusion injury. The primary deliverable derived from this Phase 1 project is the ability to protect a non-hibernating mammal against injury from hemorrhagic shock. We have already shown in preliminary experiments that ischemic rat livers are protected from damage in vivo by administration of a preconditioning solution based on a molecular profile seen in hibernators. Optimization of a hemorrhagic shock protection fluid in non-hibernating rats, and assaying for their ability to protect against hemorrhagic shock, will serve as a prelude to Phase 2 of the Surviving Blood Loss Program. The ultimate goal of our work is to protect the warfighter from pathology that occurs as a result of significant blood loss. This effort will concentrate on the preconditioning protection of two organs that are critical for successful recovery from hemorrhagic shock, the heart and brain.
DTIC
Blood; Hibernation; Losses; Military Personnel; Shock (Physiology); Substitutes

20080038953 McGill Univ., Montreal, Quebec Canada
Mammary Gland Tumor Development in Transgenic Mice Overexpressing Different Isoforms of the CDP/Cux Transcription Factor
Cadieux, Chantal; Mar 2008; 20 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0294
Report No.(s): AD-A482619; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Short CUX1 isoforms were found to be overexpressed in breast cancer cell lines, in human breast tumors and in uterine leiomyomas, suggesting that these proteins play a key role in tumor development and progression. My project consists in analyzing the effect of these CUX1 isoforms on mammary gland development and tumorigenesis. Also, I will work on the identification of targets of CUX1 that mediate its oncogenic properties. So far, I have shown that overexpressing short CUX1

isoforms leads to abnormal development of the mammary gland. Furthermore, overexpressing p75, p110 or p200 CUX1 leads to the development of mammary gland tumors in mice. These tumors seem to be of basal origin, suggesting that CUX1 promotes tumorigenesis in a precursor cell. Breast tumor patients with similar types of disease have very low chances of survival, since no specific treatment is currently available for them. Thus, my research project will enable us to gain a better understanding of the biological functions of each CUX1 isoform in mammary gland development and tumorigenesis, which could possibly lead to new therapeutic targets for the treatment of basal breast cancer.
DTIC
Breast; Cancer; Mammary Glands; Mice; Tumors

20080038955 Jackson (Henry M.) Foundation, Rockville, MD USA
Rat Models and Identification of Candidate Early Serum Biomarkers of Battlefield Traumatic Brain Injury
Leonessa, Fabio; Jul 31, 2007; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0387
Report No.(s): AD-A482621; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study is part of a larger multi-year study that has two main specific aims: 1. the characterization of a 'closed head' FPI(lateral fluid percussion), versus a penetrating ballistic rat model of traumatic brain injury (TBI) and 2. the identification of specific plasma proteomic biomarkers of TBI. Funding has covered year 1 of this study, and the following related objectives: 1) Application of TBI, neurobehavioral testing and collection of biofluids and tissues; 2) Optimization of proteomic protocols for the identification of differentially expressed proteins in the plasma of brain-traumatized rats; 3) Preliminary identification of proteins differentially expressed in plasma from rat models of TBI. All the objectives set for this part of the larger study have been met. One hundred thirty nine Sprague-Dawley rats have been used to achieve Objective 1. Results show a significant neurobehavioral effect of both kinds of TBI, more drastic for the PBI model. Optimization of proteomic technology (Objective 2) has allowed the analysis of replicate samples collected at the different time points following injury. We have thus met Objective 3 by identifying several potential time-dependent plasma protein biomarkers of TBI, including many proteins known to be normally expressed in the central nervous system. Future evaluations will need to include the verification of some of the most statistically and biologically significant plasma proteome changes observed in this study and evaluation of their dependence on trauma intensity.
DTIC
Biomarkers; Brain Damage; Injuries; Proteins; Rats; Serums

20080038956 University of Southern Illinois, Springfield, IL USA
Mechanism of Tumor Metastasis Suppression by the KAI1 Gene
Watabe, Kounosuke; Feb 2008; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-01-0193
Report No.(s): AD-A482622; No Copyright; Avail.: Defense Technical Information Center (DTIC)

KAl1 is a tumor metastases suppressor gene which is capable of blocking the metastatic process without affecting the primary tumorigenesis. In this project we tested the hypothesize that the KAl1 protein on tumor cells interacts with gp-Fy (DARC) on the endothelial cells which activates a signal pathway of the KAl1 molecule and that this activation eventually leads to cell growth arrest of tumor cells. We originally planned to examined whether the interaction of KAl1 and DARC leads to suppression of tumor metastasis in vivo (Task 1) and identify specific peptide sequences that activate KAl1 and to assess the efficacy of the peptides on tumor growth in an animal model (Task 2). We have successfully completed Task 1 and published the results in Nature Medicine. Task 2 has been partly accomplished but there are some tasks remained. However we consider that our project has been overall quite successful and our original idea has been fully developed. The results of this project have led to successful RO1 funding and we will continue to develop and expand our research.
DTIC
Metastasis; Neoplasms; Tumors

20080038962 National Research Council of Canada, Montreal, Quebec Canada
Mechanism of Xanthine Oxidase Catalyzed Biotransformation of HMX Under Anaerobic Conditions
Bhushan, Bharat; Paquet, Louise; Halasz, Annamaria; Spain, Jim C; Hawari, Jalal; Jan 2003; 8 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0269
Report No.(s): AD-A482634; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Enzyme catalyzed biotransformation of the energetic chemical octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) is

not known. The present study describes a xanthine oxidase (XO) catalyzed biotransformation of HMX to provide insight into the biodegradation pathway of this energetic chemical. The rates of biotransformation under aerobic and anaerobic conditions were 1.6 0.2 and 10.5 0.9 nmol h 1 mg protein 1, respectively, indicating that anaerobic conditions favored the reaction. The biotransformation rate was about 6-fold higher using NADH as an electron-donor compared to xanthine. During the course of reaction, the products obtained were nitrite (NO), methylenedinitramine (MDNA), 4-nitro-2,4-diazabutanal (NDAB), formaldehyde (HCHO), nitrous oxide (N2O), formic acid (HCOOH), and ammonium (NH+4). The product distribution gave carbon and nitrogen mass-balances of 91% and 88%, respectively. A comparative study with native-, deflavo-, and desulfo-XO and the site-specific inhibition studies showed that HMX biotransformation occurred at the FAD-site of XO. Nitrite stoichiometry revealed that an initial single N-denitration step was su cient for the spontaneous decomposition of HMX.
DTIC

Activity (Biology); Anaerobes; Biodegradation; Catalysis; Enzymes; HMX; Oxidase; Xanthines

20080038963 New South Wales Univ., Kensington, Australia

Treatment of Prostate Cancer by Targeting Vascular Endothelial Growth Factor Receptors (VEGFRs) and Micrometastases with Bismuth-213 Labeled Vectors

Abbas Rizvi, Syed M; Nov 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0621

Report No.(s): AD-A482637; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main purpose of the proposed study was to evaluate the toxicity and efficacy of multiple targeting vectors for the treatment of prostate cancer in mouse models. After successfully achieving the in vitro outcomes, the in vivo studies have also proven to be a great success. The efficacy of the proposed combination therapy has proven to be far better than the mono-therapy and the results are significantly different. Various combination therapy regimes were well tolerated in mice whereas the long-term toxicity studies are currently ongoing. The dose optimization, time interval optimization and subcutaneous efficacy studies have been completed whereas orthotopic model studies are expected to be complete in three months. Thus the in vitro (radiolabeling of Avastin, in vitro stability, enhancement of plasminogen activation expression and estimation of VEGF secretion by various prostate cancer cell lines) and in vivo studies have gone as per expectations and plan.
DTIC

Bismuth Isotopes; Cancer; Cardiovascular System; Prostate Gland

20080038965 North Carolina Univ., Chapel Hill, NC USA

Suppression of Prostate Tumors by INK4C and PTEN

Xiong, Yue; Dec 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0087

Report No.(s): AD-A482640; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Work during this entire funding period thoroughly characterized mutant mice in the cyclin-dependent kinase (CDK) inhibitor p18Ink4c, which causes hyperplastic cell growth in various tissues including the prostate and the lipid phosphatase Pten, which regulates cell growth and is highly associated with the development of human prostate cancer. The first two years of funding were highly productive and resulted in one manuscript publication supporting a functional collaboration between p18Ink4c and Pten in tumor suppression. Both the rate and spectrum of tumor development in the compound mutant mice were substantially accelerated and expanded. Combined genetic, histological, cellular, and biochemical analyses led to four major findings: (i) that p18 and PTEN each have previously unrecognized functions in tumor suppression, such as p18's function in the prostate and anterior lobe of the pituitary and PTEN's function in the pituitary, (ii) that the p18-Pten double mutant mice developed various stages of a prostate tumor phenotype in a gene dosage-dependent manner and with a high degree of penetrance, (iii) that Pten haploinsufficiency is tissue specific and is influenced by the status of other collaborating genes, such as p18, and (iv) that deletion of p18 or inactivation of the Rb pathway increased activation of Akt that was recessive to the reduction of PTEN activity. During the final funding period we successfully identified that not only the quantity of the activated Akt was increased but also the localization was changed into nuclear in p18-/-;Pten+/- mouse tissues (prostate and thyroid). Deletion of p18, overexpression of CDK4, or inactivation of Rb family proteins in human LNcap cell lines recaptured the nuclear localization of the activated Akt. Taken together, these results indicate that loss of p18 or inactivation of Rb pathway synergistically activated Akt and led to nuclear re-localization in the pten+/- background.
DTIC

Cancer; Prostate Gland; Tumors

20080038966 Baylor Coll. of Medicine, Houston, TX USA

Role of Reactive Stroma in Prostate Cancer Progression

Rowley, David R; Feb 2008; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0189

Report No.(s): AD-A482641; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this project is to determine the role of FGF receptor 1 in reactive stroma during prostate tumorigenesis. We are using a novel approach to target transgene expression specifically to the reactive stroma of experimental prostate cancer. Using a modified approach, we are placing an inducible Cre recombinase behind the FAP gene promoter to target expression to reactive stroma. We will cross this mouse with Fgfr1flox mice (LoxP sites flanking FGF receptor 1 alleles). These mice will be crossed with TRAMP mice (prostate cancer model). Induced expression of Cre at sites of reactive stroma generated in the cancer foci will function to excise the FGF receptor 1 alleles and create a conditional knockout mouse. Progression of tumorigenesis in this line of knockout mice will be compared to heterozygous and wild type controls. Progress has been made in each Task. We have completed all cloning steps and have putative founder mice with the FAP-Cre sequence. The Fgfr1flox and have crossed it into the appropriate backgrounds and the TRAMP mice were crossed with the Fgfr1flox mice. This study will pinpoint the role of FGF receptor 1 in reactive stroma promotion of prostate.

DTIC

Cancer; Prostate Gland; Reactivity

20080038969 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA

Activation and Protection of Dendritic Cells in the Prostate Cancer Environment

Guruli, Georgi; Jordon, Mark L; Feb 2008; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0181

Report No.(s): AD-A482657; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Third annual report for this award. Experiments were conducted as was scheduled in the Statement of Work. So far studies have demonstrated for the first time the presence of endothelin receptors on murine DC, and the fact of endothelin-1 production by murine DC upon stimulation with TNF- and lipopolysaccharide (LPS). The modification of the endothelin axis on DC changed its resistance against prostate cancer induced apoptosis the blockade of ETA receptors resulted in the increased apoptotic rate, while the blockade of the ETB receptors lead to the increased survival of DC in the prostate cancer environment. Based on these data, in vivo experiments were carried out, in which mice with prostate cancer (RM1 cells) were treated with intratumoral injection of modified DC (stimulated DC, with ETB receptor blocked). This treatment resulted in reduction of prostate cancer growth in mice in the experimental group, in comparison to untreated control mice. Studies are under way to elicit the mechanisms of endothelin axis action on DC, as well as the underlying mechanisms of interaction between dendritic cells and prostate cancer cells.

DTIC

Cancer; Endothelium; Prostate Gland; Protection

20080038970 Beth Israel Deaconess Medical Center, Boston, MA USA

Effect of a HIF-1 Alpha Polymorphism on the Incidence and Prostate Cancer

Bubley, Glen; Feb 2008; 15 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0186

Report No.(s): AD-A482658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The P582S C->T and A588T G->A polymorphisms in the Hypoxia-inducible factor-1alpha (HIF-1alpha) gene have been associated with enhanced stability of the protein and androgen-independent prostate cancer (CaP) During the course of our research we published that P582S polymorphism was not associated with CaP (see appendix). However we observed a significant interaction of the P582S genotype with insulin-like growth factor binding protein (IGFBP)-3 in modifying CaP risk such that higher IGFBP-3 levels (>= versus <median) were associated with a reduced risk only among men with the wildtype (OR, 95% CI = 0.74, 0.57-0.97; Pinteraction = 0.01). We therefore went on in the final year to study the effect of HIF 1 translation after treatment with agents that might down regulate IGF-1 down-stream signaling. Methods: Prostate cancer cell lines were treated with rapamycin, an mTOR antagonist, and the effect on HIF-1 protein levels was studied. Results: We found that agents such as rapamycin that might down regulate the effect of IGF-1 signaling by inhibiting the mTOR pathway, paradoxically increased HIF 1 protein levels. Conclusions : Treatment of prostate cancer with agents that attempt to affect signal transduction can have a paradoxical effect of HIF-1 protein levels by affecting its translation.

DTIC

Cancer; Polymorphism; Prostate Gland

20080038971 Stanford Univ., Stanford, CA USA

Cells with Unique Properties in Prostate Cancer-Associated Stroma are Mesenchvmal Stem Cells

Peehl, Donna M; Dec 2007; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0101

Report No.(s): AD-A482659; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The importance of tumor stroma in prostate cancer development and progression has been recognized through its stimulating effects on cancer cell growth, migration and angiogenesis. Our hypothesis was that the prostate cancer stroma is derived, at least in part, from mesenchymal stem cells (MSCs) that are proliferative, multipotent and self-renewing. Our objective was to demonstrate that cancer-derived stromal cells have characteristics of mesenchymal stem cells. Comparing primary cultures of stromal cells from cancer versus normal tissues, we observed (a) differential gene expression profiles, (b) increased expression of autotaxin, a motility factor, (c) increased expression of the MSC-associated antigen CD90, and (d) increased expression of transforming growth factor-beta, associated with tumor promotion, in CD90-positive cells. Many of these properties are consistent with a mesenchymal stem cell phenotype of prostate cancer-associated stroma, supporting our hypothesis.

DTIC

Cancer; Prostate Gland; Stem Cells

20080038972 Stanford Univ., Stanford, CA USA

The Role of Vitamin D Stimulation of Mullerian Inhibiting Substance (MIS) in Prostate Cancer Therapy

Feldman, David; Dec 2007; 33 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0179

Report No.(s): AD-A482660; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant investigates the potential use of calcitriol regulation of mullerian inhibitory substance (MIS) expression as an incremental therapy for prostate cancer. We have established that calcitriol (1,25-dihydroxyvitamin D3) directly stimulates MIS expression by binding to the vitamin D receptor (VDR) and directing the hormone-receptor complex to bind to a vitamin D regulatory element (VDRE) in the MIS promoter. We have attempted to demonstrate that combination of calcitriol and MIS achieve increased potency to inhibit prostate cancer cell growth compared to either drug alone. However, this has not yet been accomplished. We further demonstrated the interaction of calcitriol- VDR with other transcription factors, SF-1, SOX-9 and GATA-4, to act together to synergistically increase MIS expression in prostate cancer cells. We believe that some of calcitriol's action to inhibit prostate cancer cell growth is due to stimulation of MIS and this work plans to substantiate this hypothesis and lay the ground work to translate this information to clinical trials in men with prostate cancer.

DTIC

Calciferol; Cancer; Hormones; Prostate Gland; Stimulation; Therapy

20080038974 Iowa Univ., Iowa City, IA USA

Characterization of a Novel 12(S)-HETE Receptor and its Role in Prostate Cancer Progression

Honn, Kenneth V; Jan 2008; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0226

Report No.(s): AD-A482663; No Copyright; Avail.: Defense Technical Information Center (DTIC)

,p06/0412(S)-hydroxyeicosatetraenoic [12(S)-HETE], a lipoxygenase metabolite of arachidonic acid, has been demonstrated to enhance metastatic capacity during tumor progression via its receptor. Using cloning and binding strategy, we have identified a G-protein coupled receptor, GPR31, as a 12(S)-HETE receptor. In this project, we aimed to characterize the biochemical properties of GPR31 and study the role of GPR31 in tumor survival and metastasis. We have constructed a secondary structure model for GPR31 and using the structural characteristics, we designed two peptides to produce antibodies that against both sides of this membrane protein. We have analyzed the expression of GPR31 in cell lines and human prostate specimens. The GPR31 protein was expressed in various cancer cells and stained in prostate cancer tissue. In order to further characterize this receptor, we designed a series experiments to determine its biochemical properties. Binding experiments with or without GPR31 expressed in Chinese hamster ovary cells demonstrated that this receptor has a Kd value of 4.8 for [3H]12(S)-HETE specific binding with Bmax value of 38.3 pmol/mg protein. We also purified the two antibodies from immunized rabbit antiserums. This project will provide significant insights into the process of prostate cancer progression and metastasis.

DTIC

Cancer; Metabolism; Prostate Gland

20080038975 Brigham and Women's Hospital, Boston, MA USA
p63 in Development and Maintenance of the Prostate Epithelium
Signoretti, Sabina; Mar 2008; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0365
Report No.(s): AD-A482664; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this project is to define the role of p63 in the development and maintenance of the prostate epithelium by utilizing both in vivo and in vitro models. In the first two years of work, we have constructed the targeting vector for the generation of the p63-Cre-ERT2 knock-in mice. The p63-Cre-ERT2 vector has been electroporated in the ES cells. p63-Cre-ERT2 ES clones with successful targeting events have been obtained and injected in host blastocysts, resulting in the production of 5 high percentage p63-Cre-ERT2 chimeras, which are currently being bred. To date, two F1 p63-Cre-ERT2 knock-in pups have been generated. We have also continued to work on the identification of the molecular mechanisms through which p63 regulates development of the prostate epithelium. Specifically, the use of siRNA against p63 has been optimized in various cell lines and, most importantly, p63 shRNA inducible cell lines (including iPrEC) have been generated. Our results show that downregulation of p63 in iPrEC cells consistently causes a decrease in cell viability due to induction of apoptosis. Moreover, our data demonstrates that p63 modulates AKT and MAPK activation in iPrEC cells.
DTIC
Cancer; Epithelium; Maintenance; Prostate Gland

20080038976 Baylor Coll. of Medicine, Houston, TX USA
Enhancement of Vitamin D Action in Prostate Cancer through Silencing of CYP24
Lamb, Dolores J; Feb 2008; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0022
Report No.(s): AD-A482665; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study focuses on the enzyme, CYP24 which hydroxylates vitamin D acting to catalyze the first step in the breakdown of Vitamin D, effectively limiting this growth inhibitory signaling pathway. We are testing the hypothesis that through the inhibition of CYP24 using an siRNA approach we can convert prostate cancer cells that are resistant to the antiproliferative actions of Vitamin D to cells that are growth inhibited at low concentrations of Vitamin D. Inhibition of 1,25(OH)2D3 CYP24 mediated metabolism to potentiate Vitamin D actions in prostate cancer shows great potential for both a chemopreventative approach and the treatment of advanced hormone refractory cancer in patients. We have tested CYP24 siRNA constructs, ketoconazole and silencer control siRNA on three cell lines (LNCaP, PC3 and DU145) and evaluated CYP24 protein expression, mRNA expression, and growth inhibition. We are in the process of developing the stable transfected cell lines and optimal approach to enhance Vitamin D action in resistant cells.
DTIC
Apoptosis; Augmentation; Calciferol; Cancer; Prostate Gland

20080038977 Texas Univ. Health Science Center, San Antonio, TX USA
Investigation of the Akt/Pkb Kinase in the Development of Hormone-Independent Prostate Cancer
deGraffenried, Linda A; Feb 2008; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0218
Report No.(s): AD-A482666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our laboratory has been interested in the role of Akt in the development of hormone-independent cancers. Using a breast cancer cell model we previously demonstrated that tumors with a constitutively active Akt are resistant to anti-hormone therapy. In this study we have expanded upon our preliminary observations in the breast model into in vitroprostate cancer models to determine the molecular and biological mechanisms underlying these findings. In our second year of this study we found that treatment withan Akt inhibitor prevented the progression of LNCaP cells to a state of androgen-independence. These results correlated with suppression of expression of the androgen receptor as well as suppression of the pro-survival proteins bcl-2 and NF-kB. We are currently exploring the significance of these findings in relationship to the preventive properties of the omega-3 fatty acids. Currently progression of prostate cancer to androgen independence remains the primary obstacle to improved survival with this disease. The results of our studies suggest that targeting the Akt pathway may provide a strategy for preventing progression resulting in increased survival among patients with recurrent disease.
DTIC
Cancer; Hormones; Prostate Gland

20080038978 General Accounting Office, Washington, DC USA

Military Personnel. Army Needs to Better Enforce Requirements and Improve Record Keeping for Soldiers Whose Medical Conditions May Call for Significant Duty Limitations

Jun 2008; 62 pp.; In English

Report No.(s): AD-A482667; GAO-08-546; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The increasing need for warfighters for the Global War on Terrorism has meant longer and multiple deployments for soldiers. Medical readiness is essential to their performing needed duties, and an impairment that limits a soldier's capacities represents risk to the soldier, the unit, and the mission. Asked to review the Army s compliance with its guidance, GAO examined the extent to which the Army is (1) adhering to its medical and deployment requirements regarding decisions to send soldiers with medical conditions to Iraq and Afghanistan, and (2) deploying soldiers with medical conditions requiring duty limitations, and assigning them to duties suitable for their limitations. GAO reviewed Army guidance, and medical records for those preparing to deploy between April 2006 and March 2007; interviewed Army officials and commanders at Forts Benning, Stewart, and Drum, selected for their high deployment rates; and surveyed deployed soldiers with medical limitations.

DTIC

Medical Services; Military Personnel

20080038980 Pittsburgh Univ., Pittsburgh, PA USA

Chemoprevention of Prostate Cancer Initiation in a Novel Transgenic Mouse Model by Targeting 15-Lipoxygenase-1

Kelavkar, Uddhav P; Feb 2008; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0066

Report No.(s): AD-A482671; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To gain better mechanistic insight of the role of Fifteen lipoxygenase-1 (15-LO-1) in prostate cancer (PCa), we recently developed a novel C57BL/6 transgenic mouse called 15-LO-1 in the Mouse Prostate (FLiMP). These mice, which conditionally express prostatic human 15-LO-1, display mouse prostatic intraepithelial neoplasia (mPIN) by week 20, but do not progress to cancer when on normal diet. Therefore, FLiMP mice provide an excellent model to study the experimental paradigm of PCa initiation, highlighting their usefulness in evaluating early proactive intervention strategies in PCa. In year 1, we have studied the effect of n-6 linoleic acid (LA) in diet on the onset of PIN in prostates of FLiMP+/+ mice and studies with n-3 Stearidonic acid (SDA) in diet is ongoing. We observed that, (a) wild type (WT) mice did not exhibit any prostate-specific phenotypic changes regardless of their diet, (b) FLiMP+/+ mice fed a diet high LA diet exhibited more aggressive PIN, with PIN-like changes observed in as early as 10 weeks compared to FLiMP+/+ mice fed a normal diet (PIN observed by week 20), and (c) the severity of these mPIN-like changes in the LA-diet fed mice are similar to those seen at 35 weeks or later in the FLiMP+/+ group which were on normal diet. This preliminary observation suggests the bad effects of excessive n-6 LA diet consumption in the progression of PCa.

DTIC

Cancer; Mice; Models; Prostate Gland

20080038981 Johns Hopkins Univ., Baltimore, MD USA

Robotic Prostate Biopsy in Closed MRI Scanner

Fischer, Gregory; Feb 2008; 68 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0171

Report No.(s): AD-A482672; No Copyright; Avail.: Defense Technical Information Center (DTIC)

MRI possess many of the capabilities that TRUS is lacking for prostate brachytherapy and biopsy, with high sensitivity for detecting prostate tumors, high spatial resolution, excellent soft tissue contrast, and volumetric imaging capabilities. However, closed-bore high-field MRI has not been widely adopted for prostate interventions because strong magnetic fields and confined physical space present formidable challenges. This work enables prostate brachytherapy and biopsy procedures in standard high-field diagnostic MRI scanners through the development of a robotic needle placement device specifically designed for trans-perineal access to the prostate under real-time MR image guidance. Specifically, the requirements are defined, the system designed and constructed, the controller developed, and the full system evaluated in phantom models.

DTIC

Prostate Gland; Robotics

20080038982 Texas Univ., Austin, TX USA

Structure-Based Design of Inhibitors to the Cytotoxin RICIN. Addendum

Robertus, Jon; Apr 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-C-0088

Report No.(s): AD-A482673; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ricin is a cytotoxin and a known bioterrorist weapon. The Army is pursuing anti-ricin vaccines, but plans to develop an efficacious antidote to the toxin for cases where vaccination is not appropriate. The goal of this project was to use the X-ray structure of ricin. A chain (RTA) as a template for inhibitor design. Computer modeling and X-ray screening aid in the design process. inhibitors which bind to the RTA substrate specificity site have been identified. Several chemical platforms including 9-oxo-guanine and 9-deazaguanine have been shown to bind in the RTA active site and act as a weak inhibitors. However efforts to derivatize and diversify the platforms via several straties including triazole 'click' chemistry have met with unanticipated difficulties. None of the new compounds exhibits greatly improved inhibitory properties. A virtual screen of available compounds suggests pyrimidines may provide a useful platform for future work.

DTIC

Inhibitors; Toxins and Antitoxins

20080038983 Pittsburgh Univ., Pittsburgh, PA USA

Combinational Targeting of Prostate Carcinoma Cells and Tumors Associated Pericytes with Antibody Based Immunotherapy and Metronomic Chemotherapy

Ferrone, Soldano; Foster, Barbara; Moser, Michael; Feb 2008; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0096

Report No.(s): AD-A482674; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The hybridoma secreting the HMW-MAA-specific mAb 225.28 which is used for immuno prevention of prostate carcinoma and the hybridoma secreting the isotype matched mAb F3C25 have been tested for activity. Ascitis has been prepared and monoclonal antibodies have been purified and monitored for purity and activity. The colony of TRAMP mice has been expanded to test the efficacy of mAb 225.28 plus cyclophosphamide metronomic therapy in the inhibition of progression of prostate cancer. Sixty-four TRAMP mice have been enrolled in the combinatorial treatment schedule. Animals are being screened 2 times a week for palpable tumors.

DTIC

Antibodies; Cancer; Chemotherapy; Prostate Gland; Tumors

20080038985 California Univ., Los Angeles, CA USA

Effects of Radiation on Proteasome Function in Prostate Cancer Cells

Pajonk, Frank; Feb 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0065

Report No.(s): AD-A482676; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The proposed research in this proposal is based on our observation that the 26S proteasome is a direct target of radiation. In our initial statement of work, we proposed experiments investigating association and release of PIPs from the 26S proteasome as well as to study structural changes of the proteasome in response to radiation. We further intended to clarify to which extend proteasome subunit expression is regulated at the transcriptional, and posttranslational level in response to ionizing radiation. The final goal is to investigate these changes using cutting edge proteomic tools to identify the radiation target within the proteasome in prostate cancer. The aims are unaltered from the original submission.

DTIC

Cancer; Ionizing Radiation; Prostate Gland; Radiation Effects

20080038997 Hacettepe Univ., Ankara, Turkey

Components of Preparedness - Importance of Disease Reporting and Epidemiology Capacity

Hincal, Filiz; Jul 1, 2003; 5 pp.; In English

Report No.(s): AD-A482706; No Copyright; Avail.: Defense Technical Information Center (DTIC)

After the 9/11 disaster, not only the US, but also all the nations and all the people of the world realized that the threat of terrorism; chemical, biological, radiological or nuclear (CBRN), is real. With the understanding of the importance of preparing the public health infrastructure to prevent illness and injury, especially from a covered biological terrorism, a much vigorous effort is being made to improve and re-examine core public activities, information and detection systems in all

developed countries. Epidemiology reporting system is one of the most effective means of combating CBRN terrorism, particularly with biological type. In this paper, the necessity and requirements for establishing and running of effective disease reporting and epidemiologic investigation systems in developing countries, and the major problems faced will be discussed. DTIC

Diseases; Epidemiology; Public Health

20080038998 Army Center for Environmental Health Research, Fort Detrick, MD USA

An Evaluation of Blood Cholinesterase Testing Methods for Military Health

Knechtges, Paul L; May 2008; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): IPAAGR07KNECH1; Proj-PRFHZ

Report No.(s): AD-A482707; USACEHR-TR-0801; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Blood cholinesterase (ChE) testing is done to evaluate potential human exposure to chemicals that act as ChE-inhibitors, most often organophosphate and carbamates pesticides. The Model 400 Test-mate ChE kit (EQM Research, Inc.) is used for field blood ChE analysis within the Department of Defense. Suggested modifications to the Model 400 kit include displaying and recording acetyl-ChE activity uncorrected for temperature and using analytical standards for calibration or quality assurance purposes. The recent advent of a wide array of point of care devices may provide an opportunity for developing improved hand-held instruments field ChE analysis. If a hand-held device for field blood ChE analysis is developed for military health surveillance, a concept of operations for the device should be prepared as a first step. Some key performance areas for a field ChE device development are identified.

DTIC

Blood; Chemical Analysis; Cholinesterase; Health

20080039003 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Characterization of a Fluorescent Protein Reporter System

Dias, Sandra J; Mar 2008; 97 pp.; In English

Report No.(s): AD-A482713; AFIT/GRD/ENV/08-M04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Chemical and biological threats are ever present and attacks have occurred throughout the world in both war and peace-time. Multiple government agencies, academia, and private industry are developing detection capabilities to address such threats. The research presented in this paper supports development of a modular synthetic biology based system that detects and reports the presence of a threat agent. Synthetic biology builds upon past research in genetic engineering and seeks to combine broad applications within biotechnology in novel ways. This basic research project will help to demonstrate a proof-of-concept design which will guide future studies on the development of a modular sensor platform. In this study, in vitro and in vivo techniques were used to evaluate a reporter system composed of the Tobacco Etch Virus (TEV) protease and an engineered fluorescent fusion protein for their combined effectiveness as a reporter system. The TEV protease demonstrated the ability to cleave the fusion protein construct to produce a measureable output signal. The coupling of this reporter system with a riboswitch recognition element showed that this system can be applied to detecting chemicals. Further studies to modify this recognition element suggest modularity for future biosensors to detect chemicals of military interest.

DTIC

Fluorescence; Proteins

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*.

20080037490 Air Force Research Lab., Brooks AFB, TX USA

Is Performance of Intermittent Intense Exercise Enhanced by Use of a Commercial Palm Cooling Device?

Walker, Thomas; Zupan, Michael; Cantwell, Andrew; McGregor, Julia; Norris, Torrance; Jan 2008; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A482058; AFRL-RH-BR-TR-2008-0020; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to determine if using the Core Control (trademark) Rapid Thermal Exchange (RTX), a

commercial palm cooling device, during active rest periods of multiple set training, is an effective means to increase performance. Ten subjects completed three interval running tests on a human-powered treadmill. In those performances subjects completed eight 30-second intervals at a hard/fast pace followed by a 90-second walking or light jogging recovery period. During the recovery period, the subjects placed their hand on one of three media: the RTX held at 15 degrees Centigrade (R), a 15 degree Centigrade standard refrigerant gel pack (P), or nothing at all (C). Although there were differences in core temperature (Tc), subjective heat stress ratings, and distance and power generated between intervals, there were no significant differences among treatments for any of these variables nor was the interaction effect of interval-treatment found to be significant. The authors conclude that the RTX, in its current iteration, is ineffective at improving performance and/or mitigating thermal stress during high-intensity intermittent exercise.
DTIC
Body Temperature; Cooling; Physical Exercise; Portable Equipment

20080038695 Washington State Univ., Spokane, WA USA
Individualized Biomathematical Modeling of Fatigue and Performance
Van Dongen, Hans P; May 29, 2008; 56 pp.; In English
Contract(s)/Grant(s): FA9550-06-1-0055
Report No.(s): AD-A482265; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482265

Fatigue from sleep loss and circadian misalignment jeopardizes the cognitive performance and safety of individuals during sustained Air Force operations. Mathematical models of fatigue and performance provide a useful tool for the prediction of cognitive impairment resulting from sleep loss and circadian disruption. However, currently available models do not accurately predict the effects of chronic sleep restriction, and do not make reliable predictions at the level of persons or small teams. In this project, a new model for the sleep/wake homeostatic regulation of fatigue was developed to improve predictions of performance deficits under conditions of chronic sleep loss. Furthermore, Bayesian forecasting was implemented to predict performance responses to sleep loss and circadian displacement for individuals. This project resulted in significant advances in fatigue and performance modeling, addressing the Air Force's need to understand and help mitigate the effects of fatigue on cognitive capability.
DTIC
Biological Models (Mathematics); Circadian Rhythms; Cognition; Performance Prediction; Sleep; Sleep Deprivation

20080038738 Defence Research and Development Canada, Toronto, Ontario Canada
Field Survey on the Incidence and Severity of Motion Sickness in the Canadian Forces Enclosed light Armoured Vehicle
Cheung, Bob; Nakashima, Anne; Hofer, Kevin; Coyle, Brian; Apr 2007; 44 pp.; In English
Report No.(s): AD-A482346; DRDC-TM-2007-063; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482346

In the Advanced Vehicle Architecture for a Net-Enabled Combat Environment Technology Demonstrator Project (ADVANCE TDP), there is a need to define the requirements of the active suspension system and how the resulting motion affects performance and well-being (i.e. incidence and severity of motion sickness). At the request of the Director Armoured Vehicles Program Management (DAVPM), a study to investigate the effects of motion disturbance in the LAV III (light armoured vehicle) was completed. During a two-week mechanized platoon commander course held at Canadian Forces Base (CFB) Gagetown, an anonymous questionnaire concerning the rating of 1) motion sickness symptoms and 2) mood and alertness was distributed daily to all of the course participants. Although the participants were encouraged to complete the questionnaire several times each day, compliance with instructions was adversely affected by the operational and physical demands of the course. In addition, uncontrolled variables such as noise, vibration, adverse weather, stress and fatigue likely affected the scores of diagnostic motion sickness symptoms and mood. The most frequently reported motion sickness symptoms were drowsiness, feeling warm and headaches. The most frequently reported mood parameters were weariness, sleepiness, and physical discomfort. Anecdotal reports suggested that the course participants, who were experienced infantry members, had habituated to the motion of the LAV III and were thus less susceptible to motion disturbance than less experienced members.
DTIC
Canada; Motion Sickness; Signs and Symptoms; Surveys

20080038753 Social Sectors Development Strategies, Inc., Boston, MA USA

Physical Demands of Army Military Occupational Specialties: Constructing and Applying a Crosswalk to Evaluate the Relationship between Occupational Physical Demands and Hospitalizations

Hollander, Ilyssa E; Bell, Nicole S; Sharp, Marilyn; May 2008; 49 pp.; In English

Contract(s)/Grant(s): W81XWH-06-2-0028

Report No.(s): AD-A482364; USARIEM-TR-T08-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482364

Army Military Occupational Specialties (MOSs) for enlisted Soldiers are categorized by their relative level of physical demands. This report compares injury rates among common MOSs stratified by light, moderate and heavy levels of physical job demands. As hypothesized, unadjusted odds for experiencing an injury hospitalization increased with increasing level of physical demand. On-duty serious accidents (those resulting in an injury hospitalization) also occurred more frequently among Soldiers in heavy demands jobs, with Soldiers in the heavy demands jobs of Infantrymen, Cavalry Scouts and Indirect Fire Infantrymen particularly at risk for on-duty injuries. In contrast, the odds of experiencing a hospitalization for 'any-cause' were lowest for Soldiers in the highest physical demands jobs, followed by moderate demands jobs, with Soldiers in light demands jobs at greatest risk for any-cause hospitalization. The dynamic nature of MOS nomenclature over time makes the study of any temporal patterns or risk factors for injury or disability within an occupational cohort difficult. This report documents the technical and analytic steps taken in order to create a crosswalk for analyzing military occupation codes over time and associations with selected health outcomes. More research is needed to explore long-term chronic conditions and disability related to occupational physical demand and to clarify the independent influence of job demands once demographic factors are controlled.

DTIC

Physical Fitness; Risk

20080038788 Army Research Inst. of Environmental Medicine, Natick, MA USA

Efficacy of Body Ventilation System for Reducing Strain in Warm and Hot Climates

Chinevere, Troy D; Cadarette, Bruce S; Goodman, Daniel A; Ely, Brett R; Cheuvront, Samuel N; Sawka, Michael N; Mar 2008; 9 pp.; In English

Report No.(s): AD-A482453; USARIEM/TMMD-M08-08; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482453

This study determined whether a torso-vest forced ambient air body ventilation system (BVS) reduced physiological strain during exercise-heat stress. Seven heat-acclimated volunteers attempted nine, 2-h treadmill walks at 200 W/sq m in three environments, -40 C, 20% rh (HD), 35 C, 75% rh (HW), and 30 C, 50% rh, (WW) wearing the Army Combat Uniform, interceptor body armor (IBA) and Kevlar helmet. Three trials in each environment were BVS turned on (BVS (On)), BVS turned off (BVS(Off)), and no BVS (IBA). In HD, BVS(On) significantly lowered core temperature (T(ak)), mean torso skin temperature (T(torso)), thermal sensation (TS), heat storage (S), and physiological strain index (PSI), versus BVS(off) and IBA ($P < 0.05$). For HW ($n = 6$), analyses were possible only through 60 min. Exercise tolerance time (min) during HW was significantly longer for BVS(On) (116 +/- 10 min) versus BVS(off) (95 +/- 22 min) and IBA (96 +/- 18 min) ($P < 0.05$). During HW, BVS(On) lowered HR at 60 min versus IBA T(sk) from 30 to 60 min. versus BVS(Off) and IBA, and PSI from 45 to 60 min versus BVS(Off) and at 60 min versus IBA ($P < 0.05$). BVS(On) changes in T(re) and HR were lower in HD and HW. During WW, BVS(On) significantly lowered HR, T(sk) and T(torso) versus BVS(Off) and IBA ($P < 0.05$) during late exercise. Sweating rates were significantly lower for BVS(On) versus BVS(Off) and IBA in both HD and WW ($P < 0.05$), but not HW. These results indicate that BVS(On) reduces physiological strain in all three environments by a similar amount; however, in hot-dry conditions the BVS(Off) increases physiological strain.

DTIC

Air Conditioning Equipment; Climate; Ventilation; Vests

20080038954 Army Construction Engineering Research Lab., Champaign, IL USA

Physiological Response and Habituation of Endangered Species to Military Training Activities: SERDP 2006 Annual Report

Hayden, Timothy J; Bisson, Isabelle; Wikelski, Martin; Butler, Luke; Romero, L M; May 2008; 54 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-1396

Report No.(s): AD-A482620; ERDC/CERL-SR-08-8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Effects of transient human disturbance on avian species is a concern on Department of Defense installations that support

populations of federally listed endangered birds. Military training often is conducted within habitats that support endangered bird species, thus exposing individuals of these species to harassment as defined under the Endangered Species Act (ESA) of 1973. During the 2006 breeding season on Fort Hood, Texas, evaluations of two major physiological response systems determined response in passerine species to disturbances characteristic of military training activities: a hormonal (adrenocortical) response to stress in white-eyed vireos and endangered black-capped vireos, and energy expenditure as measured by remotely monitored heart rate in white-eyed vireos. Heart-rate radio telemetry was used to measure avian metabolic demands in response to potential stressors related to military training. This study is the first to demonstrate that 1) heart-rate transmitters can successfully be mounted on small (10-g) migratory passerines, 2) heart rate can be continuously monitored and recorded in these birds for at least 60 hours, and 3) heart rate is a robust measure of energy expenditure in small passerines and therefore is a powerful method to test the effects of military activity on survival in species of concern.
DTIC
Education; Endangered Species; Habitats; Habituation (Learning); Physiological Effects; Physiological Responses

20080039000 Army Research Inst. of Environmental Medicine, Natick, MA USA
Posttraumatic Stress Disorder and Health Functioning in a Non-Treatment-Seeking Sample of Iraq War Veterans: A Prospective Analysis
Vasterling, Jennifer J; Schumm, Jeremiah; Proctor, Susan P; Gentry, Elisabeth; King, Daniel W; King, Lynda A; May 2007; 13 pp.; In English
Report No.(s): AD-A482709; USARIEM-M-07-35; No Copyright; Avail.: Defense Technical Information Center (DTIC)
To evaluate the impact of posttraumatic stress disorder (PTSD) on health-related functioning, we assessed 800 U.S. Army soldiers before and after 1-year military deployments to Iraq. As part of the Neurocognition Deployment Health Study procedures, each soldier completed at both time points self-report indexes of PTSD symptom severity, health behaviors (smoking, alcohol use), and somatic health-related functioning. Participants also completed a health-symptom checklist at the postdeployment assessment. Structural equation modeling revealed that postdeployment PTSD severity was associated with change in somatic health-related functioning, with postdeployment health symptoms as an intermediary variable.
DTIC
Health; Iraq; Military Personnel; Warfare

53
BEHAVIORAL SCIENCES

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

20080039122 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Stress and Psychological Support in Modern Military Operations
April 2008; 372 pp.; In English; Original contains color illustrations
Report No.(s): RTO-TR-HFM-081; AC/323(HFM-081)TP/188; Copyright; Avail.: CASI: C01, CD-ROM: A16, Hardcopy
NATO Task Group HFM-081/RTG on 'Stress and Psychological Support in Modern Military Operations' has produced, in the form of a Military Leaders Guide, a series of guidelines for psychological support in military operations across the deployment cycle. The guidelines are based on best practices identified by psychological support professionals and confirmed by military leaders.
Author
Military Personnel; Stress (Psychology); Military Operations; Military Psychology

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*.

20080037387 Longmuir (Jeanne E.), Cleveland Heights, OH, USA
Method for Design and Manufacture of Insoles
Cavanagh, P. R., Inventor; Ulbrecht, J. S., Inventor; Hurley, T. B., Inventor; Zhang, H., Inventor; 21 Sep 05; 20 pp.; In English
Contract(s)/Grant(s): NIH-5R44DK59074-02

Patent Info.: Filed Filed 21 Sep 05; US-Patent-Appl-SN-11-232 204
Report No.(s): PB2008-103048; No Copyright; Avail.: CASI: A03, Hardcopy

A method for the design and production of improved pressure reducing therapeutic shoe insoles for a person. The method includes the steps of measuring a three dimensional image of a foot and the distribution of plantar pressures applied by a person's foot being measured for a pressure reducing insole. Selecting a shoe insole outline or template which best fits or corresponds to the shape of a foot being measured. A foot display is generated which combines and aligns the three dimensional foot shape and the plantar pressure distribution. A three dimensional insole display is generated which combines and aligns the foot shape and plantar pressure distribution, and includes modifications based upon selected pressure contour lines identified within the foot display which are above predetermined pressure thresholds.

NTIS

Patent Applications; Shoes; Biodynamics; Pressure Distribution

20080037648 Sovoz, Inc., Princeton Junction, NJ USA

Control Interface for Driving Interactive Characters in Immersive Virtual Environments

Lane, Stephen H; Marshall, Henry; Roberts, Timothy; Nov 2006; 9 pp.; In English
Report No.(s): AD-A481753; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481753

The effectiveness of training Soldiers in immersive 3D virtual environments is currently limited by character control interfaces that require users to learn actions, for example moving a joystick or pressing a button, that do not necessarily enhance the user's physical performance in equivalent real world tasks and situations. In order to address this need, an advanced man/machine user interface has been developed utilizing inertial position, orientation, ultrasonic range and foot force sensors that allows users to naturally control interactive character movements using sensorimotor responses that closely resemble the tasks and actions performed in the real world. Known as a Virtual Locomotion Controller (VLC), this paper describes the VLC system architecture, control logic and associated sensor processing and the simulation environment used to determine the feasibility of the approach.

DTIC

Computer Graphics; Human-Computer Interface; Military Personnel; Symbols; Virtual Reality

20080038749 Humansystems, Inc., Guelph, Ontario Canada

Soldier Integrated Headwear System: System Design Process

Tack, David W; Oct 2006; 30 pp.; In English
Report No.(s): AD-A482359; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482359

The aim of the Soldier Integrated Headwear System - Technology Demonstration Project (SIHS TDP) is to empirically determine the most promising headwear integration concept that significantly enhances the survivability and effectiveness of the future Canadian soldier/warfighter. The SIHS TDP will develop, evaluate, and demonstrate novel concepts for integrating enhanced protection, sensing, information display, and communications technologies into a headwear system. To achieve this aim the SIHS programme will develop and demonstrate three unique technology concept types that represent different levels of integration. These concept types will range from a combined add on system where components are added to existing headwear systems, to a modular/compatible approach where subsystem functionality can be added or removed as and when needed, to a fully and permanently encapsulated design where weight, space, protection and functionality are optimized. The three systems would ideally used in comparative studies to determine the most suitable integration concept for the future Canadian soldier. This document outlines a process for designing and developing the three alternative SIHS concept types to successfully meet the objectives of the programme. The process outlined in this document provides both a philosophical viewpoint on the SIHS design process as well as a framework for achieving these goals. This document is not intended as a detailed project plan with timings and taskings but serves as the framework for writing such a plan.

DTIC

Display Devices; Helmets; Systems Engineering; Systems Integration

20080038775 Army Research Lab., Aberdeen Proving Ground, MD USA

Human Factors Engineering Assessment of the TeamMATE System for Dismounted Embedded Training and Mission Rehearsal

Clark, Bryan R; Reed, Dean E; Chen, Jessie Y C; Marshall, Henry A; Jun 2008; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-62716AH70

Report No.(s): AD-A482393; ARL-TR-4479; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482393

The U.S. Army Research Laboratory's Human Research and Engineering Directorate performed a human factors engineering assessment on the TeamMATE (Team Mission Assistant-Tactical/Exercise) system, which was developed by the U.S. Army Research, Development, and Engineering Command's Simulation and Training Technology Center in response to the need of a low cost solution to embedded training for the individual Soldier. A heuristic/expert evaluation for usability was performed on the user interface of TeamMATE, and this report provides a detailed description of recommendations for improving the usability of the TeamMATE system interface.

DTIC

Education; Embedding; Human Factors Engineering; Training Devices

20080038776 Army Research Lab., Aberdeen Proving Ground, MD USA

Launch Survivability Analysis of On-board Components of the Extended Area Protection and Survivability (EAPS) Projectile System

Chen, Michael M; Jun 2008; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-622618.H80

Report No.(s): AD-A482394; ARL-TR-4484; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482394

This report focuses on the ability of on-board electronics generally required for precision projectiles to survive pressure waves that occur in early combustion phase for most propelling charges because of pressure imbalance in the chamber. The modeling of pressure waves was achieved by a deterministic transient excitation followed by a stochastic approach. The responses of the on-board electronic components were found to be significant when pressure waves were taken into account.

DTIC

Launching; Projectiles; Protection; Protectors

20080038779 Center for Technology Commercialization, Inc., Westborough, MA USA

Massachusetts State Police Special Tactical Operations Team User Focus Group Report - Law Enforcement Advanced Protection (LEAP) Duty Uniforms, Integrated Head Protection, Chemical/Biological Protection and Human Systems Integration

Creighton, II, Thomas E; Hibbard, Bradley; Doherty, Stephen; McManus, Kelly; May 2008; 30 pp.; In English

Contract(s)/Grant(s): W911QY-07-C-0035; Proj-LEAP-CB-SAP

Report No.(s): AD-A482405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482405

This focus group report documents the findings of a Law Enforcement Advanced Protection (LEAP) Requirements User Focus Group held on August 15, 2007 at Devens, Massachusetts. This focus group is one in a series of personal protective equipment (PPE) related user focus groups for members of the law enforcement community. Its purpose was primarily to collect data/criteria for operational requirements, and to identify PPE trends and concepts of operations (CONOPS) from representatives within the law enforcement community. This focus group consisted exclusively of personnel assigned to the Massachusetts State Police Special Tactical Operations (STOP) Team. Participants were all members of a specialized tactical operations team with consistency in training and use of protective equipment. The focus group included discussions related to PPE integration and compatibility concerns; chemical/biological (CB) PPE and systems; law enforcement special operations tactical uniforms; and law enforcement duty uniforms standards related issues. Data collected through this focus group, coupled with on-going research and analysis will be used in a number of LEAP-related efforts, including the development of performance criteria for law enforcement specific PPE standards.

DTIC

Biochemistry; Law (Jurisprudence); Police; Protection; Systems Integration

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

20080037305 Fulbright and Jaworski, LLP, Austin, TX, USA; Texas Univ. System, Austin, TX, USA
Methods for Memory Assignment Schemes and Architecture for Shareable Parallel Memory Module Based Internet Switches
Kumar, S., Inventor; 26 Aug 05; 29 pp.; In English
Patent Info.: Filed Filed 26 Aug 05; US-Patent-Appl-SN-11-213 626
Report No.(s): PB2008-101979; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods are described for high-speed memory assignment schemes for routing packets in a sharable parallel memory module based switch system. A method includes receiving a parameter, determining availability of memory location, determining if an available memory location is pre-assigned, and assigning a packet a parameter if the memory location is available. Systems of the present invention provides hardware and/or software based components for implementing the steps of receiving a parameter, determining available memory location, determining if available memory location is pre-assigned, and assigning a packet a parameter if the memory location is available.
NTIS
Architecture (Computers); Computer Storage Devices; Internets; Memory (Computers); Patent Applications; Switches

20080037310 Fish and Richardson, P.C., Minneapolis, MN, USA
Disk Scheduling System Using Probability of Missed Disk Access
Zimmermann, R., Inventor; Fu, K., Inventor; 12 Aug 05; 12 pp.; In English
Contract(s)/Grant(s): EEC-9519152 NSF; 0082826 NSF
Patent Info.: Filed Filed 12 Aug 05; US-Patent-Appl-SN-11-203 567
Report No.(s): PB2008-101986; No Copyright; Avail.: CASI: A03, Hardcopy

Admission of a new disk stream is based on probability of overcommitting disk bandwidth based on parameters related to the disk. This fixed parameters are determined either by obtaining or by investigating the desk. Probability functions of the disk parameters may be obtained. Exemplary disk parameters may be disk seek time, probabilistic determination of the amount of data exchange during a single exchange, and probabilistic information about reading versus writing.
NTIS
Patent Applications; Probability Theory; Scheduling

20080037314 Hoffman, Warnick, and D'Alessandro, LLC, Albany, NY, USA
Method, System and Program Product for Managing Structured Data
Brown, R. H., Inventor; 13 Sep 04; 14 pp.; In English
Contract(s)/Grant(s): R29T
Patent Info.: Filed Filed 13 Sep 04; US-Patent-Appl-SN-10-940 886
Report No.(s): PB2008-102066; No Copyright; Avail.: CASI: A03, Hardcopy

An improved solution for managing structured data, and in particular generating compressed data based on the structured data. A schema that defines the structure of the data is used to generate a dictionary. The dictionary includes a set of dictionary entries, each configured to generate compressed data for a corresponding pattern defined by the schema. Additional compression can be implemented based on the structured data itself. The compressed data can be communicated between systems to reduce transmission time.
NTIS
Data Management; Data Structures; Dictionaries; Patent Applications

20080037332 Ryan Mason and Lewis, LLP, Locust Valley, NY, USA; International Business Machines Corp., Armonk, NY, USA
Methods and Apparartus for Monitoring Abnormalities in Data Stream
Aggarwal, C. C., Inventor; 17 Sep 04; 9 pp.; In English
Contract(s)/Grant(s): H98230-04-3-0001

Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943 329
Report No.(s): PB2008-101928; No Copyright; Avail.: CASI: A02, Hardcopy

A technique for monitoring a primary data stream comprising one or more secondary data streams for abnormalities is provided. A deviation value is determined for each of the one or more secondary data streams. The determined deviation values of the one or more secondary data streams are combined to form a combined deviation value. The combined deviation value is used to generate an abnormality signal.

NTIS

Abnormalities; Data Flow Analysis; Patent Applications

20080037367 Battelle Memorial Inst., Richland, WA, USA

Device and Method For Encoding Data in Multiple Media

Carrender, C. L., Inventor; 7 May 04; 10 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RL01830
Patent Info.: Filed Filed 7 May 04; US-Patent-Appl-SN-10-841 943
Report No.(s): PB2008-102766; No Copyright; Avail.: CASI: A02, Hardcopy

A system and related device for converting encoded data from one format into one or more formats, including barcode and radio frequency identification tag formats, the system including a programmer configured to read a barcode and using the barcode data encoded thereon automatically write the data to a radio frequency (RF) tag and to read the contents of a RF tag and automatically generate a barcode with the information contained in the tag or information related thereto, preferably without decoding the encoded data.

NTIS

Coding; Patent Applications; Radio Frequencies; Decoding

20080037373 Holland and Knight, Miami, FL, USA

Parameterization of Programming Structures

Fuhrer, R. M., Inventor; Kiezun, A., Inventor; Tip, F., Inventor; 7 Oct 04; 32 pp.; In English
Patent Info.: Filed Filed 7 Oct 04; US-Patent-Appl-SN-10-960 203
Report No.(s): PB2008-102760; No Copyright; Avail.: CASI: A03, Hardcopy

A method for transforming at least a portion of at least one programming structure into a type parameter includes receiving a first list of at least one declaration of at least one programming structure for transforming to a type parameter. The method further includes generating a second list of at least one declaration of the at least one programming structure that must be transformed into a type parameter if the at least one declaration of the first list is transformed to a type parameter. The method further includes generating a third list of at least one declaration of the at least one programming structure that may optionally be transformed into a type parameter and receiving a selection of zero or more declarations from the second list and zero or more declarations from the third list.

NTIS

Computer Programming; Parameterization; Patent Applications

20080037380 Legal (Barber), Golden, CO, USA

Method and System for Controlled Play of Digital Downloads

Christal, D. V., Inventor; 5 May 05; 17 pp.; In English
Patent Info.: Filed Filed 5 May 05; US-Patent-Appl-SN-11-123 952
Report No.(s): PB2008-102761; No Copyright; Avail.: CASI: A03, Hardcopy

A method and system for digital file promotion by placing output circumscribed player terminals at commercial establishments. The terminal may be able to download digital files but be disabled from output of the downloaded files, so that users must enjoy the file on the player provided to/by the establishment. The POS station of the commercial establishment sells an access code such as a bar code on the POS receipt which the user then scans to receive a digital file play of a file downloaded from the Internet or a local memory device, the digital files played may be MP3 files, ring tones, music/video/data/test/game files or programs accessible for play for a limited number of times, a limited period of time, or as a promotion of other products sold by the commercial establishment, or offered for sale independently, or the file itself may be promoted.

NTIS

Patent Applications; Computer Storage Devices; Video Data

20080037381 Grafe (V. Gerald) Esq,, Corrales, NM, USA
Navigation and Viewing in a Multidimensional Space
Anderson, T. G., Inventor; 21 Nov 05; 17 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 21 Nov 05; US-Patent-Appl-SN-11-283 969
Report No.(s): PB2008-102759; No Copyright; Avail.: CASI: A03, Hardcopy

A display controller allows a user to control a base viewing location, a base viewing orientation, and a relative viewing orientation. The base viewing orientation and relative viewing orientation are combined to determine a desired viewing orientation. An aspect of a multidimensional space visible from the base viewing location along the desired viewing orientation is displayed to the user. The user can change the base viewing location, base viewing orientation, and relative viewing orientation by changing the location or other properties of input objects.
NTIS
Navigation; Patent Applications; Viewing

20080037382 Brown, Raysman, Millstein, Felder and Steiner, LLP, New York, NY, USA
Computer Trading of Interests (PAT-APPL-11-087 775)
Hausman, A., Inventor; Tannenbaum, K. D., Inventor; Beatty, P. B., Inventor; Waldorf, L. C., Inventor; Dweck, A., Inventor; 23 Mar 05; 41 pp.; In English
Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-087 775
Report No.(s): PB2008-102755; No Copyright; Avail.: CASI: A03, Hardcopy

The invention provides systems, methods, and programs for improved computer trading of financial and other interests, including improvements in the making, acceptance, and control of proposals for transactions in interests. Among improvements provided by the invention are the presentation of terms of proposed transactions to trading parties in terms selected or otherwise designated by the trading parties. For example, terms of proposed transactions may be displayed in present or future values, such as in straight or split amounts for forward swap agreements. Prices in currency exchanges may be expressed in terms of any of the involved currencies. Improvements further include improved means for changing terms of proposed transactions, and especially groups or sets of proposed transactions; restrictions on repeated acceptance of transaction proposals; trading by users on each other's behalf; and improved display of transaction information associated with fellow traders.
NTIS
Computer Techniques; Financial Management; Patent Applications

20080037383 Newcastle-upon-Tyne Univ., Newcastle, UK
Enterprise Service Bus: An Overview
de Leusse, P.; Periorellis, P.; Watson, P.; Jul. 2007; 12 pp.; In English
Report No.(s): PB2008-102609; CS-TR-1037; Copyright; Avail.: National Technical Information Service (NTIS)

Currently, business requirements for rapid operational efficiency, customer responsiveness as well as rapid adaptability are driving the need for ever increasing communication and integration capabilities of the software assets. Enterprise Application Integration (EAI), which is the process of integrating enterprise systems with existing applications and in general distributed computing, have produced diverse integration techniques and approaches to undertake these challenges. This has brought the development of Service-Oriented Architecture (SOA) variants, which is partly supported by commonly accepted standards that ensure interoperability, sharing and reusability. As a result of this, a safer and faster level of return on investment (ROI) can be generated while inter-software communication and integration has becomes ever easier. In this paper we discuss ESB and evaluate the concept against already existing broker architectures and paradigms.
NTIS
Service Oriented Architecture; Distributed Parameter Systems

20080037384 Newcastle-upon-Tyne Univ., Newcastle, UK
Optimizing Revenue: Service Provisioning Systems with QoS Contracts
Palmer, J.; Mitrani, I.; Mazzucco, M.; McKee, P.; Fisher, M.; May 2007; 11 pp.; In English
Report No.(s): PB2008-102608; CS-TR-1023; Copyright; Avail.: National Technical Information Service (NTIS)

We consider the problem of how best to structure and control a distributed computer system containing many processors, subject to Quality of Service contracts. Services of different types are offered, with different charges for running jobs and

penalties for failing to meet the QoS requirements. The aim is to choose the number of servers allocated to each service type, and the admission criteria for jobs of that type, so as to maximize the total average revenue per unit time. For a given set of parameters, it is shown how to compute the optimal server allocation and the associated admission policy. The performance of a fast allocation heuristic is also evaluated.
NTIS
Provisioning; Contracts; Distributed Parameter Systems

20080037385 Newcastle-upon-Tyne Univ., Newcastle, UK
Pret a Voter with a Human-Readable, Paper Audit Trail
Ryan, P. Y. A.; Jul. 2007; 15 pp.; In English
Report No.(s): PB2008-102611; CS-TR-1038; Copyright; Avail.: National Technical Information Service (NTIS)

The Pret a Voter election scheme allows voters to confirm that their vote is accurately counted whilst maintaining ballot secrecy. Initial analysis indicates that the scheme is highly trustworthy, due to the high degree of transparency and auditability. However, the assurance arguments are subtle and involve some understanding of the role of cryptography. As a result, there remain challenges regarding public understanding and trust. It is essential that a voting system be not only trustworthy but also widely trusted. In this note, I propose a simple mechanism to generate a conventional paper audit trail that can be invoked should the outcome of the cryptographic count be called into question. It is hoped that having such a familiar mechanism as a safety net will encourage public confidence. Care has to be taken to ensure that the mechanism does not undermine the carefully crafted integrity and privacy assurances of the original scheme.
NTIS
Voting; Privacy

20080037386 Newcastle-upon-Tyne Univ., Newcastle, UK
Mitigating Provider Uncertainty in Service Provision Contracts
Smith, C.; van Moorsel, A.; Jun. 2007; 11 pp.; In English
Report No.(s): PB2008-102607; CS-TR-1034; Copyright; Avail.: National Technical Information Service (NTIS)

Uncertainty is an inherent property of open, distributed and multi-party systems. The economic viability of mutually beneficial relationships between the constituent parties in these systems relies on the ability of each party to effectively quantify and reason over uncertainty in order to facilitate rational decision-making. Service provision in Grid systems is one such relationship, in which uncertainty is experienced by the service provider in his ability to deliver a given quality level due to inherent behavioural factors, such as load fluctuations and equipment failures, and due to statistical factors relating to the use of past empirical data for future prediction. Inability of the provider to effectively quantify and reason over these behavioural and statistical uncertainties can result in errors in the estimation of quality levels consistent with business objectives. Emblematic consequences of such errors include loss of revenue, inefficient resource usage and erosion of consumer trust. To address this, we propose a utility model for contract-based service provision which extends common economic utility models and facilitates explicit reasoning over the uncertainties in quality levels. We couple this model with a monitoring policy which enables the mitigation of statistical uncertainty in quality levels under the constraint of costs for information acquisition.
NTIS
Uncertain Systems; Contracts; Economics; Errors

20080037388 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau; Honeywell International, Inc., Morristown, NJ, USA
Intrusion Detection Report Correlator and Analyzer
Heimerdinger, W. L., Inventor; Schewe, J. P., Inventor; 20 Dec 04; 12 pp.; In English
Contract(s)/Grant(s): DARPA-F30602-99-C-0017
Patent Info.: Filed Filed 20 Dec 04; US-Patent-Appl-SN-11-017 382
Report No.(s): PB2008-103044; No Copyright; Avail.: CASI: A03, Hardcopy

A computer/computer network security alert management system aggregates information from multiple intrusion detectors. Utilizing reports from multiple intrusion detectors reduces the high false alarm rate experienced by individual detectors while also improving detection of coordinated attacks involving a series of seemingly harmless operations. An internal representation of a protected enclave is utilized, and intrusion detection system (IDS) information is correlated to

accurately prioritize alerts. In one embodiment, the system is capable of utilizing data from most existing IDS products, with flexibility to add further IDS products.
NTIS
Computer Networks; Computers; Detection; False Alarms; Intrusion; Management Systems; Patent Applications; Security; Warning Systems

20080037390 Newcastle-upon-Tyne Univ., Newcastle, UK
Web Service Hosting and Revenue Maximization
Mazzucco, M.; Mitrani, I.; Palmer, J.; Fisher, M.; McKee, P.; Sep. 2007; 15 pp.; In English
Report No.(s): PB2008-102610; CS-TR-1047; Copyright; Avail.: National Technical Information Service (NTIS)

An architecture of a hosting system is presented, where a number of servers are used to provide different types of web services to paying customers. There are charges for running jobs and penalties for failing to meet agreed Quality-of-Service requirements. The objective is to maximize the total average revenue per unit time. Dynamic policies for making server allocation and job admission decisions are introduced and evaluated. The results of several experiments with a real implementation of the architecture are described.
NTIS
Computers; Revenue; Web Services

20080037394 Newcastle-upon-Tyne Univ., Newcastle, UK
Computer Scientist's Reactions to NPfIT (National Programme for IT)
Randell, B.; May 2007; 26 pp.; In English
Report No.(s): PB2008-102616; CS-TR-1024; Copyright; Avail.: National Technical Information Service (NTIS)

This paper contains a set of personal views relating to NHS Connecting for Healths National Programme for IT (NPfIT), and in particular its Care Records Service, written from the point of view of a computer scientist, not a medical informatics expert. The principal points made are as follows: Centralisation: Pulling lots of data together (for individual patients and then for large patient populations) harms safety and privacy. It is one by-product of excessive use of identification when in fact all that is usually needed is authentication. Large centralized data storage facilities can be useful for reliability, but risk exchanging lots of small failures for a lesser number of much larger failures. A much more decentralised approach to Electronic Patient Record (EPR) data and its storage should be investigated.
NTIS
Health; Medical Services; Patients

20080037395 Newcastle-upon-Tyne Univ., Newcastle, UK
Cross-Layer Framework Design for the Embedded Middleware in Mobility Applications (EMMA) Project
Jambli, M. N.; Tully, A.; Selvarajah, K.; Lachenmann, A.; Jul. 2007; 7 pp.; In English
Report No.(s): PB2008-102605; CS-TR-1036; Copyright; Avail.: National Technical Information Service (NTIS)

The severe energy constraints of wireless sensor networks (WSNs) require energy-efficient communication protocols in order to fulfill the objectives of the application. Cross-layer design is a technique which can potentially be used to improve the overall performance of WSNs by way of jointly optimizing and exploiting the interactions between various layers of the network protocol stack. In this paper, we propose a cross-layer framework design for the Embedded Middleware in Mobility Applications (EMMA) project. This optimization agent based framework design provides efficient data exchange between the various protocol layers via a state repository to improve the performance of WSN applications in terms of memory consumption and processing overhead.
NTIS
Applications Programs (Computers); Embedding; Mobility

20080037396 Newcastle-upon-Tyne Univ., Newcastle, UK
Resilience Modelling Through Discrete Event and Continuous Time Co-Simulation
Andrews, Z.; Fitzgerald, J.; Verhoef, M.; May 2007; 5 pp.; In English
Report No.(s): PB2008-102601; CS-TR-1020; Copyright; Avail.: National Technical Information Service (NTIS)

We propose an approach to discrete event and continuous time co-simulation that permits the analysis of alternative fault-tolerance strategies in formal models of embedded systems at early design stages. The approach is based on the use of

a model-oriented specification language with a continuous time simulator modelling controlled processes. This permits the explicit modelling of faults and the analysis of the resilience properties of a design.
NTIS
Fault Tolerance; Simulation; Discrete Functions

20080037397 Goodwin Procter, LLP, Boston, MA, USA
Systems and Methods for Dispersing and Clustering a Plurality of Robotic Devices
McLurkin, J., Inventor; Smith, J., Inventor; 17 May 05; 32 pp.; In English
Contract(s)/Grant(s): SNWSC-N66001-99-C-8513; ASSDC-DASG60-02-C-0028
Patent Info.: Filed Filed 17 May 05; US-Patent-Appl-SN-11-130 842
Report No.(s): PB2008-102754; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention features methods for operating, such as methods for dispersing and clustering, robotic devices (i.e., 'robots') that employ adaptive behavior relative to neighboring robots and external (e.g., environmental) conditions. Each robot is capable of receiving, processing, and acting on one or more multi-device primitive commands that describe a task the robot will perform in response to other robots and the external conditions. The commands facilitate a distributed command and control structure, relieving a central apparatus or operator from the need to monitor the progress of each robot. This virtually eliminates the corresponding constraint on the maximum number of robots that can be deployed to perform a task (e.g., data collection, mapping, searching, dispersion, and retrieval). By increasing the number of robots, the efficiency in completing the task is also increased.
NTIS
Dispersing; Patent Applications; Robotics; Robots

20080037398 Newcastle-upon-Tyne Univ., Newcastle, UK
Formal Engineering of XACML Access Control Policies in VDM++
Bryans, J. W.; Fitzgerald, J. S.; Jun. 2007; 23 pp.; In English
Report No.(s): PB2008-102615; CS-TR-1028; Copyright; Avail.: National Technical Information Service (NTIS)

We present a formal, tool-supported approach to the design and maintenance of access control policies expressed in the eXtensible Access Control Markup Language (XACML). Our aim is to help developers evaluate the consequences of policy decisions in complex situations where security requirements change and access decisions may depend on the external dynamic environment. The approach applies the model-oriented specification language from the Vienna Development Method (VDM++). An executable formal model of XACML access control is presented in VDM++. The use of the model to analyse and revise both policies and requirements on the environment is illustrated through an example. An approach to the practical problem of analysing access control in virtual organisations with dynamic membership and goals is proposed.
NTIS
Access Control; Document Markup Languages; Maintenance; Policies

20080037399 Newcastle-upon-Tyne Univ., Newcastle, UK
Connection Between Two Ways of Reasoning About Partial Functions
Fitzgerald, J. S.; Jones, C. B.; Aug. 2007; 11 pp.; In English
Report No.(s): PB2008-102606; CS-TR-1044; Copyright; Avail.: National Technical Information Service (NTIS)

This paper addresses the relationship between the theorems derived in two logics that provide alternative ways of reasoning about partial functions. Theorems in the Logic of Partial Functions using weak equality can be directly translated into First Order Predicate Calculus using existential equality. Translation in the other direction is, in general, more complicated but simplifies pleasingly in many cases. Such results are important if formal methods tool integration is to proceed safely.
NTIS
Predicate Calculus; Translating

20080037401 Newcastle-upon-Tyne Univ., Newcastle, UK
ReSIST Resilience Knowledge Base
Anderson, T.; Andrews, Z. H.; Fitzgerald, J. S.; Randell, B.; Glaser, H.; May 2007; 5 pp.; In English
Report No.(s): PB2008-102602; CS-TR-1021; Copyright; Avail.: National Technical Information Service (NTIS)

We describe a prototype knowledge base that uses semantic web technologies to provide a service for querying a large and expanding collection of public data about resilience, dependability and security. We report progress and identify

opportunities to support resilience-explicit computing by developing metadata-based descriptions of resilience mechanisms that can be used to support design time and, potentially, run-time decision making.
NTIS
Knowledge Based Systems; Prototypes; Resilience

20080037402 Newcastle-upon-Tyne Univ., Newcastle, UK
Formal Approach to Dependable Evolution of Access Control Policies in Dynamic Collaborations
Bryans, J. W.; Fitzgerald, J. S.; Periorellis, P.; Jun. 2007; 5 pp.; In English
Report No.(s): PB2008-102604; CS-TR-1027; Copyright; Avail.: National Technical Information Service (NTIS)

Network-enabled dynamic collaborations between businesses are increasingly common, and can evolve rapidly. We propose a formal approach to maintaining information security during evolution, while enabling participants to evolve their access control policies with the coalition.
NTIS
Access Control; Policies

20080037404 Newcastle-upon-Tyne Univ., Newcastle, UK
Proceedings of the Workshop on Methods, Models and Tools for Fault Tolerance
Butler, M.; Jones, C. B.; Romanovsky, A.; Troubitsyna, E.; Jun. 2007; 161 pp.; In English
Report No.(s): PB2008-102629; CS-TR-1032; Copyright; Avail.: National Technical Information Service (NTIS)

The Workshop on Methods, Models and Tools for Fault Tolerance, is being held at the Integrated Formal Methods 2007 Conference on 3 July 2007 in Oxford. The aim of the workshop is to bring together researchers in design of fault tolerance systems with researchers in formal methods in order to help foster greater collaboration between these research fields.
NTIS
Conferences; Fault Tolerance

20080037405 Newcastle-upon-Tyne Univ., Newcastle, UK
Formal Languages and Concurrent Behaviours
Kleijn, J.; Koutny, M.; Sep. 2007; 59 pp.; In English
Report No.(s): PB2008-102619; CS-TR-1049; Copyright; Avail.: National Technical Information Service (NTIS)

This is a tutorial based on a course delivered as part of the International PhD School in Formal Languages and Applications located at the Rovira i Virgili University in Tarragona, Spain. It is focused on an application of formal language theory to represent behaviours of concurrent systems necessitating a generalisation of language theory to traces, which originates with the work of Mazurkiewicz in 1977. The tutorial uses Petri nets as an underlying system model which allows one to clearly distinguish between causality and independence between executions of actions, a major feature of concurrent behaviour.
NTIS
Behavior; Languages

20080037406 Newcastle-upon-Tyne Univ., Newcastle, UK
Experiments Towards Adaptation of Concurrent Workflows
Smith, J.; Watson, P.; Jul. 2007; 14 pp.; In English
Report No.(s): PB2008-102623; CS-TR-1039; Copyright; Avail.: National Technical Information Service (NTIS)

This paper is concerned with the adaptive execution of workflows on a resources consisting of a pool of machines and a pool of alternative web services. The hierarchical nature of workflows enables adaptation at multiple levels. In this work, adaptivity is concerned with changing the mapping of services to machines and workflow invocations to services, in order to meet the requirements of both user and provider. Specifically, a third-party workflow engine (ActiveBPEL) has been wrapped to support mapping at these two levels. Results are presented for experiments within a cluster of machines which demonstrate a benefit from adapting in response to changes of user load and to changes in the pool of alternative services available during a workload. The experiments include a range of adaptivity scenarios and show that, by selection of an appropriate policy, a significant gain can be made.
NTIS
Workloads (Psychophysiology); Web Services

20080037407 Newcastle-upon-Tyne Univ., Newcastle, UK

Structural Proof of the Soundness of Rely/Guarantee Rules (Revised)

Coleman, J. W.; Jones, C. B.; Jun. 2007; 34 pp.; In English

Report No.(s): PB2008-102618; CS-TR-1029; Copyright; Avail.: National Technical Information Service (NTIS)

Various forms of rely/guarantee conditions have been used to record and reason about interference in ways that provide compositional development methods for concurrent programs. This paper illustrates such a set of rules and proves their soundness. The underlying concurrent language allows fine-grained interleaving and nested concurrency; it is defined by an operational semantics; the proof that the rely/guarantee rules are consistent with that semantics (including termination) is by a structural induction. A key lemma which relates the states which can arise from the extra interference that results from taking a portion of the program out of context makes it possible to do the proofs without having to perform induction over the computation history. This lemma also offers a way to think about expressibility issues around auxiliary variables in rely/guarantee conditions.

NTIS

Proving; Computation

20080037408 Newcastle-upon-Tyne Univ., Newcastle, UK

Integration of Constraints Documented in SBML, SBO, and the SBML Manual Facilitates Validation of Biological Models

Lister, A. L.; Pocock, M.; Wipat, A.; Aug. 2007; 18 pp.; In English

Report No.(s): PB2008-102613; CS-TR-1043; Copyright; Avail.: National Technical Information Service (NTIS)

The creation of quantitative, simulatable, Systems Biology Markup Language (SBML) models that accurately simulate the system under study is a time-intensive manual process that requires careful checking. Currently, the rules and constraints of model creation, curation, and annotation are distributed over at least three separate documents: the SBML schema document (XSD), the Systems Biology Ontology (SBO), and the Structures and Facilities for Model Definition document. The latter document contains the richest set of constraints on models, and yet it is not amenable to computational processing. We have developed an OWL (Web Ontology Language) knowledge base that integrates these three structure documents, and that contains a representative sample of the information contained within them. This Model Format OWL (MFO) performs both structural and constraint integration and can be reasoned over and validated. SBML Models are represented as individuals of OWL classes, resulting in a single computationally amenable resource for model checking. Knowledge that was only accessible to humans is now explicitly and directly available for computational approaches. The integration of all structural knowledge for SBML models into a single resource creates a new style of model development and checking.

NTIS

Bionics; Manuals; Knowledge Based Systems

20080037409 Newcastle-upon-Tyne Univ., Newcastle, UK

Smartdust and ZigBee for Transport Applications

Selvarajah, K.; Tully, A.; Jun. 2007; 11 pp.; In English

Report No.(s): PB2008-102622; CS-TR-1035; Copyright; Avail.: National Technical Information Service (NTIS)

Over the last few years many different versions of wireless sensor devices have been designed and built by various companies and institutions. The wireless sensor devices include sensors, microprocessor, bi-directional wireless communication technology and a power supply. This type of tiny wireless micro electro mechanical device has been nicknamed as Smartdust. The Smartdust devices have been successfully tested in many sensor network applications but potential use of the devices in transport domain is not clearly known. The Embedded Middleware in Mobility Applications project (EMMA) is funded under the Information Society Technologies (IST) Priority of the 6th Framework Programme of the European Commission. The application domain of transport will be taken as a pilot example where EMMA will foster cost-efficient ambient intelligence systems with optimal performance, high confidence and faster deployment. Even though number of Smartdust platforms are available in the market, Crossbow MICA family motes will be used for EMMA applications due to its commercial success in many wireless sensor network applications. Also, MICAz mote will be the best suitable platform for the EMMA project since it features sensing and networking capabilities with low power consumption and using ZigBee as communication protocol. The presentation will be focused on our experience of using Smartdust and Zigbee protocol for the EMMA infrastructure and vehicle sensor networks. Mainly, how communication between vehicle and the infrastructure can be faced and how heterogeneity issues will be handled using Zigbee as the most suitable communication technology.

NTIS

Applications Programs (Computers); Embedding; Mobility; Wireless Communication

20080037412 Newcastle-upon-Tyne Univ., Newcastle, UK

CARMEN Neuroscience Server

Watson, P.; Jackson, T.; Pitsilis, G.; Gibson, F.; Austin, J.; Aug. 2007; 10 pp.; In English

Report No.(s): PB2008-102625; CS-TR-1042; Copyright; Avail.: National Technical Information Service (NTIS)

Understanding the brain is one of the major scientific challenges. It requires the capability to synthesize a detailed and applicable understanding of the way in which information is encoded, accessed, analysed, archived and decoded in neuronal networks. Data is difficult and expensive to produce, but is rarely shared and collaboratively exploited. The main reason for this is that a proliferation of techniques produce voluminous data in a variety of heterogenous and proprietary formats; this is then locally described and curated and is often not computationally amenable. The EPSRC CARMEN e-Science Pilot project (www.carmen.org.uk) is addressing these challenges by leveraging e-Science infrastructure and expertise to support the virtual integration of research teams, and multi-modal experimentation. CARMEN will allow data sharing and integration, supported by metadata and an expandable range of services accessible to users for raw, transformed and live experimental data. Achieving this requires progress in a number of areas including: the ability to store, curate and deploy services as well as data; standardised metadata for neuroscience; and, advanced tools for searching and visualising time-series and related data. This paper gives an overview of the CARMEN infrastructure, and illustrates its functionality by describing the application of an early prototype to a specific neuroscience scenario.

NTIS

Brain; Neurology; Physical Sciences

20080037413 Newcastle-upon-Tyne Univ., Newcastle, UK

Balancing Insight and Effort: The Industrial Uptake of Formal Methods

Fitzgerald, J. S.; Larsen, P. G.; Jun. 2007; 21 pp.; In English

Report No.(s): PB2008-102614; CS-TR-1031; Copyright; Avail.: National Technical Information Service (NTIS)

This paper is a contribution to the Festschrift marking the 70th birthdays of Prof. Dines Bjoerner and Prof. Zhou Chaochen. Our goal is to help the developers of computer-based systems to make informed design decisions on the basis of insights gained from the rigorous analysis of abstract system models. The early work on model-oriented specification has inspired the development of numerous formalisms and tools supporting modelling and analysis. There are also many stories of successful industrial application, often driven by a few champions possessing deep a priori understanding of formalisms. There are fewer cases of successful take-up or adoption of the technologyin the long term.We argue that successful industrial adoption of this technology requires that potential users strike a balance between the effort expended in producing and analysing a model and insight gained. In order to support this balancing act, tools need to offer a range of levels of effort and insight. Further, educators need to recognise that training in formal development techniques must support this trade-off process.

NTIS

Balancing; Computer Techniques

20080037414 Newcastle-upon-Tyne Univ., Newcastle, UK

Modelling Secure Secret Key Exchange Using Stochastic Process Algebra

Zhao, Y.; Thomas, N.; Jul. 2007; 16 pp.; In English

Report No.(s): PB2008-102628; CS-TR-1041; Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we explore the trade-off between security and performance in considering a model of a key distribution centre. The model is specified using the Markovian process algebra PEPA and analysed numerically. Three versions of the model are proposed, using different modelling approaches and assumptions about the behaviour of the system. These different models are shown to display the same overall behaviour, but with some significant differences in absolute performance.

NTIS

Algebra; Security; Performance Prediction; Tradeoffs

20080037539 International Business Machines Corp., Cedar Park, TX, USA

Data Replication in Multiprocessor NUCA Systems to Reduce Horizontal Cache Thrashing

Rajamony, R., Inventor; Shen, X., Inventor; Sinharoy, B., Inventor; 7 Oct 04; 11 pp.; In English

Patent Info.: Filed Filed 7 Oct 04; US-Patent-Appl-SN-10-960 611

Report No.(s): PB2008-102758; No Copyright; Avail.: CASI: A03, Hardcopy

A method of managing a distributed cache structure having separate cache banks, by detecting that a given cache line has

been repeatedly accessed by two or more processors which share the cache, and replicating that cache line in at least two separate cache banks. The cache line is optimally replicated in a cache bank having the lowest latency with respect to the given accessing processor. A currently accessed line in a different cache bank can be exchanged with a cache line in the cache bank with the lowest latency, and another line in the cache bank with lowest latency is moved to the different cache bank prior to the currently accessed line being moved to the cache bank with the lowest latency. Further replication of the cache line can be disabled when two or more processors alternately write to the cache line.
NTIS
Multiprocessing (Computers); Patent Applications; Memory (Computers)

20080037575 NASA Stennis Space Center, Stennis Space Center, MS, USA
Intelligent Sensors for Integrated Systems Health Management (ISHM)
Schmalzel, John L.; July 17, 2008; 31 pp.; In English; IEEE New Orleans Section Meeting, 17 Jul. 2008, Stennis Space Center, MS, USA; Original contains color and black and white illustrations
Report No.(s): SSTI-2200-0104; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037575

IEEE 1451 Smart Sensors contribute to a number of ISHM goals including cost reduction achieved through: a) Improved configuration management (TEDS); and b) Plug-and-play re-configuration. Intelligent Sensors are adaptation of Smart Sensors to include ISHM algorithms; this offers further benefits: a) Sensor validation. b) Confidence assessment of measurement, and c) Distributed ISHM processing. Space-qualified intelligent sensors are possible a) Size, mass, power constraints. b) Bus structure/protocol.
Derived from text
Configuration Management; Systems Integration; Cost Reduction; Systems Management; Distributed Processing; Adaptation

20080037703 Carter, DeLuca, Farrell and Schmidt, LLP, Hyattsville, MD, USA
Compiler-Driven Dynamic Memory Allocation Methodology for Scratch-Pad Based Embedded Systems
Barua, R. K., Inventor; Udayakumaran, S., Inventor; 21 Sep 04; 17 pp.; In English
Contract(s)/Grant(s): NSF-CNS-0133519
Patent Info.: Filed Filed 21 Sep 04; US-Patent-Appl-SN-10-945 651
Report No.(s): PB2008-102757; No Copyright; Avail.: CASI: A03, Hardcopy

A highly predictable, low overhead and yet dynamic, memory allocation methodology for embedded systems with scratch-pad memory is presented. The dynamic memory allocation methodology for global and stack data (i) accounts for changing program requirements at runtime; (ii) has no software-caching tags; (iii) requires no run-time checks; (iv) has extremely low overheads; and (v) yields 100% predictable memory access times. The methodology provides that for data that is about to be accessed frequently is copied into the SRAM using compiler-inserted code at fixed and infrequent points in the program. Earlier data is evicted if necessary.
NTIS
Compilers; Memory (Computers); Patent Applications

20080037704 Quarles and Brady, LLP., Milwaukee, WI, USA
Agent-Based Method for Distributed Clustering of Textual Information
Potok, T. E., Inventor; 12 Oct 04; 16 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-963 241
Report No.(s): PB2008-102756; No Copyright; Avail.: CASI: A03, Hardcopy

A computer method and system for storing, retrieving and displaying information has a multiplexing agent (20) that calculates a new document vector (25) for a new document (21) to be added to the system and transmits the new document vector (25) to master cluster agents (22) and cluster agents (23) for evaluation. These agents (22, 23) perform the evaluation and return values upstream to the multiplexing agent (20) based on the similarity of the document to documents stored under their control. The multiplexing agent (20) then sends the document (21) and the document vector (25) to the master cluster agent (22), which then forwards it to a cluster agent (23) or creates a new cluster agent (23) to manage the document (21). The system also searches for stored documents according to a search query having at least one term and identifying the

documents found in the search, and displays the documents in a clustering display (80) of similarity so as to indicate similarity of the documents to each other.
NTIS
Computers; Data Processing; Multiplexing; Patent Applications; Texts

20080037705 Newcastle-upon-Tyne Univ., Newcastle, UK
IP Traceback in a Switched Ethernet Network
Andreou, M. S.; van Moorsel, A.; Jul. 2007; 18 pp.; In English
Report No.(s): PB2008-102612; CS-TR-1040; Copyright; Avail.: National Technical Information Service (NTIS)

IP traceback is the generic term given to systems that allow the tracing of IP packets back to their originating machine. A common shortcoming shared by existing traceback proposals is that they are able to identify the source network, but not the source host. Our work extends the traceback process by allowing the tracing of frames within the originating network (once this has been identified) to identify the originating host. We extend the SPIE system (which operates at the IP routers) with auditing at the Ethernet switches. The Ethernet traffic visibility issue is resolved with the use of switch port mirroring. The MAC address table is used to establish causality between the source frame address and source switch port. Our work removes the requirement for a specific network topology, as is the case in other known solutions. We provide a prototype implementation and preliminary evaluation of this to establish the efficacy of our proposal.
NTIS
Ethernet; Internets; Protocol (Computers); Switching

20080037750 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Los Angeles, CA, USA
Tracking Multiple Topics for Finding Interesting Articles
Pon, R. K.; Cardenas, A. F.; Buttler, D. J.; Critchlow, T. J.; Feb. 23, 2007; 12 pp.; In English
Report No.(s): DE2007-913552; UCRL-CONF-228286; No Copyright; Avail.: National Technical Information Service (NTIS)

We introduce multiple topic tracking (MTT) for iScore to better recommend news articles for users with multiple interests and to address changes in user interests over time. As an extension of the basic Rocchio algorithm, traditional topic detection and tracking, and single-pass clustering, MTT maintains multiple interest profiles to identify interesting articles for a specific user given user-feedback. Focusing on only interesting topics enables iScore to discard useless profiles to address changes in user interests and to achieve a balance between resource consumption and classification accuracy. Also by relating a topics interestingness to an articles interestingness, iScore is able to achieve higher quality results than traditional methods such as the Rocchio algorithm. We identify several operating parameters that work well for MTT. Using the same parameters, we show that MTT alone yields high quality results for recommending interesting articles from several corpora. The inclusion of MTT improves iScores performance by 9% to 14% in recommending news articles from the Yahoo News RSS feeds and the TREC11 adaptive filter article collection. And through a small user study, we show that iScore can still perform well when only provided with little user feedback.
NTIS
Information Retrieval; Tracking (Position)

20080037758 Lawrence Livermore National Lab., Livermore, CA USA; Johns Hopkins Univ., Baltimore, MD, USA
Multi-Grained Level of Detail for Rendering Complex Meshes Using a Hierarchical Seamless Texture Atlas
Niski, K.; Purnomo, B.; Cohen, J.; Dec. 01, 2006; 10 pp.; In English
Report No.(s): DE2007-913544; UCRL-CONF-226467; No Copyright; Avail.: National Technical Information Service (NTIS)

Previous algorithms for view-dependent level of detail provide local mesh refinements either at the finest granularity or at a fixed, coarse granularity. The former provides triangle-level adaptation, often at the expense of heavy CPU usage and low triangle rendering throughput; the latter improves CPU usage and rendering throughput by operating on groups of triangles. We present a new multiresolution hierarchy and associated algorithms that provide adaptive granularity. This multi-grained hierarchy allows independent control of the number of hierarchy nodes processed on the CPU and the number of triangles to be rendered on the GPU. We employ a seamless texture atlas style of geometry image as a GPU-friendly data organization, enabling efficient rendering and GPU-based stitching of patch borders. We demonstrate our approach on both large triangle meshes and terrains with up to billions of vertices.
NTIS
Computer Graphics; Textures

20080037817 International Business Machines Corp., Yorktown Heights, NY, USA

Method for Wiring Allocation and Switch Configuration in a Multiprocessor Environment

Aridor, Y., Inventor; Domany, T., Inventor; Frachtenberg, E., Inventor; Shmueli, E., Inventor; Stockmeyer, L. J., Inventor; 14 Sep 04; 28 pp.; In English

Contract(s)/Grant(s): DE-B517552

Patent Info.: Filed Filed 14 Sep 04; US-Patent-Appl-SN-10-940 549

Report No.(s): PB2008-103492; No Copyright; Avail.: CASI: A03, Hardcopy

A method for wiring allocation and switch configuration in a multiprocessor computer, the method including employing depth-first tree traversal to determine a plurality of paths among a plurality of processing elements allocated to a job along a plurality of switches and wires in a plurality of D-lines, and selecting one of the paths in accordance with at least one selection criterion.

NTIS

Multiprocessing (Computers); Patent Applications; Switches; Wiring

20080037818 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA

Network of Networks of Associative Memory Networks for Knowledge Management

Fleming, J. S., Inventor; McGiverin, B. J., Inventor; Aparicio, M., Inventor; 3 Nov 04; 50 pp.; In English

Patent Info.: Filed Filed 3 Nov 04; US-Patent-Appl-SN-10-980 520

Report No.(s): PB2008-103491; No Copyright; Avail.: CASI: A03, Hardcopy

Associative memory systems, methods and/or computer program products include a network of networks of associative memory networks. A network of entity associative memory networks is provided, a respective entity associative memory of which includes associations among a respective observer entity and observed entities that are observed by the respective observer entity, based on input documents. A network of feedback associative memory networks includes associations among observed entities for a respective positive and/or negative evaluation for a respective task of a respective user. A network of document associative memory networks includes associations among observed entities in a respective observed input source, such as a respective input document. A network of community associative memory networks includes associations among a respective observer entity, observed entities that are observed by the respective observer entity, and observed tasks of users in which the observer entity was queried. Associations may be observed into and imagined from the network of networks of associative memory networks.

NTIS

Associative Memory; Computer Networks; Patent Applications

20080037820 Newcastle-upon-Tyne Univ., Newcastle, UK

Deriving Specifications for Systems That Are Connected to the Physical World

Jones, C. B.; Hayes, I. J.; Jackson, M. A.; Aug. 2007; 31 pp.; In English

Report No.(s): PB2008-102617; CS-TR-1045; Copyright; Avail.: National Technical Information Service (NTIS)

Well understood methods exist for developing programs from formal specifications. Not only do such methods offer a precise check that certain sorts of deviations from their specifications are absent from implementations but they can also increase the productivity of the development process by careful use of layers of abstraction and refinement in design. These methods, however, presuppose a specification from which to begin the development. For tasks that are fully described in terms of the symbolic values within a machine, inventing a specification is not difficult but there is an increasing demand for systems in which programs interact with an external physical world. Here, the task of fixing the specification for the silicon package can be more challenging than the development itself. Such applications include control programs that attempt to bring about changes in the physical world via actuators and measure things in that external (to the silicon package) world via sensors. Furthermore, most systems of this class must tolerate failures in the physical components outside the computer: it then becomes even harder to achieve confidence that the specification is appropriate. This paper offers a systematic way to derive the specification of a control program. Furthermore, our approach leads to recording assumptions about the physical world. We also discuss separating the detection and management of faults from system operation in the absence of faults. This discussion is linked to the distinction between normal and radical design.

NTIS

Systems Engineering; Design Optimization; Design Analysis

20080037853 Rader, Fishman, and Grauer, PPLC, Bloomfield Hills, MI, USA

Dynamic Logic Circuit Apparatus and Method for Reducing Leakage Power Consumption Via Separate Clock and Output Stage Control

Ngo, H. C., Inventor; Kuang, J. B., Inventor; Deogun, H. S., Inventor; Kleinosowski, A. J., Inventor; 18 Nov 04; 9 pp.; In English

Patent Info.: Filed Filed 18 Nov 04; US-Patent-Appl-SN-10-992 488

Report No.(s): PB2008-102780; No Copyright; Avail.: CASI: A02, Hardcopy

A dynamic logic circuit apparatus and method for reducing leakage power consumption via separate clock and output stage control reduces power consumption of processors and other systems incorporating dynamic circuits. The power control signal may be a delayed version of the logic clock and turns on the output inverter foot device after the dynamic node has had sufficient time to evaluate, providing a fast evaluate time and reducing leakage through the inverter input when the foot device is off. Alternatively, a coarsely timed static power control signal may be used to control the inverter foot devices. The drains of the inverter foot devices can be commonly connected across multiple circuits, reducing the foot device total area. NTIS

Clocks; Leakage; Logic Circuits; Patent Applications

20080037862 North Carolina Univ., Chapel Hill, NC, USA

Methods, Systems, and Computer Program Products for Modeling and Simulating Application-Level Traffic Characteristics in a Network Based on Transport and Network Layer Header Information

Jeffay, K., Inventor; Campos, F. H., Inventor; Smith, F. D., Inventor; Nobel, A. B., Inventor; 9 Mar 05; 12 pp.; In English

Contract(s)/Grant(s): ANI 03-23648; ITR 00-82870

Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-075 992

Report No.(s): PB2008-102781; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, systems, and computer program products are disclosed for determining application-level traffic characteristics in a network based on transport and network layer header information. Transport and network layer header information is collected from packet traffic in a network. Packets are classified to different connections based on the transport and network layer header information. Each connection is modeled using an abstract syntax for characterizing bidirectional interactions between endpoints of each connection and delays between the interactions. Application-level characteristics of the packet traffic are determined based on the modeled connections. Simulated traffic that models application-level traffic behavior in a real network may also be generated by simulating traffic connections based on the modeled connections.
NTIS

Computer Networks; Computer Programs; Data Transmission; Internets; Patent Applications; Simulation; Traffic

20080037882 George Mason Univ., Fairfax, VA, USA

Open Set Recognition Using Transduction

Li, F., Inventor; Wechsler, H., Inventor; 10 Mar 05; 25 pp.; In English

Contract(s)/Grant(s): N41756-03-C-4026

Patent Info.: Filed Filed 10 Mar 05; US-Patent-Appl-SN-11-075-982

Report No.(s): PB2008-102817; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed is an open set recognition system that utilizes transductive inference. One embodiment of this open set recognition system includes capture device(s), a basis, quality checker(s), feature extractor(s), a gallery, a rejection threshold, a storage mechanism, and a recognition stage. The basis is configured to encode the sample(s) and is derived using representative training samples. The feature extractor(s) generates signature(s) from sample(s) using the basis. The rejection threshold may be created using a rejection threshold learning mechanism configured to calculate the rejection threshold using the sample(s) by: swapping one of the sample identifier with other possible sample identifier(s); computing a credibility value (p) for each of the swapped sample identifiers; deriving a peak-to-side ratio distribution using a multitude of the credibility values; and determining the rejection threshold using the peak-to-side ratio distribution. The open set recognition stage authenticates or reject as unknown the identity of unknown sample(s) by: deriving a set of credibility values by iteratively assigning each of the gallery identifiers to the unknown sample; deriving a peak-to-side ratio for the unknown sample using the set of credibility values; comparing the peak-to-side ratio for the unknown sample to the rejection threshold; rejecting the unknown sample as unknown if the peak-to-side ratio is less than or equal to the rejection threshold; and finding the closest of the at least one gallery sample if the peak-to-side ratio is greater than the rejection threshold.
NTIS

Genetics; Patent Applications; Pattern Recognition; Transducers; Transferring

20080038079 King (Eric G.), Warrenton, VA, USA
Cryptographic System and Methods Using a One-Way Multidimensional Function
Recht, B. H., Inventor; Gershenfeld, N. A., Inventor; Rahimi, A., Inventor; 4 Oct 05; 13 pp.; In English
Contract(s)/Grant(s): NSF-CCR0122419; CN-ARPA-F30602-03-2-0090
Patent Info.: Filed Filed 4 Oct 05; US-Patent-Appl-SN-11-242 132
Report No.(s): PB2008-101614; No Copyright; Avail.: CASI: A03, Hardcopy

A cryptographic method and systems using a keyed one-way function. A sending device uses the keyed one-way function to authenticate one or more receiving devices prerequisite to communication.
NTIS
Cryptography; Patent Applications

20080038094 George Mason Univ., Fairfax, VA, USA; Army Research Lab., Aberdeen Proving Ground, MD, USA
Minimum-Cost Network Hardening
Noel, S. E., Inventor; Jajodia, S., Inventor; O'Berry, B. C., Inventor; Jacobs, M. A., Inventor; 17 Oct 05; 21 pp.; In English
Contract(s)/Grant(s): ARL-W911QX-04-C-0101; ARO-DAAD-19-03-1-0257
Patent Info.: Filed Filed 17 Oct 05; US-Patent-Appl-SN-11-250 449
Report No.(s): PB2008-101639; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed is a network hardening mechanism. The mechanism: generates a dependency graph from a multitude of exploits; constructs a goal conditions expression which may then be used to determine set(s) of safe network configurations. A subset of these safe network configuration sets may then be selected for implementation using hardening costs as a criterion.
NTIS
Computer Information Security; Computer Networks; Cost Effectiveness; Patent Applications

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20080037632 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fpack and Funpack Utilities for FITS Image Compression and Uncompression
Pence, W.; [2008]; 2 pp.; In English; Astronomical Data Analysis Software and Systems (ADASS) Conference, 2 - 5 Nov. 2008, Quebec, Canada; Copyright; Avail.: Other Sources; Abstract Only

Fpack is a utility program for optimally compressing images in the FITS (Flexible Image Transport System) data format (see http://fits.gsfc.nasa.gov). The associated funpack program restores the compressed image file back to its original state (as long as a lossless compression algorithm is used). These programs may be run from the host operating system command line and are analogous to the gzip and gunzip utility programs except that they are optimized for FITS format images and offer a wider choice of compression algorithms. Fpack stores the compressed image using the FITS tiled image compression convention (see http://fits.gsfc.nasa.gov/fits_registry.html). Under this convention, the image is first divided into a user-configurable grid of rectangular tiles, and then each tile is individually compressed and stored in a variable-length array column in a FITS binary table. By default, fpack usually adopts a row-by-row tiling pattern. The FITS image header keywords remain uncompressed for fast access by FITS reading and writing software. The tiled image compression convention can in principle support any number of different compression algorithms. The fpack and funpack utilities call on routines in the CFITSIO library (http://hesarc.gsfc.nasa.gov/fitsio) to perform the actual compression and uncompression of the FITS images, which currently supports the GZIP, Rice, H-compress, and PLIO IRAF pixel list compression algorithms.
Author
Computer Programs; Data Compression; Image Processing

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.

20080037487 Army Research Lab., White Sands Missile Range, NM USA
White Sands Missile Range 2007 Urban Study: Data Processing - Volume DP-3 (Airflow Qualitative Assessment)
Vaucher, Gail; Bustillos, Manuel; May 2008; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482090; ARL-TR-4441; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Urban toxic chemical releases pose a threat to the military and civilians. The White Sands Missile Range (WSMR) Urban Studies address two critical elements in diagnosing airborne hazard releases, namely, airflow (chemical distribution) and stability (chemical concentration). This document provides a qualitative assessment of seven airflow features targeted by the WSMR 2007 Urban Study (W07US). The W07US stability assessment is published separately. The features identified for verification and characterization include the Fetch Flow, Velocity Acceleration, Velocity Deficit, Cavity Flows, Canyon Flows, Leeside Corner Eddies, and Reattachment Zone. Feature definitions, frequency of occurrences/day, and field study statistics are presented. Case studies enrich the text with excellent examples of inter-feature attributes and the detailed temporal and spatial urban characteristics. Suggestions for future airflow analysis work are interwoven throughout the text. The conclusions and recommendations recap key findings and next step suggestions for the W07US airflow qualitative assessment.
DTIC
Air Flow; Cities; Data Processing; Missile Ranges

20080037494 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Experimental Design Analysis of U.S. Army Command and Control Systems With the Cadre Tool
Williges, Robert C; Middlebrooks, Sam E; Nov 1, 2006; 9 pp.; In English
Report No.(s): AD-A482155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Previous work has involved experimental design interrogation of a series of computer models of human task and workload performance in military command and control (C2) systems. These models, called Computer modeling Of Human Operator System Tasks (CoHOST) (Middlebrooks et al., 1999), have shown a dramatic need for some tool to assist experimental designers in efforts to establish effective experiments. Specific needs include the collection of data in a manner that minimizes the amount of data required while maximizing the effectiveness and power of the data. A desktop tool called Computer-Aided Design Reference for Experiments (CADRE) was developed for this purpose. The CADRE tool includes over 850 pages of reference material covering 25 topics that are divided into five major sections including an introduction to experimental design, supplemental data collection design and analysis, basic analysis of variance (ANOVA) designs, advanced ANOVA designs, and empirical model building. In addition, the CADRE tool contains over 200 pages explaining 39 examples of statistical analyses covered in the reference material and is hyperlinked to Version 9.1.3 of the SAS statistical analysis package. The CADRE tool can be used for choosing experimental design procedures to interrogate and build empirical models in support of complex studies such as future C2 systems computer simulations.
DTIC
Command and Control; Computer Aided Design; Design Analysis; Experiment Design

20080037591 General Dynamics Advanced Technology Systems, Arlington, VA USA
Human Augmentation of Reasoning Through Patterning (HARP)
Sickels, Stephen J; Apr 2008; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0001; Proj-GENO
Report No.(s): AD-A481851; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481851

The objective for this effort was to develop effective software tools to support collaborative intelligence analysis. The development led to two separate tools, tag/Connect and Catalyst. These tools can be used separately or combined for a more expansive collaborative capability. Tag/Connect allows analysts to apply tags (keywords) to Web-based resources, and to see and leverage the tags and tagged resources of others. Catalyst is a modeling tool that can be utilized for performing risk assessment and option generation. Catalyst is flexible and can be applied to a variety of intelligence issues. Catalyst models

consist of nodes of information organized into hierarchical tree structures. Nodes can contain attachments or links to tags from tag/Connect. Tag/Connect is a core service on the three Intelink networks.
DTIC
Augmentation; Information Management; Intelligence; Software Development Tools

20080037592 Jacksonville State Univ., AL USA
Development and Performance of Camel_Aero, a Truly Matrix-Free, Parallel and Vectorized Unstructured Finte Volume Solver for Compressible Flow
Tu, Shuangzhang; Watts, Marvin; Fuller, Andrew; Patel, Reena; Aliabadi, Shahrouz; Nov 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0014; DAAD19-03-D-0001
Report No.(s): AD-A481847; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481847

This paper reports the development and performance of CaMEL_Aero, our truly matrix-free, parallel and vectorized unstructured finite volume solver for compressible flows. The Jacobian-free GMRES method is used to solve the linear systems of equations inside each nonlinear Newton-Raphson iteration. Furthermore, the matrix-free Lower-Upper Symmetric Gauss Seidel (LUSGS) method is employed as a preconditioning technique to the GMRES solver. The solver is parallelized using mesh partitioning and Message Passing Interface (MPI) functions. The solver is also vectorized using two main vectorization techniques: the face coloring algorithm to vectorize the long loops over faces and the truncated Neumann expansions of the inverse of preconditioning matrices to vectorize the LU-SGS preconditioner, respectively. A few 2D and 3D numerical examples are presented to demonstrate the performance of the present solver.
DTIC
Compressible Flow; Computational Fluid Dynamics; Parallel Processing (Computers)

20080037630 Alabama Univ., Birmingham, AL USA
Resistance of Membrane Retrofit Concrete Masonry Walls to Lateral Pressure
Moradi, Lee G; Davidson, James S; Apr 2008; 163 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-02-C-7027; Proj-4915
Report No.(s): AD-A481630; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481630

Mitigation techniques are currently being sought to ensure public safety in the event of intentional or accidental explosions. Building material fragmentation is a major cause of human injury during such events. Use of concrete masonry walls is a common method of building construction. Concrete masonry provides a fast inexpensive way to construct buildings of various heights; however, these walls are extremely vulnerable to blast pressure resulting in collapse, fragmentation and severe injury to occupants. Much research has been conducted using actual blast tests as well as computational methods to study the behavior of masonry walls. Blast tests examined masonry walls of various shapes and make up, as well as the use of retrofit materials to mitigate the blast damage to masonry. In the computational arena, research made use of Livermore Software - DYNamics (LS-DYNA) finite element software to simulate full-scale models of concrete masonry walls. The results were compared to the actual blast tests, but the cost of high fidelity computational models made them impractical for day-to-day design. Design tools developed by other investigators in the field have been available for the past few years; however, their accuracy remains questionable when compared to actual blast test data. The research presented in this dissertation developed resistance functions for three different scenarios of membrane retrofit unreinforced concrete masonry walls to lateral pressure. These functions were further coupled with single degree of freedom systems to predict wall response to blast loads. The analysis results were compared to field blast tests for verification. This research gives the structural engineer a practical software tool for the design of membrane retrofit masonry walls to resist lateral pressures such as wind, and various blast charges and distances.
DTIC
Concretes; Explosions; Masonry; Membranes; Retrofitting; Software Development Tools; Walls

20080037642 University of Southern California, Marina del Rey, CA USA

Relighting Character Motion for Photoreal Simulations

Lamond, Bruce; Chabert, Charles-Felix; Einarsson, Per; Jones, Andrew; Ma, Wan-Chun; Hawkins, Tim; Bolas, Mark; Sylwan, Sebastian; Debevec, Paul; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481779; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481779

We present a fully image-based approach for capturing and modeling real human locomotion under varying illumination and viewpoint that overviews the techniques and results presented by [Einarsson et al, 2006]. An actor performs repeatable locomotive actions (walking/running) on a rotating treadmill while being filmed from a vertical array of 3 high-speed cameras under controlled rapidly changing lighting conditions. The known rotation of the treadmill, repeatability of the actor's motion, timing of the lighting pattern and capture rate of the cameras are all carefully synchronized so that the actor is imaged in (approximately) the same position in the locomotion at the same point in the lighting pattern but having rotated a known amount due to the known turntable motion. This allows us to effectively multiply the number of cameras from 3 1 in azimuth to 3 36. Small perturbations in the actor's repeating cyclic position are corrected for using optical flow, and optical flow is also used to align images temporally. This leads to a flowed reflectance field data structure. Datasets are compressed using image compression. Image-based relighting and a combination of view morphing and light field rendering implemented on the GPU allow us to render the subject under novel viewpoint and illumination. To composite the person into a scene we derive an alpha matte from retro-reflective material and a back-lit diffuse backdrop, and implement a voxel-based visual hull process to compute how the person should cast shadows on the ground plane. We demonstrate realistic composites of real subjects into real and virtual environments applicable to the area of training simulation.

DTIC

Illuminating; Motion Simulation; Shadows; Virtual Reality

20080037645 Army Research Lab., Adelphi, MD USA

Creating the Semantic Battlespace: Narrative Structure for Information Fusion

Hobbs, Reginald L; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481766; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481766

The army has identified a need for representations of the battlespace that can be analyzed by both computational systems and subject matter experts to aid the C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance). The Future Combat System (FCS) envisions a seamless merge of information systems and hardware, communicating on the battlespace in realtime with persistent data. Much of the infrastructure of FCS will be supported by the Global Information Grid (GIG); the Department of Defense (DOD) mandated interconnected set of information capabilities for war fighters, policy makers, and support personnel. One of the primary policy requirements on GIG assets is interoperability using common or enterprise-level communications and computing architectures. The multiple data sources, communication channels, heterogeneous platforms, and information systems in FCS will not only generate cognitive overload to the war-fighter, but will make information fusion difficult. The problem is context; how to add semantics to the data to assist decision makers and battle planning. The purpose of this paper is to highlight the narrative approaches that are inherent in several ongoing Army efforts. Recognizing the storytelling nature of these systems and the potential for automated contextual enhancement will leverage the significant research in narrative from other disciplines. Incorporating M & S systems with C4ISR applications, particularly the Future Combat System (FCS), will necessitate a multidisciplinary approach to making seamless communications with automated systems.

DTIC

Information Management; Information Systems

20080037646 Center for Edge Power, Monterey, CA USA

Exploring Edge C2 Approaches: ELICIT & POW-ER Tools

Nissen, Mark E; Jun 2007; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481769; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481769

This briefing discusses two new tools in research on the concept of the Edge command and control concept. ELICIT is an instrumented multiplayer intelligence game and POW-ER is a modeling and simulation program.

DTIC

Command and Control; Computerized Simulation

20080037981 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Software Archive Related Issues
Angelini, Lorella; July 23, 2008; 1 pp.; In English; Urbino 2008: High Energy Astrophysics Summer School, 23 Jul. - 5 Aug. 2008, Urbino, Italy; No Copyright; Avail.: Other Sources; Abstract Only

With the archive opening of the major X-ray and Gamma ray missions, the school is intended to provide information on the resource available in the data archive and the public software. This talk reviews the archive content, the data format for the major active missions Chandra, XMM-Newton, Swift, RXTE, Integral and Suzaku and the available software for each of these missions. It will explain the FITS format in general and the specific layout for the most popular mission, explaining the role of keywords and how they fit in the multimission standard approach embrace by the High Energy Community. Specifically, it reviews : the difference data levels and the difference software applicable; the popular/standard method of analysis for high level products such as spectra, timing and images; the role of calibration in the multi mission approach; how to navigate the archive query databases. It will present also how the school is organized and how the information provided will be relevant to each of the afternoon science projects that will be proposed to the students and led by a project leader
Author
X Ray Timing Explorer; Data Bases; Computer Programs; Gamma Rays; X Rays; Calibrating; Format

20080038005 Army Engineer Research and Development Center, Vicksburg, MS USA
Morphologic Modeling of Multiple Barrier Island Breaches for Regional Application
Connell, Kenneth J; Larson, Magnus; Kraus, Nicholas C; May 2007; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482018; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper introduces a time-dependent model of regional barrier island breaching for multiple openings, whether as permanent inlets or as new breaches to the same bay. The model allows an arbitrary number of breaches and is forced by tide, storm surge, and wave set up. Limitations on the hydrodynamics, hence calculated breach evolution, are those associated with the Keulegan inlet model. The model includes possible closure or limited breaching by shoaling of the breach channel by longshore transport. Capabilities of the multiple breaching model are examined through eight sensitivity tests.
DTIC
Inlets (Topography); Waterways

20080038020 Army Tactical Command and Control Hardware and Software, Fort Monmouth, NJ USA
IPv6: Key to Army Future Force Net-Centric Capabilities
Walsh, T J; Jain, A K; Chan, K F; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481541; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481541

This paper reports on the Next Generation Internet Protocol (IPv6), a key enabler to the achievement of Net-centric capabilities to support the Army's Future Force. In addition, the paper describes the Fort Monmouth IPv6 Center of Excellence initiatives undertaken in response to the difficult IPv6 transitional challenges. It also presents the positive operational results, obtained from participating in the 2006 Joint User Interoperability Communications Exercise (JUICE), that focused on interoperability of IPv6 Transition Mechanisms, automated task force reorganization, and mobility capabilities enabled by IPv6 support for warfighter.
DTIC
Protocol (Computers); Warfare; Computer Networks

20080038022 Soar Technology, Inc., Ann Arbor, MI USA
Bringing the Schoolhouse Inside the Box - A Tool for Engaging, Individualized Training
Magerko, Brian; Stensrud, Brian S; Holt, Lisa S; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N61339-05-C-0142
Report No.(s): AD-A481593; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481593

The Interactive Storytelling Architecture for Training (ISAT) is designed to address the limitations of computer games for advanced distributed learning (ADL) and to fully realize the potential of games to become engaging and individualized training environments. The central component of the ISAT architecture is an intelligent director agent responsible for individualizing the training experience. To achieve this, the director tracks the trainee's demonstration of knowledge and skills during the training experience. Using that information, the director plays a role similar to that of a schoolhouse trainer,

customizing training scenarios to meet individual trainee needs. The director can react to trainee actions within a scenario, dynamically adapting the environment to the learning needs of trainee as well as the dramatic needs of the scene. This paper describes a prototype implementation of the ISAT architecture in the combat medic training domain, with an emphasis on the design of the agent.
DTIC
Education; Games; Computers

20080038644 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Giovanni: A Web Services Workflow-Based Data Visualization and Analysis System
Berrick, Stephen W.; Leptoukh, Gregory; Farley, John; Rui, Hualan; [2008]; 7 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): Proj. REASoN CAN-02-OES-01; Proj. REASoN CAN-02-OES-01
Report No.(s): TGRS-2008-00058; Copyright; Avail.: Other Sources

NASA's Goddard Earth Sciences Data and Information Services Center (GES DISC) has developed the Goddard Interactive Online Visualization ANd aNalysis Infrastructure or 'Giovanni', an asynchronous, Web services-based, workflow management system for Earth science data. Giovanni has been providing an intuitive and responsive interface for visualizing, analyzing, and inter-comparing multisensor data using only a Web browser to scientists and other users. Giovanni supports many types of single- and multiparameter visualizations and statistical analyses. The interface also provides users with capabilities for downloading images and data in multiple formats. Giovanni supports open and standard data protocols and formats. Finally, Giovanni provides users with a data lineage that describes, in detail, the algorithms used in processing the data including caveats and other scientifically pertinent information.
Author
Earth Sciences; Information Systems; Scientific Visualization; Web Services; Multisensor Applications; Systems Engineering

20080038691 Naval Research Lab., Washington, DC USA
Visualizing Cetacean Auditory Responses to Underwater Noise
Hillson, R; Schmidt, G; Jan 2004; 4 pp.; In English
Contract(s)/Grant(s): MIPR-N0001404WX20972
Report No.(s): AD-A482224; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482224

To estimate the impact of anthropogenic noise sources on marine mammals, we must develop the ability to predict both physiological and behavioral responses of cetaceans to diverse acoustic sources. Behavioral experimentation is constrained by both technical and ethical considerations, but the detailed simulation of auditory processing provides a necessary alternative. The objective of this task is to create three-dimensional interactive simulations of sound propagation and impacts from both impulse and continuous sound sources. The visualizations will be driven by anatomical and simulation data provided by the Woods Hole Institute (WHOI) and BU (Boston University). This effort will extend prior research by using new visualization tools to model both the auditory system and the salient aspects of the skull and jaw involved in focusing incoming sound. The frames for rendered movies will be generated using finite element models. The Naval Research Laboratory (NRL) team will assemble the frames and create a three-dimensional movie linked to predictive models for the behavior of the auditory system. The movie can be displayed using an interactive three-dimensional display as well as a desktop workstation. During the second year of research, NRL will attempt to prototype a web-based implementation of the volume rendering techniques developed in year 1.
DTIC
Anatomy; Computer Graphics; Computerized Simulation; Marine Mammals; Sound Transmission; Underwater Acoustics

20080038698 Carnegie-Mellon Univ., Pittsburgh, PA USA
Models for Evaluating and Improving Architecture Competence
Bass, Len; Clements, Paul; Kazman, Rick; Klein, Mark; Mar 2008; 87 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A482284; CMU/SEI-2008-TR-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482284

Software architecture competence is the ability of an individual or organization to acquire, use, and sustain the skills and

knowledge necessary to carry out software architecture-centric practices. Previous work in architecture has concentrated on its technical aspects: methods and tools for creating, analyzing, and using architecture. However, a different perspective recognizes that these activities are carried out by people working in organizations, and those people and organizations can use assistance towards consistently producing high-quality architectures. This report lays out the basic concepts of software architecture competence and describes four models for explaining, measuring, and improving the architecture competence of an individual or a software-producing organization. The models are based on the following: (1) the duties, skills, and knowledge required of a software architect or architecture organization; (2) human performance technology, an engineering approach applied to improving the competence of individuals; (3) organizational coordination, the study of how people and units in an organization share information; and (4) organizational learning, an approach to how organizations acquire, internalize, and utilize knowledge to improve their performance. The report also shows how the four models can be synergistically applied to produce an evaluation instrument to measure an organization's architecture competence.
DTIC
Computer Programming; Organizations; Quality; Software Engineering

20080038699 Carnegie-Mellon Univ., Pittsburgh, PA USA
Evaluation of CERT Secure Coding Rules through Integration with Source Code Analysis Tools
Dewhurst, Stephen; Dougherty, Chad; Ito, Yurie; Keaton, David; Saks, Dan; Seacord, Robert C; Svoboda, David; Taschner, Chris; Togashi, Kazuya; Jun 2008; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A482285; CMU/SEI-2008-TR-014; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482285

This report describes the results of a study to evaluate the effectiveness of secure coding practices, including the use of static analysis tools coupled with secure coding rule sets such as the CERT C Programming Language Secure Coding Standard (CERT 07a) and the CERT C++ Programming Language Secure Coding Standard (CERT 07b). This study represents a joint effort between the CERT Secure Coding Initiative and JPCERT/CC. The CERT Secure Coding Initiative was established to work with software developers and software development organizations to eliminate vulnerabilities resulting from coding errors before they are deployed. The goal of this effort is to reduce the number of vulnerabilities to a level where they can be handled by existing vulnerability analysis teams around the world and decrease remediation costs by eliminating vulnerabilities before software is deployed. JPCERT/CC is the first CSIRT (computer security incident response team) established in Japan. The objectives of the study were to evaluate the efficacy of the CERT Secure Coding Standards and source code analysis tools in improving the quality and security of commercial software projects. Two static analysis tools, Fortify Source Code Analysis (SCA) from Fortify Software and Compass/ROSE from Lawrence Livermore National Laboratory were selected for their extensibility as well as overall effectiveness. Checkers were then developed for each of the tools to check code for violations of the CERT C and C++ Secure Coding Standards. The tools were then provided to Software Research Associates, Inc., Japan, which evaluated the extended versions of Fortify SCA and Compass/ROSE on two existing projects: an electronic toll collection (ETC) system-related GUI application written in C++ and an IP-TV Service Protocol Stack (IP-TV) written in the C programming language. The project successfully extended source code analysis tools to discover software defects in both projects evaluated.
DTIC
Coding; Computer Programming; Program Verification (Computers); Quality Control; Security; Software Development Tools

20080038766 Technische Univ., Munich, Germany
Integrating Requirements Engineering, Modeling, and Verification Technologies into Software and Systems Engineering
Broy, Manfred; Leucker, Martin; Oct 28, 2007; 27 pp.; In English
Contract(s)/Grant(s): DAAD19-03-1-0197
Report No.(s): AD-A482377; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482377

The objective of this project is the development of an integrated suite of technologies focusing on end-to-end software development supporting requirements analysis, design, implementation, and verification. This final progress report summarizes the work that has been performed within this project. It contains an overview about the project's achievements

in respect to original problem statement, the technical work of the related work packages, and reports on our cooperation with leading US institutes.
DTIC
Computer Programs; Program Verification (Computers); Requirements; Software Engineering; Systems Engineering

20080038772 Army Research Lab., Aberdeen Proving Ground, MD USA
Visualization of a Text Network Structure Using X3D
Neiderer, Andrew M; May 2008; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8TEDUC
Report No.(s): AD-A482385; ARL-MR-691; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482385

This report describes a dynamic extensible three-dimensional (3-D) (X3D) scene graph for visualizing text documents. It was developed at the U.S. Army Research Laboratory as a tool for social network analysis: specifically, to view a network of nodes where a node is a noun within a news article. Keyword and target nodes are represented as X3D spheres of different radii and color. Keyword node attraction to a specific target node is dynamic by a Java class access to scene content from an X3D script node. The magnitude of the direction vector, or speed, between keyword and target is currently proportional to frequency of the word within the document. This technique can be modified/replaced easily for a more comprehensive examination, such as with an algorithm that considers word selection across multiple documents. X3D code for a particular example is given and viewed using the Xj3D 2.0 browser from Yumetech, Inc.
DTIC
Computer Networks; Data Processing; Navigation; Texts

20080038781 Oslo Univ., Norway
Semantics and Pragmatics of Real-Time Maude
Olveczky, Peter C; Meseguer, Jose; Jan 2007; 36 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0715; CCR-0234524
Report No.(s): AD-A482415; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482415

At present, designers of real-time systems face a dilemma between expressiveness and automatic verification: if they can specify some aspects of their system in some automaton-based formalism, then automatic verification is possible; but more complex system components may be hard or impossible to express in such decidable formalisms. These more complex components may still be simulated; but there is then little support for their formal analysis. The main goal of Real-Time Maude is to provide a way out of this dilemma, while complementing both decision procedures and simulation tools. Real-Time Maude emphasizes ease and generality of specification, including support for distributed real-time object-based systems. Because of its generality, falling outside of decidable system classes, the formal analyses supported-including symbolic simulation, breadth-first search for failures of safety properties, and model checking of time-bounded temporal logic properties- are in general incomplete (although they are complete for discrete time). These analysis techniques have been shown useful in finding subtle bugs of complex systems, clearly outside the scope of current decision procedures. This paper describes both the semantics of Real-Time Maude specifications, and of the formal analyses supported by the tool. It also explains the tool's pragmatics, both in the use of its features, and in its application to concrete examples.
DTIC
Computer Programming; Real Time Operation; Semantics

20080038787 Space and Naval Warfare Systems Center, San Diego, CA USA
Segway Robotic Mobility Platform
Nguyen, Hoa G; Morrell, John; Mullens, Katherine; Burmeister, Aaron; Miles, Susan; Farrington, Nathan; Thomas, Kari; Cage, Douglas W; Oct 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482450; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482450

The Segway Robotic Mobility PlatformTM (RMP) is a new mobile robotic platform based on the self-balancing Segway Human Transporter (HT). The Segway RMP is faster, cheaper, and more agile than existing comparable platforms. It is also rugged, has a small footprint, a zero turning radius, and yet can carry a greater payload. The new geometry of the platform presents researchers with an opportunity to examine novel topics, including people-height sensing and actuation modalities.

This paper describes the history and development of the platform, its characteristics, and a summary of current research projects involving the platform at various institutions across the USA.
DTIC
Mobility; Robotics

20080038789 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Reducing Risk by Managing Software Related Failures in Networked Control Systems
Baliga, Girish; Graham, Scott; Gunter, Carl A; Kumar, P R; Dec 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-02-1-0325; F49620-02-1-0217
Report No.(s): AD-A482454; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482454

Managing risk is a central problem in the design and operation of networked control systems, and due to the increasing role and growing complexity of software in such systems, managing software related failures is becoming a central challenge. Even simple programming errors can cause catastrophic failures. Hence, it is vital to contain risks due to software related failures in such systems. Our main thesis is that most software related failures can be managed through relatively simple and generally applicable strategies, and such strategies can be effectively developed and reused with suitable support from software infrastructure such as middleware. We describe mechanisms in Etherware, our middleware for control over networks, for containing software failures, and demonstrate the effectiveness of these mechanisms through experiments in a vehicular control testbed.
DTIC
Failure; Risk; Software Development Tools

20080038872 Mei Technology Corp., San Antonio, TX USA
Training Instructors to Develop Interactive Multimedia Courseware
Wenzel, B M; Jul 2001; 18 pp.; In English
Contract(s)/Grant(s): F41624-96-C-5006; Proj-2743
Report No.(s): AD-A482478; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents training ten instructors at Texas Community Colleges on developing interactive multimedia courseware (ICW), using Experimental Advanced Instructional Design Advisor (XAIDA) as an authoring tool. Workshops consisting of two three-day sessions of lecture, demonstration, and hands-on practice with XAIDA were used. The participants as subject-matter experts demonstrated an ability to develop ICW using XAIDA, even though they had no experience doing so. They were able to develop ICW that teaches a topic, how to reason about a topic, and multimedia to communicate about a topic.
DTIC
Computer Programs; Education; Instructors; Multimedia

20080038967 Carnegie-Mellon Univ., Pittsburgh, PA USA
Process Guide for the DSSA Process Life Cycle
Armitage, James W; Dec 1993; 61 pp.; In English
Report No.(s): AD-A482653; CMU/SEI-93-SR-21; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document describes the prototype domain-specific software architecture (DSSA) process life cycle developed by GTE as part of the ARPA, formerly DARPA, DSSA program. It is a high-level process description and represents a snapshot of the process as it was in the fall of 1992. The original version of the document was prepared as part of the Software Engineering Institute's process asset library (PAL) work for the Software Technology for Adaptable and Reliable Systems (STARS) program. That document became the baseline process description for the ARPA DSSA program. The original document is available from the Asset Source for Software Engineering Technology (ASSET) library (asset number ASSET_A_429, file name is PD-081 DSSA-PG-001 Rev 0.2, dated October 16, 1992). Due to the demand for the document, the original document was reformatted in accordance with related SEI documents so it could be released as an SEI report. The technical content is identical. This document is intended for those wanting to understand the GTE team DSSA approach to DSSA-based software development. This document is version 0.2a of the process guide. Its file name is: PD-081 SEI-93-SR-21 .2a.
DTIC
Computer Programming; Libraries; Life (Durability); Software Engineering; Software Reuse

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COMPUTER SYSTEMS

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

20080037929 Carnegie-Mellon Univ., Pittsburgh, PA USA
Scalable and Manageable Storage Systems
Amiri, Khalil S; Dec 2000; 263 pp.; In English
Contract(s)/Grant(s): N00174-96-0002; ARPA ORDER D306
Report No.(s): AD-A482189; CMU-CS-00-178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Emerging applications such as data warehousing, multimedia content distribution, electronic commerce and medical and satellite databases have substantial storage requirements that are growing at 3X to 5X per year. Such applications require scalable, highly-available and cost-effective storage systems. Traditional storage systems rely on a central controller 'file server, disk array controller' to access storage and copy data between storage devices and clients which limits their scalability. This dissertation describes an architecture, network-attached secure disks 'NASD', that eliminates the single controller bottleneck allowing throughput and bandwidth of an array to scale with increasing capacity up to the largest sizes desired in practice. NASD enables direct access from client to shared storage devices, allowing aggregate bandwidth to scale with the number of nodes. In a shared storage system, each client acts as its own storage 'RAID' controller, performing all the functions required to manage redundancy and access its data. As a result, multiple controllers can be accessing and managing shared storage devices concurrently. Without proper provisions, this concurrency can corrupt redundancy codes and cause hosts to read incorrect data. This dissertation proposes a transactional approach to ensure correctness in highly concurrent storage device arrays. It proposes distributed device-based protocols that exploit trends towards increased device intelligence to ensure correctness while scaling well with system size. Emerging network-attached storage arrays consist of storage devices with excess cycles in their on-disk controllers, which can be used to execute file system function traditionally executed on the host. Programmable storage devices increase the flexibility in partitioning filesystem function between clients and storage devices. DTIC

Electronic Commerce; Data Storage

20080038021 Telcordia Technologies, Inc., Piscataway, NJ USA
Transforming Network Management for the Future Army Networks
Chiang, Cho-Yu J; Chadha, Ritu; Newman, Scott; Lo, Richard; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481715; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481715

Network management has been used in daily operations for decades to maintain Army networks. With the inclusion of Mobile Ad hoc NETworks (MANETs) as tactical networks, we believe that the role and function of network management need adjustment. MANETs can provide the agility required by the future Army force; however, their topology will not be static, their wireless radio connectivity will not be stable, and their bandwidth capacity will not be abundant. Given that several ongoing programs including FCS, WIN-T and JTRS are jointly shaping the outlook of the future Army tactical networks with MANETs, it is imperative to ensure that the future Army networks will be integrated seamlessly so that they can deliver desirable communications performance to support network centric warfare. We envision that network management will play a key role in ensuring communications performance. Since network centric warfare will require the highest possible performance from the networks, the focus of network management must transition from maintaining network operations to providing optimal communications services. In this paper, we describe the issues and challenges in providing seamless communications services for the future Army networks, and discuss the path forward for supporting the vision of network centric warfare by means of transforming network management.
DTIC

Communication Networks; Warfare

20080038713 Carnegie-Mellon Univ., Pittsburgh, PA USA

Incorporating Security Quality Requirements Engineering (SQUARE) into Standard Life-Cycle Models

Mead, Nancy R; Viswanathan, Venkatesh; Padmanabhan, Deepa; Raveendran, Anusha; May 2008; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A482308; CMU/SEI-2008-TN-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482308

SQUARE (Security Quality Requirements Engineering) is a method for eliciting and prioritizing security requirements in software development projects. This report describes how SQUARE can be incorporated in standard life-cycle models for security-critical projects. Lifecycle models and process methods considered for the report are the waterfall model, Rational Unified Process, the spiral model, and Dynamic Systems Development Method (an agile method). This report is for information technology managers and security professionals, management personnel with technical and information security knowledge, and any personnel who manage security-critical projects that follow standard life-cycle models.

DTIC

Life (Durability); Models; Requirements; Security

20080038714 Carnegie-Mellon Univ., Pittsburgh, PA USA

Proceedings of the First Workshop on Service-Oriented Architectures and Software Product Lines

Cohen, Sholom; Krut, Robert; May 2008; 76 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A482309; CMU/SEI-2008-SR-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482309

This report contains the proceedings of the First Workshop on Service-Oriented Architectures and Product Lines (SOAPL) 2007 that was held on September 10th, 2007 in Kyoto, Japan as part of the 2007 Software Product Line Conference (SPLC 2007). This report includes an overview of the workshop, four invited presentations, details of the workshop's outcomes, and the workshop position papers.

DTIC

Architecture (Computers); Computer Programming; Conferences; Service Oriented Architecture; Software Engineering

20080038715 Carnegie-Mellon Univ., Pittsburgh, PA USA

The 'Big Picture' of Insider IT Sabotage Across U.S. Critical Infrastructures

Moore, Andrew P; Cappelli, Dawn M; Trzeciak, Randall F; May 2008; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A482311; CMU/SEI-2008-TR-009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482311

A study conducted by the U.S. Secret Service and the Carnegie Mellon University Software Engineering Institute CERT Program analyzed 150 insider cyber crimes across U.S. critical infrastructure sectors. Follow-up work by CERT involved detailed group modeling and analysis of 30 cases of insider IT sabotage out of the 150 total cases. Insider IT sabotage includes incidents in which the insider s primary goal is to sabotage some aspect of the organization or direct specific harm toward an individual. This paper describes seven general observations about insider IT sabotage based on our empirical data and study findings. We describe a system dynamics model of the insider IT sabotage problem that elaborates complex interactions in the domain and unintended con-sequences of organizational policies, practices, technology, and culture on insider behavior. We describe the structure of an education and awareness workshop on insider IT sabotage that incorporates the previously mentioned artifacts as well as an interactive instructional case.

DTIC

Computer Information Security; Crime; Information Systems; Sabotage; Security

20080038755 Army War Coll., Carlisle Barracks, PA USA

Blue Force Tracking: Building a Joint Capability

Sweeney, Michael M; Mar 15, 2008; 33 pp.; In English

Report No.(s): AD-A482366; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482366

Blue Force Tracking technology is a battle proven force enabler desired by commanders at all echelons. The ability to

know who an individual or unit is, and where they are located will continue to be a critical need in the rugged environments of the future. The realities of current operations have created such a need for this capability, and there are at least a dozen different devices being used in our current operations supporting all functional areas. This has created interoperability challenges in that none of the disparate systems are able to share data amongst themselves without additional technical processing and distribution. Development of a joint capability is required for tomorrow's fight that resolves the peer to peer data sharing issues while reducing the burden on satellite assets. Success will take leadership, strategy, and resources. It is a coherent strategy that is most needed to develop a capability that is born and developed jointly.
DTIC
Color; IFF Systems (Identification); Interoperability; Situational Awareness

20080038784 Columbia Univ., New York, NY USA
Developing Collaborative Profiles of Attackers: A Longitudinal Study
Stolfo, Salvatore; Parekh, Janak; Locasto, Michael; May 4, 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0442
Report No.(s): AD-A482434; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482434

We implemented a new content anomaly detector, Anagram, which models a mixture of high-order n-grams (n > 1) designed to detect anomalous and 'suspicious' network packet payloads. For both Anagram and previously developed anomaly detector, Payl, we explored possible ways in which payload-based correlation can be applied, so that the alerts generated by both sensors can be included in our 'collaborative security' infrastructure, called Worminator. Worminator is designed to exchange information securely, privately and in real-time between sites in order to reveal an accurate view of external threats, especially stealthy ones. To address the need for efficient alert correlation, we introduced the notion of network scheduling: the controllable formation and dissolution of relationships between nodes and groups of nodes in a network. Our network scheduling mechanism is a procedure for coordinating the exchange of information between the members of a correlation group. The mechanism is controlled by a dynamic and parameterizable correlation schedule. We performed a longitudinal study which is designed to demonstrate the proposed Worminator hypothesis, that collaborative intrusion detection not only enables detection of worm spread but also scanning behavior as precursors to an attack. There are three key longitudes for analysis: over time, over geographical and network space and by target.
DTIC
Computer Networks; Detection; Warning Systems

20080038913 Voltage Security, Inc., Palo Alto, CA USA
Evaluation of Identity Based Encryption (IBE) Capabilities for the US DHS S&T Secure Wireless Communications Program and the CAN-US Security Enhanced Blackberry Trial
Schertler, Mark J; Jan 2007; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-C-0038
Report No.(s): AD-A482532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate's Cyberspace Security Research and Development program initiated a Secure Wireless Data Communications Program with the goal of evaluating wireless communications for securely delivering information where and when needed to assist the mission of the Department of Homeland Security. To achieve this goal the DHS S&T Directorate engaged with commercial industry to develop and evaluate solutions against the program's objectives. Voltage Security, Inc. partnered with DHS S&T to provide secure communication solutions based on the Identity Based Encryption (IBE) public key technology for the program. As part of the Secure Wireless Data Communications Program and under the direction of the Canada-U.S. Public Security Technical Program (PSTP) DHS S&T engaged in a collaborative exercise with Defence R&D Canada (DRDC). This exercise was called the CAN-US Security Enhanced Blackberry Trial. The Blackberry Trial's focus was on commercial technologies that can be used to secure the existing commercial wireless infrastructure for the use of the public safety, emergency preparedness, and law enforcement communities. The Blackberry Trial focused on the RIM Blackberry device because of its wide acceptance across all levels of government and in commercial industry. This exercise evaluated security technologies that overlay the commercial infrastructure and gave a frank and objective assessment of their usefulness in the target environment.
DTIC
Coding; Cryptography; Identities; Security; Wireless Communication

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20080038012 Army Engineer Research and Development Center, Vicksburg, MS USA
Agent-Based Framework for Discrete Entity Simulations
Cowan, Mark; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481937; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481937

Agent-based modeling represents a new way of simulating the interaction of objects with their environment and among themselves through communication. Agent technology incorporates many of the features of more traditional (Lagrangian and Eulerian) efforts but has become feasible in modeling more complex systems only recently. This paper describes the development of a general parallel agent-based modeling framework in C++ on Department of Defense High Performance Computing (HPC) machines at the U.S. Army Engineer Research and Development Center (ERDC) Information Technology Laboratory (ITL) in Vicksburg, MS. It provides background on the motivation behind agent-based modeling and how it extends traditional modeling techniques. Differences are identified, and the strengths and weaknesses of various modeling paradigms are explained. A short history of continuum and discrete model coupling is provided, followed by a description of how agent-based techniques can incorporate features of both Eulerian and Lagrangian models. The architecture of the ITL agent framework and the construction of the behavioral functions that excite or inhibit agent behavior are presented in detail. The hardware/software evolution path is described as the code goes from a small, single-threaded binary running on a Linux workstation utilizing database calls (to meet memory requirements) up to its successful translation as a parallel implementation on large HPC machines. Porting and scaling difficulties are fully explained. The framework is tested on an idealized ecological sandbox representing the Noyo River basin, California, and the virtual growth of submerged aquatic vegetation (SAVs) under hydraulic conditions driven by the ADH (ADaptive Hydrology) code output of the ERDC Coastal and Hydraulics Laboratory.
DTIC
Simulation; Complex Systems; Defense Program; Mathematical Models; Continuum Modeling

20080038017 Army Tank-Automotive Research and Development Command, Warren, MI USA
Image Understanding for Robot Navigation
Karlsen, Robert E; Witus, Gary; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481641; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481641

This paper presents a method to forecast terrain trafficability from visual appearance. During training, the system identifies a set of image chips (or exemplars) that span the range of terrain appearance and measures terrain trafficability characteristics as the vehicle traverses the terrain. Each chip is assigned a vector tag representing the measured vehicle-terrain interaction properties. After training, the system uses the exemplars to segment images into regions, based on visual similarity to terrain patches observed during training, and assigns the appropriate vehicle-terrain interaction tag to them. The system will therefore allow the online forecasting of vehicle performance on upcoming terrain.
DTIC
Forecasting; Navigation; Robots; Visual Signals

20080038678 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The NASA Robotic Conjunction Assessment Process: Overview and Operational Experiences
Newman, Lauri Kraft; [2008]; 15 pp.; In English; Original contains color illustrations
Report No.(s): IAC-08-A.6.2.6; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080038678

Orbital debris poses a significant threat to spacecraft health and safety. Recent events such as China's anti-satellite test and the Breeze-M rocket explosion have led to an even greater awareness and concern in the satellite community. Therefore, the National Aeronautics and Space Administration (NASA) has established requirements that routine conjunction assessment screening shall be performed for all maneuverable spacecraft having perigees less than 2000 km or within 200 km of geosynchronous altitude. NASA s Goddard Space Flight Center (GSFC) has developed an operational collision risk assessment process to protect NASA s high-value unmanned (robotic) assets that has been in use since January 2005. This paper provides an overview of the NASA robotic conjunction assessment process, including descriptions of the new tools

developed to analyze close approach data and of the risk mitigation strategies employed. In addition, statistical data describing the number of conjunctions experienced are presented. A debris avoidance maneuver performed by Aura in June of 2008 is described in detail to illustrate the process.
Author
Space Debris; Risk Assessment; Maneuverable Spacecraft; Explosions; Collisions; Safety; Robotics

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080037625 North Carolina Univ., Chapel Hill, NC USA
Accelerating Route Planning and Collision Detection for Computer Generated Forces Using GPUs
Tuft, David; Gayle, Russell; Salomon, Brian; Govindaraju, Naga; Lin, Ming; Manocha, Dinesh; Bauer, Maria; Rodriguez, Angel; Macedonia, Michael; Nov 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N61339-04-C-0043
Report No.(s): AD-A481888; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481888

We present algorithms to accelerate route planning and collision detection for computer generated forces. Our algorithms exploit the parallel computing capability of Graphics Processing Units (GPUs) along with their ability to perform geometric culling. We combine the GPU accelerated computations with exact intersection tests on the CPU. Our approach supports dynamic terrains and multiple feature intersections in parallel. Our technique has been integrated into OneSAF block D build 24. Our route planning technique is a 30x - 50x speedup and has demonstrated an overall speedup of 10x. Our collision detection code is a 5x - 10x speedup over existing collision detection techniques.
DTIC
Algorithms; Coding; Collision Parameters; Collisions; Detection; Routes

20080038752 Science and Technology Corp., Edgewood, MD USA
Temporal-Spectral Detection in Long Wave Infrared Hyperspectral Imagery
Heinz, Daniel C; Davidson, Charles E; Ben-David, Avishai; Jun 2008; 16 pp.; In English
Report No.(s): AD-A482363; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482363

Ground-based staring hyperspectral chemical detectors allow for repeated measurements through time with near-perfect image registration. The problem with standard spectral based hyperspectral detection algorithms is that they do not make effective use of this temporal information. In this paper we show that significant improvements in detection performance for staring geometry can be made by making use of statistical information obtained from previous samples and new temporal-spectral detection algorithms are developed. These new algorithms have the advantage that they limit detection to regions where both temporally and spectrally significant events have occurred. We discuss the development of these algorithms and demonstrate the performance of both temporal-spectral and spectral detectors for detection of gaseous plumes using data from the FIRST (Field-Portable Imaging Radiometric Spectrometer Technology) passive long wave infrared (LWIR) hyperspectral sensor.
DTIC
Algorithms; Detection; Detectors; Imagery; Imaging Spectrometers; Infrared Imagery; Infrared Radiation; Portable Equipment; Radiometers; Spectra; Target Acquisition

20080038756 Texas Univ., Arlington, TX USA
High Order Modified Weighted Compact Scheme for High Speed Flow
Liu, Chaoqun; Su, Jianzhong; May 4, 2008; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0136
Report No.(s): AD-A482367; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482367

The critical problem of CFD is perhaps an accurate approximation of derivatives for a given discrete data set. Based on

our previous work on the weighted compact scheme (WCS), a modified weighted compact scheme (MWCS) has been developed. Similar to WENO, three high order candidates, left, right, and central, are constructed by Hermite polynomials.
DTIC
Flow; High Speed

20080038764 Brown Univ., Providence, RI USA
Algorithm Development and Application of High Order Numerical Methods for Shocked and Rapid Changing Solutions
Shu, Chi-Wang; Dec 6, 2007; 18 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0291
Report No.(s): AD-A482375; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482375

We have investigated high order finite difference weighted essentially non-oscillatory (WENO) schemes, finite volume WENO schemes and discontinuous Galerkin finite element methods, for solving partial differential equations with discontinuous or rapidly changing solutions. Algorithm development, analysis, implementation and applications have been carried out. Research has been performed in all areas listed in the original proposal, and progress and results consistent with the original objectives have been obtained. There are 53 refereed journal publications (42 appeared, 11 accepted and to appear) resulting from this project. These achievements have strengthened our objective to obtain powerful and reliable high order numerical algorithms and use them to solve convection dominated problems, especially those of army interest.
DTIC
Algorithms; Finite Difference Theory; Fluid Dynamics; Numerical Analysis

65
STATISTICS AND PROBABILITY

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

20080037685 City Univ. of New York, NY USA
Using LSA to Compute Word Sense Frequencies
Levin, Esther; Sharifi, Mehrbod; Feb 2008; 46 pp.; In English
Contract(s)/Grant(s): FA8650-05-1-6637
Report No.(s): AD-A481969; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481969

This document describes a project to explore the use of Latent Semantic Analysis (LSA) and statistical clustering techniques for automatically identifying word senses and for estimating word sense frequencies from application relevant corpora. The hypothesis is that LSA can be used to compute context vectors for ambiguous words that can be clustered together - with each cluster corresponding to a different sense of the word. The document is organized as follows: the first section includes a short introduction to LSA, an introduction to the context-group discrimination paradigm adopted in the project, and a description of the corpus used in the experiments. Section 2 describes the investigation of the effect of LSA dimensionality on sense discrimination accuracy. Overall, sense discrimination accuracy was relatively low. This motivated a digression into investigation of the influence of different distance measures; investigation of the geometry of the sense clusters in the LSA-based space through silhouette value analysis; investigation of sense discrimination accuracy as a function of the degree of supervision provided during model training; and investigation and comparison of sense discrimination in homonyms versus polysemes. Section three describes the investigation of optimal context size for word sense discrimination from 3 (1 word on each side of word) to 11 words (5 words on each side). Section 4 describes the use of Minimal Description Length (MDL) to determine the number of word senses. Section 5 provides a project summary. Appendix A provides a literature review and Appendix B provides a source code listing (not included in this published report).
DTIC
Semantics; Words (Language)

20080037990 AI Solutions, Inc., Lanham, MD, USA

Relative Velocity as a Metric for Probability of Collision Calculations

Frigm, Ryan Clayton; Rohrbaugh, Dave; [2008]; 12 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNG04DA01C

Report No.(s): IAC-08-A6.2.5; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037990

Collision risk assessment metrics, such as the probability of collision calculation, are based largely on assumptions about the interaction of two objects during their close approach. Specifically, the approach to probabilistic risk assessment can be performed more easily if the relative trajectories of the two close approach objects are assumed to be linear during the encounter. It is shown in this analysis that one factor in determining linearity is the relative velocity of the two encountering bodies, in that the assumption of linearity breaks down at low relative approach velocities. The first part of this analysis is the determination of the relative velocity threshold below which the assumption of linearity becomes invalid. The second part is a statistical study of conjunction interactions between representative asset spacecraft and the associated debris field environment to determine the likelihood of encountering a low relative velocity close approach. This analysis is performed for both the LEO and GEO orbit regimes. Both parts comment on the resulting effects to collision risk assessment operations. Author

Risk Assessment; Collisions; Trajectories; Debris; Low Earth Orbits

20080038011 Army Medical Research Unit (Europe), USA

Advances in Generalized Linear Mixed-Effects Models

Bliese, P D; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481947; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481947

Analyses of applied military data is often complex for two reasons. First, many performance and health variables of interest are non-normally distributed. Second, data typically have a complex nested or partially crossed structure. Recent advances in applied statistics make it possible to address both complexities within a single unified statistical framework. DTIC

Probability Theory; Mathematical Models; Decomposition

20080038708 Naval Undersea Warfare Center, Newport, RI USA

Summary of a Modeling and Simulation Framework for High-Fidelity Weapon Models in Joint Semi-Automated Forces (JSAF) and Other Mission-Simulation Software

Welch, John R; May 1, 2008; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482299; NUWC-NPT-TR-11; 861; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482299

This report (1) summarizes a modeling and simulation (M&S) framework for testing high-fidelity weapon models In Joint Semi- Automated Forces (JSAF) and other mission-simulation software; (2) highlights the products and steps required to develop a weapon model and communicate with other weapon models in a mission-level simulation; (3) introduces the four configuration levels of the M&S framework; and (4) presents a cost-effective M&S laboratory design based on Mak Technologies and MathWorks software.

DTIC

Computerized Simulation; Models; Simulation

20080038720 Naval Research Lab., Washington, DC USA

Ship Airwake Correlation Analysis for the San Antonio Class Transport Dock Vessel

Geder, Jason; Ramamurti, Ravi; Sandberg, William C; May 21, 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 64-1528-1-8

Report No.(s): AD-A482322; NRL/MR/6410--08-9127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482322

A space-time correlation function method is applied to the analysis of Large Eddy Simulation (LES) unsteady ship airwake data computed for the LPD 17. Correlation functions are computed for potentially dangerous velocity bursting events

visually tracked in space and time in the air vehicle landing zone. It is shown that a correlation function approach is of potential value but the usefulness of the approach is very sensitive to the knowledge, or correction computational determination, of the gust propagation path. Recommendations are made for computational extension of this work.
DTIC
Correlation; Drydocks; Large Eddy Simulation; Ship Terminals; Ships; Wharves

20080038726 City Univ. of New York, NY USA
A New Approach to Radar Waveform Design
Gladkova, Irina; Aug 24, 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0329
Report No.(s): AD-A482329; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482329

We have extended Wilcox's classical result to address an issue of acceptable approximation of the 'ideal' ambiguity surface in the area of interest. We have considered a problem of constructing a waveform with minimal volume under the ambiguity surface in a certain given area. In case when the region of interest is a circle centered at the origin, we have proven that Hermite waveform is a solution to such optimization problem. We have developed software for numerical implementations for various choices of areas where ambiguity surface desired to be small. We have also considered frequency stepping design, which is one of the known techniques employed by modern radars to achieve high range resolution. We have developed an approach which allows us to suppress grating lobes below a desired threshold level in the case of appropriately chosen stepped frequency waveforms. We have introduced a multi-parametric generalization of a stepped frequency train, and by exploiting a factorization of the autocorrelation function, achieved a useful trade-off between competing properties of the factors by careful choices of relevant parameters.
DTIC
Autocorrelation; Computer Programming; High Resolution; Software Engineering; Waveforms

20080038762 Maryland Univ., College Park, MD USA
Heterogeneous Uncertainty Management
Subrahmanian, Venkatramanan S; Mar 8, 2008; 14 pp.; In English
Contract(s)/Grant(s): DAAD19-03-1-0202
Report No.(s): AD-A482373; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482373

We developed methods to study the uncertainty that arises when we need multiple forms of reasoning and when multiple data representations are involved. We developed the concepts of heterogeneous temporal probabilistic (HTP) agents, the concept of probabilistic version of XML and RDF, and probabilistic methods to reason about collections of moving objects.
DTIC
Computers; Heterogeneity; Logic Design; Probability Theory

20080038944 RAND Corp., Santa Monica, CA USA
An Argument for Documenting Casualties: Violence Against Iraqi Civilians 2006
Hall, Katharine; Stahl, Dale; Jan 2008; 72 pp.; In English
Contract(s)/Grant(s): W74V8H-06-C-0002
Report No.(s): AD-A482597; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The problem of measuring the number of civilian fatalities in Iraq gained widespread media coverage when the Lancet published a study in October 2004 claiming that more than 100,000 Iraqi civilians had been killed since the U.S. invasion in March 2003. The authors of this study later released another report, published in October 2006, asserting that 655,000 Iraqi civilians had been killed since the invasion. The findings of both Lancet studies were widely debated along with other efforts to count civilian fatalities, such as the Iraq Body Count (IBC). This debate has highlighted the problems associated with measuring civilian fatalities in a violent, unstable situation. Until recently, the U.S.-led Coalition did not have a formal system for documenting the level of violence directed at Iraqi civilians; the only publicly available sources of data were independent studies (Lancet, IBC), United Nations figures, and Iraqi government statistics. Because protecting the population is one of the central tenets of U.S. COIN doctrine, it can be surmised that trends related to Iraqi civilian fatalities should be a chief concern for the U.S. military. Thus, to develop a better picture of what is happening to the civilian population and support the creation of more-effective strategies to protect it, this document examines and analyzes available data on violent incidents involving

Iraqis. The document begins by evaluating the open-source data currently available. Much of these data are problematic because of how they were collected or because of their level of fidelity. In response to these limitations, the RAND study team compiled a more robust dataset for 2006 by combining two extant databases, the IBC dataset and RAND's own RAND-Memorial Institute for the Prevention of Terrorism Knowledge Base dataset. This dataset provided the RAND study team with a basis for a thorough analysis of violence against Iraqi civilians in 2006.
DTIC
Casualties; Data Acquisition; Death; Statistics; Violence

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080037617 Army Aviation and Missile Command, Redstone Arsenal, AL USA
Controlling Turbulence in Reaction Diffusion Systems
Pethel, Shawn D; Corron, Ned J; Nov 2006; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481913; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481913

We propose local symbolic models as a practical tool for understanding high-dimensional spatiotemporal chaos in reaction-diffusion systems modeled by coupled map lattices (CMLs). A local symbolic model is a truncation of the full symbolic dynamics to one that considers only a single element and a few neighbors. Local symbolic models can be applied element by element to a large lattice to build up an approximate picture of the global dynamics. Whereas the difficulty of finding the exact global symbolic dynamics increases exponentially with lattice size, the difficulty of the approximation presented here increases linearly at worst. The many uses of symbolic dynamics for one-dimensional maps, including control and targeting, are thus made practical for lattices. We explore the efficacy of the concatenated local model approach and give an example of controlling an arbitrary pattern in a CML using only small perturbations.
DTIC
Diffusion; Turbulence

20080038908 Naval Research Lab., Washington, DC USA
Nonlinear Modelling of Start-Up Phase Pressure Spectra from Optically Smoothed Induced Spatial Incoherence Laser Imprint
Keskinen, M J; Schmitt, A J; Jan 2005; 18 pp.; In English
Report No.(s): AD-A482527; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The spectrum of early time pressure perturbations, due to optically smoothed induced spatial incoherence (ISI) laser imprint, is computed for a planar target using a forced, dissipative model. The time-dependent ISI laser deposition is computed using a time-dependent electromagnetic full wave Maxwell code. It is found that the pressure spectrum evolves into a power law in which spectral power is transferred from large to smaller scales through a nonlinear cascade process. The model results are compared with experimental observations.
DTIC
Incoherence; Lasers; Nonlinear Systems; Nonlinearity; Planar Structures; Spectra

20080038957 Maryland Univ., College Park, MD USA
Wireless and Distributed Sensing of Shape and Health Monitoring of Morphing Structures
Smoker, Jason; Baz, Amr; Mar 28, 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-07-1-0128
Report No.(s): AD-A482624; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents the development of the theoretical basis for the design of sensor networks for determining the 2-dimensional shape of morphing structures by monitoring simultaneously the bending and twist deflections. The proposed development is based on the non-linear theory of finite elements to extract the transverse linear and angular deflections of a plate-like structure. The sensors outputs are wirelessly transmitted to the command unit to simultaneously compute maps of the linear and angular deflections and maps of the strain distribution of the entire structure. The deflection and shape information are required to ascertain that the structure is properly deployed and that its surfaces are operating wrinkle-free. The strain map ensures that the structure is not loaded excessively to adversely affect its service life. The developed theoretical

model is validated experimentally using a prototype of a variable cambered span morphing structure provided with a network of distributed sensors. The structure/sensor network system is tested under various static conditions to determine the response characteristics of the proposed sensor network as compared to other conventional sensor systems. The presented theoretical and experimental techniques can have a great impact on the safe deployment and effective operation of a wide variety of morphing and inflatable structures such as morphing aircraft, solar sails, inflatable wings, and large antennas.
DTIC
Detection; Detectors; Health; Shapes

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080037610 Army Aviation and Missile Command, Redstone Arsenal, AL USA
Chaos Without Nonlinear Dynamics
Corron, Ned J; Hayes, Scott T; Pethel, Shawn D; Blakely, Jonathan N; Nov 2006; 6 pp.; In English
Report No.(s): AD-A481946; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481946

Recently, it has been shown that chaos can be synthesized by the linear superposition of certain pulse basis functions. Here, we extend this result and show that a linear, second-order filter driven by a random signal can generate a waveform that is chaotic under time reversal. That is, the waveform exhibits determinism and a positive Lyapunov exponent when viewed backward in time. We demonstrate the filter using a passive electronic circuit, and the resulting waveform exhibits a Lorenz-like butterfly structure. This method for generating chaotic waveforms may be useful for a number of potential applications, including spread-spectrum communication and ultra-wideband (UWB) radar and ladar. The filter also demonstrates that chaos may be connected to physical theories beyond those described by a deterministic nonlinear dynamical system.
DTIC
Chaos; Nonlinearity; Reaction Time; Waveforms

20080037636 Science Applications International Corp., McLean, VA USA
Seismic Source Locations and Parameters for Sparse Networks by Matching Observed Seismograms to Semi-Empirical Synthetic Seismograms
Salzberg, David H; Marshall, Margaret E; Dec 6, 2007; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-05-C-0019; Proj-1010
Report No.(s): AD-A481579; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481579

In this study, we have used a semi-empirical approach to computing synthetic seismograms to demonstrate full-waveform earthquake location and provide size estimates of one nuclear explosion (2006 North Korea Event). The overall approach is to use a known (reference) event to empirically characterize the propagation by comparing the reference event to a synthetic seismogram computed for appropriate. This empirical correction is then applied to a synthetic seismogram computed for a different location and/or source mechanism. Three study areas were used for locations: Central California, Nevada Test Site, and Lop Nor. Events were located to within 5 km of ground truth locations (though in semi-major axes of the error ellipses were greater than 5 km). The approach was also used to estimate the yield of the Oct. 9, 2006 North Korea Nuclear Test using a small 1.2 - 1.5 ton explosion as a reference event. The resulting yield was a chemical equivalent of 372-465 tons.
DTIC
Earthquakes; Green's Functions; Position (Location); Seismograms

20080038734 California Univ., San Diego, La Jolla, CA USA
QuaCGR Fellowship: Adiabatic Quantum Algorithms
Liu, Yi-Kai; Feb 4, 2008; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0374; Proj-411359
Report No.(s): AD-A482339; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482339

We studied the quantum adiabatic algorithm for combinatorial optimization. We obtained a simpler proof of the adiabatic

theorem. However, we did not make much progress in developing new tools for rigorous analysis of the algorithm's performance on realistic optimization problems. This analysis seems to be substantially more difficult than for classical algorithms such as simulated annealing, because the ground state does not have a simple form. We also proved some interesting results about the complexity of the Local Consistency problem (deciding whether local density matrices that describe small pieces of a quantum system are consistent with a single overall state). In particular, we showed that this problem is QMA-complete. We also showed that N-representability, an important problem in quantum chemistry, is QMA-complete.
DTIC
Algorithms; Quantum Theory

20080038947 Dartmouth Coll., Hanover, NH USA
Fast Forward Modeling of EMI Responses from Subsurface Metallic Objects and Ambient Environments
Paulsen, Keith; Aug 23, 2006; 10 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0455
Report No.(s): AD-A482606; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project focused on fast numerical modeling of ultra-wideband (UWB) electromagnetic induction (EMI) sensing of buried unexploded ordnances (UXO'S). Modeling of the 'targets' (or representative clutter objects), the soil environment, and the two in combination were treated. Two example sensors were modeled specifically, one working in the frequency domain (FD), the other in the time domain (TD). The models of UXO response were extremely high fidelity, using the standardized excitations approach (SEA). This includes all effects, and all internal interactions. At the same time, the models are fast enough to use in essentially real time modeling of contemplated scenarios in which prospective signal patterns are sought over plots of ground on the order of typical survey segments. Models of the ground response include ultra-fast code that evaluate analytical solutions for responses of magnetically permeable and conductive environments to the subject instruments, with algorithms for generalization to other instruments.
DTIC
Ambience; Boundary Value Problems; Magnetic Induction

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20080037309 Beyer Weaver and Thomas, LLP, Oakland, CA, USA; Lean Stanford Jr, Unv,, Palo Alto, CA, USA
Variable Density Signal Sampling
Lee, J. H., Inventor; Osgood, B., Inventor; Nishimura, D. G., Inventor; 17 Sep 04; 9 pp.; In English
Contract(s)/Grant(s): NIH-39297; HL75803
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-944 381
Report No.(s): PB2008-101985; No Copyright; Avail.: CASI: A02, Hardcopy

An optimal sampling pattern for variable density sampling of a continuous signal uses a statistical knowledge of the signal to determine an autocorrelation matrix from which a basis set is identified. Sampling is performed at locations determined from an eigenvector matrix, and the sampled output provides coefficients for the basis set. The reconstructed signal output is a summation of the multiplication of the coefficients and the basis set. The invention is applicable to the sampling of any signal but has particular applicability to magnetic resonance imaging (MRI) signals.
NTIS
Imaging Techniques; Magnetic Resonance; Patent Applications; Sampling

20080037346 Pennington (Joan), Chicago, IL, USA; Chicago Univ., Chicago, IL USA
High Power, Long Focus Electron Source for Beam Processing
Lewellen, J. W., Inventor; Noonan, J., Inventor; 2 Jun 05; 23 pp.; In English
Contract(s)/Grant(s): W-31-109-ENG-38
Patent Info.: Filed Filed 2 Jun 05; US-Patent-Appl-SN-11-143 417
Report No.(s): PB2008-101970; No Copyright; Avail.: CASI: A03, Hardcopy

Beam processing methods including e-beam welding and e-beam evaporation for thin film deposition are implemented

with a novel high power, long focus electron source. The high power, long focus electron source generates an e-beam. The e-beam is transported through a series of steering magnets to steer the beam. At least one refocusing magnet is provided to refocus the e-beam. A final steering magnet bends the e-beam to focus on a target, such as a weld joint or a deposition target.
NTIS
Electron Beams; Electron Sources; Patent Applications; Welding

20080037372 Sandia National Labs., Albuquerque, NM USA
Shock Response of Dry Sand
Brown, J. L.; Vogler, T. J.; Chhabildas, L. C.; Reinhart, W. D.; Thornhill, T. F.; Aug. 2007; 28 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-913227; SAND2007-3524; No Copyright; Avail.: National Technical Information Service (NTIS)

The dynamic compaction of sand was investigated experimentally and computationally to stresses of 1.8 GPa. Experiments have been performed in the powders partial compaction regime at impact velocities of approximately 0.25, 0.5, and 0.75 km/s. The experiments utilized multiple velocity interferometry probes on the rear surface of a stepped target for an accurate measurement of shock velocity, and an impedance matching technique was used to deduce the shock Hugoniot state. Wave profiles were further examined for estimates of reshock states. Experimental results were used to fit parameters to the P-Lambda model for porous materials. For simple 1-D simulations, the P-Lambda model seems to capture some of the physics behind the compaction process very well, typically predicting the Hugoniot state to within 3%.
NTIS
Drying; Sands; Compacting

20080037374 Radiation Monitoring Devices, Inc., Watertown, MA, USA
Advanced APD-Based Spectroscopic Radiation Monitor
Woodring, M.; Christian, J. F.; Apr. 30, 2004; 27 pp.; In English
Contract(s)/Grant(s): DE-FG02-99ER82866
Report No.(s): DE2007-897108; No Copyright; Avail.: National Technical Information Service (NTIS)

In response to DOE needs, RMD, Inc. proposed to develop an advanced, spectroscopic, radiation-imaging instrument based upon recent advancements in detector technology. This research was to provide an effective solution to critical DOE remediation problems. The research undertaken in the Phase I and Phase II segments of the proposed work plan is expected to result in the most sensitive, portable, radiation imager available in the world. Additionally, this radiation-imaging device will incorporate key properties that make use easy, consistent, and valuable to greatly aid the DOE in solving the decontamination and remediation problems at DOE facilities.
NTIS
Radiation Detectors; Spectroscopy

20080037520 Baker and Botts, New York, NY, USA
Process and System for Laser Crystallization Processing of Film Regions on a Substrate to Provide Substantial Uniformity Within Arears in Such Regions and Edge Areas Thereof, and a Structure of Film Regions
Im, J. S., Inventor; 19 Aug 03; 66 pp.; In English
Contract(s)/Grant(s): N66001-98-1-8913
Patent Info.: Filed Filed 19 Aug 03; US-Patent-Appl-SN-10-525 283
Report No.(s): PB2008-102079; No Copyright; Avail.: CASI: A04, Hardcopy

A process and system for processing a thin film sample, as well as the thin film structure are provided. In particular, a beam generator can be controlled to emit successive irradiation beam pulses at a predetermined repetition rate. Each irradiation beam pulse may be masked to define a first plurality of beamlets and a second plurality of beamlets. The first and second plurality of beamlets of each of the irradiation pulses being provided for impinging the film sample and having an intensity which is sufficient to at least partially melt irradiated portions of the section of the film sample. A particular portion of the section of the film sample is irradiated with the first beamlets of a first pulse of the irradiated beam pulses to melt first areas of the particular portion, the first areas being at least partially melted, leaving first unirradiated regions between respective adjacent ones of the first areas, and being allowed to resolidify and crystallize. After the irradiation of the particular portion with the first beamlets, the particular portion is again irradiated with the second beamlets of a second pulse of the irradiated beam pulses to melt second areas of the particular portion, the second areas being at least partially melted, leaving second unirradiated regions between respective adjacent ones of the second areas, and being allowed to resolidify and crystallize. The

first irradiated and re-solidified areas and the second irradiated and re-solidified areas are intermingled with one another within the section of the film sample. In addition, the first areas correspond to first pixels, and the second areas correspond to second pixels.
NTIS
Crystallization; Lasers; Patent Applications; Substrates; Thin Films

20080037531 Hampton Univ., VA, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Deeply Virtual Neutrino Scattering
Psaker, A.; Sep. 06, 2007; 11 pp.; In English
Report No.(s): DE2007-913565; JLAB-THY-07-716; No Copyright; Avail.: Department of Energy Information Bridge

We investigate the extension of the deeply virtual Compton scattering process into the weak interaction sector. Standard electromagnetic Compton scattering provides a unique tool for studying hadrons, which is one of the most fascinating frontiers of modern science. In this process the relevant Compton scattering amplitude probes the hadron structure by means of two quark electromagnetic currents. We argue that replacing one of the currents with the weak interaction current can promise a new insight.
NTIS
Compton Effect; Neutrinos; Scattering

20080037593 Army Research Lab., Adelphi, MD USA
HTSC Microbolometer for Passive MMW Imaging Applications
Zakar, E; Wikner, D; Potrepka, D; Tidrow, S; Dubey, M; Kirchner, K; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481843; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481843

High temperature superconductor (HTSC) microbolometers are highly sensitive thermal detectors that can be miniaturized for affordable passive millimeter-wave (MMW) imaging. When coupled to a micro-antenna and built into an imaging system, they are most promising for pilotage in fog, clouds, and smoke. A completely dry etch process is described for fabricating resistive-edge microbolometers based on YBa2Cu3O7 (YBCO).
DTIC
Bolometers; High Temperature Superconductors; Imaging Techniques; Millimeter Waves

20080037689 High Performance Technologies, Inc., Aberdeen, MD USA
Classical Model of the Electromagnetic Interaction Suitable for High Speed Semiconductor Device Simulation
Grupen, Matt; Nov 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): GS04T01BFC0061
Report No.(s): AD-A481954; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481954

The vector field relations and mobile charge thermodynamics that form a complete and self-consistent classical model of the electromagnetic interaction are presented. The charge thermodynamics includes an original treatment of heat flow between ideal Fermi gases that is derived from their heat capacities. An original discretization scheme based on the properties of Delaunay and Voronoi meshes is also presented. This new scheme allows the field equations to be solved self-consistently with the highly nonlinear charge transport equations, producing the fully coupled dynamics of full wave vector fields, mobile charge densities, as well as mobile charge and crystal lattice temperatures. Linear and nonlinear lossy transmission lines are used to demonstrate the simulator.
DTIC
Electromagnetic Fields; Electromagnetic Interactions; High Speed; Semiconductor Devices; Simulation

20080037710 College of William and Mary, Williamsburg, VA, USA
Spin Structure of (sup 3) HE and the Neutron At Low Q (sup 2) a Measurement of the Generalized GDH Integrand
Sulkosky, V. A.; Aug. 2007; 216 pp.; In English
Report No.(s): DE2007-913561; No Copyright; Avail.: National Technical Information Service (NTIS)

Since the 1980's, the study of nucleon (proton or neutron) spin structure has been an active field both experimentally and theoretically. One of the primary goals of this work is to test our understanding of Quantum Chromodynamics (QCD), the

fundamental theory of the strong interaction. In the high energy region of asymptotically free quarks, QCD has been verified. However, verifiable predictions in the low energy region are harder to obtain due to the complex interactions between the nucleons constituents: quarks and gluons. In the non-pertubative regime, low-energy effective field theories such as chiral perturbation theory provide predictions for the spin structure functions in the form of sum rules. Spin-dependent sum rules such as the Gerasimov-Drell-Hearn (GDH) sum rule are important tools available to study nucleon spin structure. Originally derived for real photon absorption, the Gerasimov-Drell-Hearn (GDH) sum rule was first extended for virtual photon absorption in 1989. The extension of the sum rule provides a unique relation, valid at any momentum transfer (Q2), that can be used to study the nucleon spin structure and make comparisons between theoretical predictions and experimental data.
NTIS
Neutrons; Particle Spin

20080037711 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Energy Recovery Linacs
Merminga, L.; January 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-913465; No Copyright; Avail.: National Technical Information Service (NTIS)

The success and continuing progress of the three operating FELs based on Energy Recovery Linacs (ERLs), the Jefferson Lab IR FEL Upgrade, the Japan Atomic Energy Agency (JAEA) FEL, and the Novosibirsk High Power THz FEL, have inspired multiple future applications of ERLs, which include higher power FELs, synchrotron radiation sources, electron cooling devices, and high luminosity electron-ion colliders. The benefits of using ERLs for these applications are presented. The key accelerator physics and technology challenges of realizing future ERL designs, and recent developments towards resolving these challenges are reviewed.
NTIS
Free Electron Lasers; Linear Accelerators

20080037712 Brookhaven National Lab., Upton, NY USA
Insertion Device Activities for NSLS-II. Presented at the 22nd Particle Accelerator Conference 2007 at Alburquerque, New Mexico on June 25-29, 2007
Tanabe, T.; Harder, D. A.; Rakowsky, G.; Shaftan, T.; Skaritka, J.; Jun. 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-913423; BNL-79158-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

NSLS-II is a medium energy storage ring of 3GeV electron beam energy with sub-nm.rad horizontal emittance and top-off capability at 500mA. Damping wigglers will be used not only to reduce the beam emittance but also for broadband sources for users. Cryo-Permanent Magnet Undulators (CPMUs) are considered for hard X-ray linear device, and permanent magnet based Elliptically Polarized Undulators (EPUs) are for polarization control. Rigorous R&D plans have been established to pursue the performance enhancement of the above devices as well as building new types of insertion devices such as high temperature superconducting wiggler/undulators. This paper describes the details of these activities and discuss technical issues.
NTIS
Conferences; Electron Beams; Light Sources; Particle Accelerators; Storage Rings (Particle Accelerators); Synchrotrons

20080037713 Brookhaven National Lab., Upton, NY USA
Insertion Device Activities for NSLS-II. Presented at the Synchrotron Radiation Instrumentation Conference 2007 at Baton Rouge, LA on April 25-27, 2007
Tanage, T.; Harcer, D. A.; Hulbert, S.; Rakowsky, G.; Skaritka, J.; Apr. 2007; 11 pp.; In English
Report No.(s): DE2007-913422; BNL-79157-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

National Synchrotron Light Source-II (NSLS-II) will be a medium energy storage ring of 3GeV electron beam energy with sub-nm.rad horizontal emittance and top-off capability at 500mA. Damping wigglers will be used not only to reduce the beam emittance but also used as broadband sources for users. Cryo-Permanent Magnet Undulators (CPMUs) are considered for hard X-ray linear device, and permanent magnet based elliptically polarized undulators (EPUs) for variable polarization devices for soft X-ray. 6T superconducting wiggler with minimal fan angle will be installed in the second phase as well as quasi-periodic EPU for VUV and possibly high-temperature superconducting undulator. R&D plans have been established to

pursue the performance enhancement of the baseline devices and to design new types of insertion devices. A new insertion device development laboratory will also be established.
NTIS
Conferences; Electron Beams; Light Sources; Storage Rings (Particle Accelerators); Synchrotron Radiation; Synchrotrons

20080037717 Brookhaven National Lab., Upton, NY USA
Conceptual Design of the NSLS-II Injection System. Presented at the 22nd Particle Accelerator Conference in Alburquerque, New Mexico on June 25-29, 2007
Shaftan, T.; Rose, J.; Pinayev, I.; Heese, R.; Bengtsson, J.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913421; BNL-79156-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

We present the conceptual design of the NSLS-II injection system. The injection system consists of a low-energy linac, booster and transport lines. We review two different injection system configurations; a booster located in the storage ring tunnel and a booster housed in a separate building. We briefly discuss main parameters and layout of the injection system components.
NTIS
Beam Injection; Injection; Light Sources; Particle Accelerators; Synchrotrons

20080037718 Brookhaven National Lab., Upton, NY USA
Poincare Map, LIE Generator Nonlinear Invariant, Parameter Dependance, Dynamic Aperture for Rings
Bengtsson, J.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913420; BNL-79155-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

In earlier work related to the NSLS-II project we have outlined a control theory approach for the dynamic aperture problem. In particular, an algorithm for the joint optimization of the Lie generator and the working point for the Poincark map. This time we report on how the Lie generator provides guidelines on acceptable magnitudes for e.g. the intrinsic nonlinear effects from insertion devices, and the nonlinear pseudo-invariant from the map normal form can be used to optimize the dynamic aperture. We also show how a polymorphic beam line class can be used to study the parameter dependence and rank conditions for control of optics and dynamic aperture.
NTIS
Apertures; Nonlinearity; Storage Rings (Particle Accelerators)

20080037719 Brookhaven National Lab., Upton, NY USA
Impedance of Electron Beam Vacuum Chambers for the NSLS-II Storage Ring
Blednykh, A.; Krinsky, S.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913419; BNL-79154-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we discuss computation of the coupling impedance of the vacuum chambers for the NSLS-II storage ring using the electromagnetic simulator GdfidL. The impedance of the vacuum chambers depends on the geometric dimensions of the cross-section and height of the slot in the chamber wall. Of particular concern is the complex geometry of the infrared extraction chambers to be installed in special large-gap dipole magnets. In this case, wakefields are generated due to tapered transitions and large vertical-aperture ports with mirrors near the electron beam.
NTIS
Electron Beams; Impedance; Storage Rings (Particle Accelerators); Vacuum Chambers; Vacuum Systems

20080037720 Brookhaven National Lab., Upton, NY USA
Preliminary Impedance Budget for NSLS-II Storage Ring
Blednykh, A.; Krinsky, S.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913418; BNL-79153-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The wakefield and impedance produced by the components of the NSLS-II storage ring have been computed for an electron bunch length of 3mm rms. The results are summarized in a table giving for each component, the loss factor, the imaginary part of the longitudinal impedance at low frequency divided by the revolution harmonic, and the transverse kick factors. In order to be able to accurately estimate the instability threshold currents in the NSLS-II storage ring, it is necessary to have a reliable model of the ring impedance. In this note, we report work in progress aimed at evaluating the ring

impedance. Extensive calculations of the impedance and wakefields produced by the components of the vacuum vessel have been performed using the electromagnetic simulator.
NTIS
Impedance; Storage Rings (Particle Accelerators); Synchrotrons

20080037721 Brookhaven National Lab., Upton, NY USA
Coupling Impedance of CESR-B RF Cavity for the NSLS-II Storage Ring
Blednykh, A.; Krinsky, S.; Rose, J.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913417; BNL-79152-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

CESR-B type superconducting cavities are under consideration for acceleration of the electron beam in the 3GeV NSLS-II storage ring. In this paper we present detailed investigation of longitudinal and transverse impedance of CESR-B cavity and transitions. Ferrite material is included in impedance analysis. Its effect on short range wakepotential has been studied using GdfidL code. The summary results of loss factors and kick factors are presented for a 3mm rms bunch length.
NTIS
Cavities; Impedance; Radio Frequencies; Storage Rings (Particle Accelerators); Superconducting Cavity Resonators; Synchrotrons

20080037722 Brookhaven National Lab., Upton, NY USA
Collective Effects in the NSLS-II Storage Ring
Krinsky, S.; Bengtsson, J.; Berg, J. S.; Blaskiewicz, M.; Blednykh, A.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-913416; BNL-79151-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A new high-brightness synchrotron light source (NSLS-II) is under design at BNL. The 3-GeV NSLS-II storage ring has a double-bend achromatic lattice with damping wigglers installed in zero-dispersion straights to reduce the emittance below lnm. In this paper, we present an overview of the impact of collective effects upon the performance of the storage ring. Subjects discussed include instability thresholds, Touschek lifetime and intrabeam scattering.
NTIS
Storage Rings (Particle Accelerators); Synchrotrons

20080037728 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Studies of Beam Halo Formation in the 12GEV CEBAF Design
Roblin, Y.; Freyberger, A.; January 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-913467; No Copyright; Avail.: National Technical Information Service (NTIS)

Beam halo formation in the beam transport design for the Jefferson Lab 12GeV upgrade was investigated using 12GeV beam transport models as well as data from 6GeV CEBAF operations. Various halo sources were considered; these covered both nuclear interactions with beam gas as well as optics-related effects such as non linearities in the magnetic fields of the transport elements. Halo due to beam gas scattering was found to be less of a problem at 12GeV compared to the 6GeV machine. Halo due to non linear effects of magnetic elements was characterized as a function of beam orbit and functional forms of the distribution were derived. These functional forms were used as inputs in subsequent detector optimizations studies.
NTIS
Halos; Linear Accelerators

20080037729 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Future Research Program at JLab: 12 GeV and Beyond
de Jager, K.; Aug. 23, 2007; 8 pp.; In English
Report No.(s): DE2007-913560; No Copyright; Avail.: National Technical Information Service (NTIS)

The project to upgrade the CEBAF accelerator at Jefferson Lab to 12 GeV is presented. Most of the research program supporting that upgrade, will require a highly polarized beam, as will be illustrated by a few selected examples. To carry out

that research program will require an extensively upgraded instrumentation in two of the existing experimental halls and the addition of a fourth hall. The plans for a high-luminosity electron-ion collider are briefly discussed.
NTIS
Linear Accelerators; Polarization

20080037760 Fermi National Accelerator Lab., Batavia, IL, USA
Searches in Photon and Jet States
Soha, A.; January 2007; 6 pp.; In English
Report No.(s): DE2007-913476; FERMILAB-CONF-07-206-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Various searches for new physics at D0 and Collider Detector at Fermilab (CDF) using photons and jets are constraining specific models, while signature based searches are looking for deviations from the SM. Discoveries may be just around the corner, as additional analyses and larger data sets are considered.
NTIS
Photons; High Energy Interactions; Signatures

20080037761 Fermi National Accelerator Lab., Batavia, IL, USA
Multi-Batch Slip Stacking in the Main Injector at FERMILAB
Seiya, K.; Berenc, T.; Chase, B.; Dey, J.; Joireman, P.; January 2007; 4 pp.; In English
Report No.(s): DE2007-913474; FERMILAB-CONF-07-275-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The Main Injector (MI) at Fermilab is planning to use multi-batch slip stacking scheme in order to increase the proton intensity at the NuMI target by about a factor of 1.5. By using multi-batch slip stacking, a total of 11 Booster batches are merged into 6, 5 double ones and one single. We have successfully demonstrated the multi-batch slip stacking in MI and accelerated a record intensity of 4.6E13 particle per cycle to 120 GeV. The technical issues and beam loss mechanisms for multi-batch slip stacking scheme are discussed.
NTIS
Injectors; Particle Accelerators

20080037762 Fermi National Accelerator Lab., Batavia, IL, USA
BPM Calibration Procedure Using TBT Data
Yang, M. J.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2007-913473; FERMILAB-CONF-07-258-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Accurate BPM calibration is crucial for lattice analysis. It is also reassuring when the calibration can be independently verified. This paper outlines a procedure that can extract BPM calibration information from TBT orbit data. The procedure is developed as an extension to the Turn-By-Turn lattice analysis. Its application to data from both Recycler Ring and Main Injector (MI) at Fermilab have produced very encouraging results. Some specifics in hardware design will be mentioned to contrast that of analysis results.
NTIS
Beams (Radiation); Calibrating; Monitors; Particle Accelerators

20080037763 Fermi National Accelerator Lab., Batavia, IL, USA
Lattice Measurement for FERMILAB Main Injector
Yang, M. J.; January 2007; 3 pp.; In English
Report No.(s): DE2007-913472; FERMILAB-CONF-07-259-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The installation of seven large aperture quadrupoles during shut-down of 2006 necessitates new lattice measurements to evaluate the state of the machine lattice at energies critical to operation. For Main Injector (MI) this means at 8-GeV kinetic energy for proton and pbar injections, at 150-GeV extraction to Tevatron for collider operation, and at 120-GeV extraction to

Numi for nutrino experiment and slow spill to fixed target test beam facility. The results of measurement at these three energies and their comparison to their corresponding calculations will be presented.
NTIS
Beam Injection; Injectors; Particle Accelerators

20080037764 Fermi National Accelerator Lab., Batavia, IL, USA
Simulations of Beam-Wire Experiments at RHIC
Kim, H. J.; Sen, T.; January 2007; 3 pp.; In English
Report No.(s): DE2007-913471; FERMILAB-CONF-07-306-AD-APC; No Copyright; Avail.: National Technical Information Service (NTIS)

A weak-strong beam simulation code (BBSIM) is used to study the compensation of long range beam-beam effects by current carrying wires at the Relativistic Heavy Ion Collider. Tune footprints and tune scans of diffusive aperture are presented for various wire separation distances. Beam life time is estimated using the dependence of the transverse diffusion coefficients on initial action. Comparison of the loss rate from tracking with that measured by BNL is presented.
NTIS
Particle Accelerators; Simulation; Wire

20080037927 Colorado State Univ., Fort Collins, CO USA
Random Generation of Coherent Spin Wave Solitons From Incoherent Spin Waves
Patton, Carl E; Wu, Mingzhong; Krivosik, Pavol; Nov 2006; 6 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0247; N00014-06-1-0889
Report No.(s): AD-A481512; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481512

This paper reports on the random generation of coherent envelope solitons from incoherent waves in a medium with an instantaneous nonlinearity, and specifically, in a magnetic thin film strip. One excites a propagating incoherent spin wave packet and observes the random appearance of spin wave envelope solitons from the propagating packet. The random solitons are as coherent as traditional envelope solitons, but both the peak amplitude and timing are random.
DTIC
Magnons; Coherence; Wave Packets; Solitary Waves

20080038019 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Seismic Propagation From Activity in Tunnels and Underground Facilities
Ketcham, Stephen A; McKenna, Jason R; Greenfield, Roy J; Anderson, Thomas S; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481549; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481549

Dynamic mechanical activity in a tunnel can be measured as ground vibrations at offset distances. These signals can be processed in sensing algorithms for detection, location, and discrimination of the activity. The objective of this work is to demonstrate that seismic simulations can reveal the effect of the environment on seismic energy as it propagates from tunnels. Using massively parallel high-performance computers, the work applies a finite-difference solution to the equations of motion and isotropic stress-velocity for viscoelastic seismic propagation. Results from simulations in open, urban, and mountainous terrain reveal the nature of seismic waves as they propagate from tunnel-digging pulses and harmonic sources. Measures of relative energy and signal cross correlation provide maps that reveal locations of optimal sensing. We demonstrate applications of beam forming to monitor tunnel activity, and conclude that the simulation method produces realistic wave-field data for clarifying complicated propagation phenomena and for virtual trials of sensing algorithms.
DTIC
Wave Propagation; Cross Correlation; Seismic Energy

20080038653 Fermi National Accelerator Lab., Batavia, IL, USA
IPM Measurements in the Tevatron
Jansson, A.; Bowie, K.; Fitzpatrick, T.; Kwarciany, R.; Lundberg, C.; January 2007; 3 pp.; In English
Report No.(s): DE2007-917422; FERMILAB-CONF-07-278-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Two Ionization Profiel Monitors (IPMs) were installed in the Tevatron in 2006. The detectors are capable of resolving

single bunches turn-by-turn. This paper presents recent improvements to the system hardware and its use for beam monitoring. In particular, the correction of beam size oscillations observed at injection is discussed.
NTIS
Particle Accelerators; Injection; Resolution

20080038654 Fermi National Accelerator Lab., Batavia, IL, USA
Muon Beam for Cooling Experiments
Jansson, A.; Balbekov, V. I.; Broemmelsiek, D.; Hu, M.; Mokhov, N. V.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2007-917423; FERMILAB-CONF-07277; No Copyright; Avail.: National Technical Information Service (NTIS)

Within the framework of the Fermilab Muon Collider Task Force, the possibility of developing a dedicated muon test beam for cooling experiments has been investigated. Cooling experiments can be performed in a very low intensity muon beam by tracking single particles through the cooling device. With sufficient muon intensity and large enough cooling decrement, a cooling demonstration experiment may also be performed without resolving single particle trajectories, but rather by measuring the average size and position of the beam. This allows simpler, and thus cheaper, detectors and readout electronics to be used. This paper discusses muon production using 400MeV protons from the Linac, decay channel and beamline design, as well as the instrumentation required for such an experiment, in particular as applied to testing the Helical Cooling Channel (HCC) proposed by Muons Inc.
NTIS
Cooling; Muons; Particle Accelerators

20080038655 Fermi National Accelerator Lab., Batavia, IL, USA; Siena Univ., Italy
Results on Rare Decays and Other CP Violation at the Tevatron
Squillacioti, P.; January 2007; 5 pp.; In English
Report No.(s): DE2007-917425; FERMILAB-CONF-07-353-E; No Copyright; Avail.: National Technical Information Service (NTIS)

NONE
NTIS
CP Violation; Elementary Particles; High Energy Interactions; Invariance; Particle Accelerators

20080038659 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Los Alamos National Lab., NM USA
Quantifying Structural Damage From Self-Irradiation in a Plutonium Superconductor
Booth, C. H.; Bauer, E. D.; Daniel, M.; Wilson, R. E.; Mitchell, J. N.; January 2007; 7 pp.; In English
Report No.(s): DE2007-917542; LBNL-61766; No Copyright; Avail.: National Technical Information Service (NTIS)

The 18.5 K superconductor PuCoGa5 has many unusual properties, including those due to damage induced by self-irradiation. The superconducting transition temperature decreases sharply with time, suggesting a radiation-induced Frenkel defect concentration much larger than predicted by current radiation damage theories. Extended x-ray absorption fine-structure measurements demon- strate that while the local crystal structure in fresh material is well ordered, aged material is disordered much more strongly than expected from simple defects, consistent with strong disorder throughout the damage cascade region. These data highlight the potential impact of local lattice distortions relative to defects on the properties of irradiated materials and underscore the need for more atomic-resolution structural comparisons between radiation damage experiments and theory.
NTIS
Irradiation; Plutonium; Radiation Damage; Superconductors (Materials)

20080038660 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
4th Generation Light Source at Jefferson Lab
Benson, S.; Biallas, G.; Boyce, J.; Bullard, D.; Coleman, J.; January 2007; 8 pp.; In English
Report No.(s): DE2007-917546; No Copyright; Avail.: National Technical Information Service (NTIS)

A number of Grand Challenges in Science have recently been identified in reports from The National Academy of Sciences, and the U.S. Dept. of Energy, Basic Energy Sciences. Many of these require a new generation of linac-based light

source to study dynamical and non-linear phenomena in nanoscale samples. In this paper we present a summary of the properties of such light sources, comparing them with existing sources, and then describing in more detail a specific source at Jefferson Lab. Importantly, the JLab light source has developed some novel technology which is a critical enabler for other new light sources.
NTIS
Light Sources; Linear Accelerators

20080038661 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Effective CSR Forces on an Energy-Chirped Bunch under Magnetic Compression
Li, R.; January 2007; 3 pp.; In English
Report No.(s): DE2007-917548; No Copyright; Avail.: National Technical Information Service (NTIS)
Following our earlier formulation of the coherent synchrotron radiation (CSR) effect on bunch dynamics in magnetic bends, here we investigate the behavior of the effective CSR forces for an energy-chirped Gaussian bunch in the bending plane around full compression, with special care being taken in the incorporation of the retardation relation. Our results show clearly a delayed response of the CSR forces to the compression or lengthening of the bunch length. In addition, around full compression, our results reveal sensitivity of the effective CSR forces on the particles transverse position, as a consequence of the geometry of particle interaction and retardation in this regime. These results can serve as benchmarks to the numerical simulation of the CSR effects.
NTIS
Bunching; Coherent Radiation; Magnetic Compression; Synchrotron Radiation

20080038662 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Jefferson Lab High Power THz User Facility
Klopf, J. M.; Greet, A.; Gubeli, J.; Neil, G. R.; Shinn, M.; January 2007; 4 pp.; In English
Report No.(s): DE2007-917550; No Copyright; Avail.: National Technical Information Service (NTIS)
We describe here, a high power (100 Watt average, 10 MW peak) broadband THz facility based on emission from sub-picosecond bunches of relativistic electrons and the beam transport system that delivers this beam in to a user laboratory.
NTIS
Relativistic Particles; High Energy Electrons; Broadband

20080038663 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Experience and Plans of the JLAB Fel Facility as a User Facility
Shinn, M. D.; January 2007; 5 pp.; In English
Report No.(s): DE2007-917551; No Copyright; Avail.: Department of Energy Information Bridge
Jefferson Lab's IR Upgrade FEL building was planned from the beginning to be a user facility, and includes an associated 600 m2 area containing seven laboratories. The high average power capability (multikilowatt-level) in the near-infrared (1-3 microns), and many hundreds of watts at longer wavelengths, along with an ultrafast (approximately 1 ps) high PRF (10's MHz) temporal structure makes this laser a unique source for both applied and basic research. In addition to the FEL, we have a dedicated laboratory capable of delivering high power (many tens of watts) of broadband THz light. After commissioning the IR Upgrade, we once again began delivering beam to users in 2005. In this presentation, I will give an overview of the FEL facility and its current performance, lessons learned over the last two years, and a synopsis of current and future experiments.
NTIS
Free Electron Lasers; Research Facilities

20080038664 South Carolina Univ., Columbia, SC, USA
Nucleon Transition Form Factors and New Perspectives
Gothe, R. W.; January 2007; 6 pp.; In English
Report No.(s): DE2007-917554; No Copyright; Avail.: National Technical Information Service (NTIS)
The status of the electro-excitation program to study baryon resonances at Jefferson Lab will be exemplified by the most recent results on resonance parameters and transition form factors in single and double-pion production. These results demonstrate that the separation of resonance and background contributions and therefore the extraction of the electro-coupling amplitudes of resonances become easier and cleaner at higher four-momentum transfers (Q2). Furthermore, the double-pion

in comparison to the single-pion channel shows a higher sensitivity to higher excited resonances and a distinctly different Q2 dependence of the background amplitudes. The combined analysis of the single- and double-pion data reduces model dependent uncertainties significantly, which allows us to extract the resonant electrocoupling amplitudes with an unprecedented quality.
NTIS
Baryon Resonance; Pair Production

20080038665 Carnegie-Mellon Univ., Pittsburgh, PA USA
Quantum Operator Design for Lattice Baryon Spectroscopy
Lichtl, A. D.; Sep. 07, 2006; 180 pp.; In English
Report No.(s): DE2007-917690; No Copyright; Avail.: National Technical Information Service (NTIS)

A previously-proposed method of constructing spatially-extended gauge-invariant three-quark operators for use in Monte Carlo lattice QCD calculations is tested, and a methodology for using these operators to extract the energies of a large number of baryon states is developed. This work is part of a long-term project undertaken by the Lattice Hadron Physics Collaboration to carry out a first-principles calculation of the low-lying spectrum of QCD. The operators are assemblages of smeared and gauge-covariantly-displaced quark fields having a definite flavor structure. The importance of using smeared fields is dramatically demonstrated. It is found that quark field smearing greatly reduces the couplings to the unwanted high-lying short-wavelength modes, while gauge field smearing drastically reduces the statistical noise in the extended operators.
NTIS
Baryons; Quantum Chromodynamics; Spectroscopy

20080038746 Princeton Univ., NJ USA
Development of Ultra Sensitive Piezoresistive Sensors Using AlAs 2D Electrons
Shayegan, Mansour; Feb 14, 2008; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0219
Report No.(s): AD-A482354; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482354

The electronic properties of the two-dimensional (2D) electron systems in modulation-doped AlAs quantum wells are investigated, with the goal of developing this material as a sensor with an unprecedented, large sensitivity to stress and/or strain. Such a sensor may find use in various scanning probe microscopes, and in other applications where minute amounts of variables such as force, displacement, or pressure need to be measured.
DTIC
Aluminum Arsenides; Electrons; Piezoelectric Transducers; Quantum Wells; Sensitivity

20080038939 Auburn Univ., AL USA
Characterization of Pulsed Electromagnetic Induction (EMI) System
Riggs, Lloyd S; Apr 30, 2007; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0496
Report No.(s): AD-A482588; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The following report summarizes efforts on ‘Characterization of Pulsed Electromagnetic Induction (EMI) System’. Specifically the effort focused on evaluating the operational characteristics of the EM-63 pulsed electromagnetic induction (EMI) system manufactured and sold by Geonics Ltd. at 8-1745 Meyerside Drove, Mississsauga, Ontario L5T 1C6 (Web site: http://www.geonics.com). A significant part of the effort was consumed in returning the EM-63 to the manufacturer for repairs. In particular we discovered that the transmitter current pulse did not conform to the manufacture’s specifications. As discussed in greater detail below, the correct transmitter current waveform consists of a positive current pulse followed (temporally) by a negative current pulse that in turn is followed by a short duration positive current pulse. Measurements indicated that the transmitter current waveform on our EM-63 had only a positive current waveform. It was necessary to return the EM-63 to the manufacturer twice for repairs since we discovered that the transmitter current waveform was still not correct after the first repair effort.
DTIC
Intake Systems; Magnetic Induction

20080038959 University of South Florida, Tampa, FL USA
Static and Dynamic Magnetic Response in Ferrofluids
Srikanth, Hariharan; Oct 30, 2007; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0354
Report No.(s): AD-A482629; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ferrofluids are technologically important for a variety of applications ranging from biomedicine, hydraulics, to power generation. They are also model systems for the investigation of physics of relaxation phenomena in magnetic nanoparticles. We have done systematic DC and AC magnetization studies of ferrofluids composed of Fe3O4 and CoFe2O4 nanoparticles (mean size 14 nm) suspended in hexane and dodecane, respectively. The blocking temperature was just above (hexane) and much below (dodecane) the carrier fluid freezing temperatures providing interesting regimes to study the relaxation mechanisms associated with the fluid and frozen states.
DTIC
Dynamic Response; Ferrofluids; Fluids; Magnetic Properties; Responses

20080039153 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Practical Considerations for Optimizing Position Sensitivity in Arrays of Position-sensitive TES's
Smith, Stephen J.; Bandler, Simon R.; Figueroa-Feliciano, Encetali; Iyomoto, Naoko; Kelley, Richard L.; Kilbourne, Caroline A.; Porder, Frederick S.; Sadleir, John E.; July 22, 2007; 1 pp.; In English; Low Temperature Detectors-12 (LTD-12), 22-27 Jul. 2007, Paris, France
Contract(s)/Grant(s): NNH06CC03B; Copyright; Avail.: Other Sources; Abstract Only

We are developing Position-Sensitive Transitions-Edge Sensors (PoST's) for future X-ray astronomy missions such as NASA's Constellation-X. The PoST consists of one or more Transitions Edge Sensors (TES's) thermally connected to a large X-ray absorber, which through heat diffusion, gives rise to position dependence. The development of PoST's is motivated by the desire to achieve the largest the focal-plan coverage with the fewest number of readout channels. In order to develop a practical array, consisting of an inner pixellated core with an outer array of large absorber PoST's, we must be able to simultaneously read out all (-1800) channels in the array. This is achievable using time division multiplexing (TDM), but does set stringent slew rate requirements on the array. Typically, we must damp the pulses to reduce the slew rate of the input signal to the TDM. This is achieved by applying a low-pass analog filter with large inductance to the signal. This attenuates the high frequency components of the signal, essential for position discrimination in PoST's, relative to the white noise of the readout chain and degrades the position sensitivity. Using numerically simulated data, we investigate the position sensing ability of typical PoST designs under such high inductance conditions. We investigate signal-processing techniques for optimal determination of the event position and discuss the practical considerations for real-time implementation.
Author
X Ray Astronomy; Time Division Multiplexing; Position Sensing; Low Pass Filters; High Frequencies; Real Time Operation

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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*.

20080037333 Blank Rome, LLP, Washington, DC, USA
Statistical Estimation of Ultrasonic Propagation Parameters for Aberration Correction
Wang, R. C., Inventor; Astheimer, J. P., Inventor; 29 Jul 05; 28 pp.; In English
Contract(s)/Grant(s): HL50855; CA74050
Patent Info.: Filed Filed 29 Jul 05; US-Patent-Appl-SN-11-192 393
Report No.(s): PB2008-101923; No Copyright; Avail.: CASI: A03, Hardcopy

In estimation of an aberration in propagation of an ultrasonic wave from an aperture through an aberration path, the aperture is modeled as a plurality of sources and receivers. The frequency-domain magnitude of the aberration is estimated by normalizing the scattered signal power spectrum. The frequency-domain phase of the aberration is estimated by a recursion using cross spectra of signals at neighboring receivers.
NTIS
Aberration; Patent Applications; Statistical Analysis; Ultrasonic Radiation

20080037572 NASA Langley Research Center, Hampton, VA, USA

Vibro-Acoustic Response of Buildings Due to Sonic Boom Exposure: July 2007 Field Test

Klos, Jacob; September 2008; 298 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.18.02

Report No.(s): NASA/TM-2008-215349; L-19480; No Copyright; Avail.: CASI: A13, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037572

During the month of July 2007, a series of structural response measurements were made on a house on Edwards Air Force Base (EAFB) property that was exposed to sonic booms of various amplitudes. The purpose of this report is to document the measurements that were made, the structure on which they were made, the conditions under which they were made, the sensors and other hardware that were used, and the data that were collected. To that end, Chapter 2 documents the house, its location, the physical layout of the house, the surrounding area, and summarizes the transducers placed in and around the house. Chapter 3 details the sensors and other hardware that were placed in the house during the experiment. In addition, day-to-day variations of hardware configurations and transducer calibrations are documented in Chapter 3. Chapter 4 documents the boom generation process, flight conditions, and ambient weather conditions during the test days. Chapter 5 includes information about sub-experiments that were performed to characterize the vibro-acoustic response of the structure, the acoustic environment inside the house, and the acoustic environment outside the house. Chapter 6 documents the data format and presents examples of reduced data that were collected during the test days.

Author

Sonic Booms; Vibrational Stress; Calibrating; Buildings; Transducers; Flight Conditions

20080038016 Northeastern Univ., Boston, MA USA

Auditory Attention Shifting

Scharf, Bertram; Reeves, Adam; Feb 5, 2008; 5 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0244

Report No.(s): AD-A481922; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481922

This research effort measured the spectral and temporal dynamics of human auditory attentional control, concentrating on the requirements for efficient shifting of auditory attention within the frequency spectrum of normal human hearing.

DTIC

Audio Frequencies; Hearing; Frequency Distribution

20080038862 California Univ., Santa Cruz, CA USA

Standardization of Electrophysiological Measures of Hearing in Marine Mammals

Kastak, Colleen R; Kastak, David; Finneran, James J; Moore, Patrick; Houser, Dorian; Jan 2004; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0707

Report No.(s): AD-A482440; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary goal of this project is to develop the technology and methods required to make quantitative, repeatable, and interpretable measurements of pinniped hearing sensitivity using averaged evoked potentials recorded from the surface of the head. This effort will advance understanding of marine mammal auditory physiology and provide the tools necessary for the study of population-level and species-level hearing so that noise impacts in marine ecosystems can be better understood. The immediate goals of this project are as follows: (1) transfer available technology from ongoing research with cetaceans to establish an appropriate system for recording auditory evoked potentials in pinnipeds, (2) develop protocols for electrode placement and stimulus presentation that result in optimal evoked potential recordings, (3) measure the hearing sensitivity of individuals from multiple pinniped species using evoked potential methodology, (4) benchmark the evoked potential measures of hearing against standard behavioral measurements obtained for the same individuals, and (5) compare both behavioral and physiological hearing measures obtained for pinnipeds with those obtained under similar conditions for dolphins. Development of standardized procedures and technologies for evoked potential audiometry that are suitable for marine mammal species are necessary to achieve the ultimate goals of understanding species-specific population level variations in hearing sensitivity and to move toward the ability to measure the hearing sensitivity of species for which behavioral methodologies are not applicable (e.g., baleen whales, beaked whales, Antarctic seals). Such information is essential to mitigating the effects of anthropogenic noise in the marine environment and furthering scientific knowledge of the role of acoustics in marine mammal biology, behavior, and ecology.

DTIC

Audiometry; Auditory Perception; Electrophysiology; Hearing; Marine Mammals; Sensitivity; Standardization

20080038875 North Carolina Univ., Charlotte, NC USA

Resonant Optical Circuits Based on Coupling Between Whispering Gallery Modes in Dielectric Microresonators

Astratov, Vasily N; Cai, Wei; A -Hasan, Mohamed; Dec 30, 2007; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0529

Report No.(s): AD-A482482; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project was devoted to advancing understanding of the optical properties of mesoscopic systems of coupled spherical cavities. Using numerical modeling we studied optical coupling between spherical cavities with detuned whispering gallery mode (WGMs) resonances. The results were found to be in agreement with experiments performed on size-mismatched bispheres with controllable inter-cavity gaps. We observed a new type of optical modes termed 'nanojet-induced modes' in straight chains of microspheres. Due to subwavelength sizes of the periodically focused spots and small propagation losses (<0.1 dB/sphere) these modes were shown to be very promising for developing novel devices. The 3D lattices of closely packed spherical cavities were synthesized by flow-assisted self-assembly with the thickness well controllable up to 100 monolayers. By analogy with the percolation theory we argued that by selecting more uniform spheres it should be possible to achieve an optical percolation threshold for WGM-related transport in such systems. Along with dielectric microspheres we studied GaAs/AlGaAs pillar microcavities where we observed WGMs with Q-factors up to 20000 and small modal volumes. The results of this project are important for developing microprobes for biochemical sensing with subwavelength spatial resolution, reconfigurable filters, sensors and single photon sources.

DTIC

Circuits; Dielectric Properties; Dielectrics; Optical Coupling; Resonance; Whispering Gallery Modes

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ATOMIC AND MOLECULAR PHYSICS

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

20080038874 Innsbruck Univ., Austria

Quantum Information Processing with Trapped 43Ca+ Ions

Blatt, Rainer; Mar 18, 2008; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0176

Report No.(s): AD-A482481; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report on experiments with strings of laser-cooled Ca+ ions for quantum information processing. An experiment using the isotope 43Ca+ was set up from scratch. We devised techniques for loading and laser-cooling 43Ca+ ion strings, initializing the ions in the hyperfine clock states and reading out the quantum state with high efficiency. Coherence times of the qubits are about 1 s. The single-qubit gates were implemented using microwave and Raman excitation, and coupling to the motional state was demonstrated. Very recently, a pair of 43Ca+ ions were entangled for the first time. In a second line of experiments, we demonstrated simple quantum algorithms with few 40Ca+ ions as well as the implementation of a high-fidelity gate operation entangling a pair of ions with a fidelity of 99.3(1)%. Among the milestone experiments are the demonstration and quantum process tomography of a Cirac-Zoller gate with mean fidelity of about 93%, the demonstration of entanglement in a decoherence-free sub space lasting for 20s, the demonstration of deterministic quantum teleportation, a Toffoli gate, deterministic entanglement swapping a partial measurement of a GHZ state preserving entanglement in the remaining qubits, creation and analysis of an 8-ion W-state, the application of entangled ions for precision spectroscopy.

DTIC

Data Processing; Ions; Isotopes; Trapped Particles

20080038919 Air Force Research Lab., Hanscom AFB, MA USA

SWIR Variable Dispersion Spectral Imaging Sensor

Sheperd, F D; Mooney, J M; Reeves, T E; Franco, D S; Murguia, J E; Wong, C; Dumont, P; Khaghani, F; Diaz, G; Weeks, M M; Leahy, D; Aug 2007; 7 pp.; In English

Contract(s)/Grant(s): F19628-02-C-0082; Proj-4916

Report No.(s): AD-A482542; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A novel spectral imaging sensor based on dual direct vision prisms is described. The prisms project a spectral image onto the focal plane array of an infrared camera. The prism set is rotated on the camera axis and the resulting spectral information is extracted as an image cube(x, y, 1), using tomographic techniques. The sensor resolves more than 40 spectral bands

(channels) at wavelengths between 1.2 microns and 2.5 microns wavelength. The sensor dispersion characteristic is determined by the vector sum of the dispersions of the two prisms. The number of resolved channels, and the related signal strength per channel, varies with the angle between the prism dispersion axes. This is a new capability for this class of spectral imaging sensor. Reconstructed short-wave imagery and spectral data is presented for outdoor and laboratory scenes and for standard test sources.
DTIC
Detectors; Imagery; Imaging Techniques; Spectra

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*.

20080036826 NASA Marshall Space Flight Center, Huntsville, AL, USA
ART-XC: A Medium-energy X-ray Telescope System for the Spectrum-R-Gamma Mission
Arefiev, V.; Pavlinsky, M.; Lapshov, I.; Thachenko, A.; Sazonov, S.; Revnivtsev, M.; Semena, N.; Buntov,M.; Vikhlinin, A.; Gubarev, M.; ODell, S.; Ramsey, B.; Romaine, S.; Swartz. D/; Weisskopf, M.; Hasinger, G.; Predehl, P.; Grigorovich, S.; Litvin, D.; Meidinger, N.; Strueder, L. W.; June 21, 2008; 12 pp.; In English; SPIE Conference, 21-29 Jun. 2008, Marseille, France; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The ART-XC instrument is an X-ray grazing-incidence telescope system in an ABRIXAS-type optical configuration optimized for the survey observational mode of the Spectrum-RG astrophysical mission which is scheduled to be launched in 2011. ART-XC has two units, each equipped with four identical X-ray multi-shell mirror modules. The optical axes of the individual mirror modules are not parallel but are separated by several degrees to permit the four modules to share a single CCD focal plane detector, 1/4 of the area each. The 450-micron-thick pnCCD (similar to the adjacent eROSITA telescope detector) will allow detection of X-ray photons up to 15 keV. The field of view of the individual mirror module is about 18 x 18 arcminutes(exp 2) and the sensitivity of the ART-XC system for 4 years of survey will be better than 10(exp -12) erg s(exp -1) cm(exp -2) over the 4-12 keV energy band. This will allow the ART-XC instrument to discover several thousand new AGNs.
Author
X Ray Telescopes; Grazing Incidence Telescopes; Optical Properties

20080037304 Haynes Beffel and Wolfeld, LLP, Half Moon Bay, CA, USA; California Univ., Berkeley, CA, USA
Relay Telescope for High Power Laser Alignment System
Dane, C. B., Inventor; Hackel, L., Inventor; Harris, F., Inventor; 10 Nov 05; 18 pp.; In English
Patent Info.: Filed Filed 10 Nov 05; US-Patent-Appl-SN-11-271 197
Report No.(s): PB2008-101978; No Copyright; Avail.: CASI: A03, Hardcopy

A laser system includes an optical path having an intracavity relay telescope with a telescope focal point for imaging an output of the gain medium between an image location at or near the gain medium and an image location at or near an output coupler for the laser system. A kinematic mount is provided within a vacuum chamber, and adapted to secure beam baffles near the telescope focal point. An access port on the vacuum chamber is adapted for allowing insertion and removal of the beam baffles. A first baffle formed using an alignment pinhole aperture is used during alignment of the laser system. A second tapered baffle replaces the alignment aperture during operation and acts as a far-field baffle in which off angle beams strike the baffle a grazing angle of incidence, reducing fluence levels at the impact areas.
NTIS
Alignment; High Power Lasers; Lasers; Patent Applications; Telescopes

20080037306 Morris Manning and Martin, LLP, Atlanta, GA, USA; Vanderbilt Univ., Nashville, TN, USA
Smith-Purcell Free Electron Laser and Method of Operating Same
Brau, C. A., Inventor; Boulware, C. H., Inventor; Andrews, H. L., Inventor; 30 Jun 05; 19 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0429
Patent Info.: Filed Filed 30 Jun 05; US-Patent-Appl-SN-11-172 429
Report No.(s): PB2008-101980; No Copyright; Avail.: CASI: A03, Hardcopy

A free electron laser for generating a Smith-Purcell radiation. In one embodiment, the free electron laser includes a grating

having a grating surface, an electron emitter for generating a beam of electrons, and a guiding member positioned therebetween the electron emitter and the grating for directing the beam of electrons along a path extending over the grating surface of the grating with a focal point so that in operation a Smith-Purcell radiation and an evanescent wave are generated by interaction of the beam of electrons with the grating. In operation, the beam current of the beam of electrons is equal to or greater than a threshold current and the group velocity of the evanescent wave is substantially close to zero or negative so that the evanescent wave travels backward to allow electrons in the beam of electrons are bunched by interaction with the evanescent wave to substantially enhance the Smith-Purcell radiation over the range of wavelengths.
NTIS
Free Electron Lasers; Patent Applications

20080037308 Jagtiani and Guttag, Fairfax, VA, USA
Temperature Compensated Laser
Jewell, J. L., Inventor; 1 Feb 05; 14 pp.; In English
Contract(s)/Grant(s): DASG60-98-C-0032
Patent Info.: Filed Filed 1 Feb 05; US-Patent-Appl-SN-11-046 735
Report No.(s): PB2008-101982; No Copyright; Avail.: CASI: A03, Hardcopy

A novel approach for providing temperature compensation for semiconductor lasers is disclosed. This approach utilizes reflectivity characteristics in the at least one of the mirrors of the semiconductor laser to provide temperature compensation to the device.
NTIS
Lasers; Patent Applications

20080037312 Blank Rome, LLP, Washington, DC, USA
Method and Apparatus for Improving Both Lateral and Axial Resolution in Ophthalmoscopy
Miller, D. T., Inventor; Jonnal, R. S., Inventor; Qu, J., Inventor; Thorn, K. E., Inventor; 11 Jun 03; 23 pp.; In English
Contract(s)/Grant(s): AST-9876783
Patent Info.: Filed Filed 11 Jun 03; US-Patent-Appl-SN-10-517 367
Report No.(s): PB2008-102062; No Copyright; Avail.: CASI: A03, Hardcopy

The invention provides a method of optical imaging comprising providing a sample to be imaged, measuring and correcting aberrations associated with the sample using adaptive optics, and imaging the sample by optical coherence tomography. The method can be used to image the fundus of a human eye to provide diagnostic information about retinal pathologies such as macular degeneration, retinitis pigmentosa, glaucoma, or diabetic retinopathy. The invention further provides an apparatus comprising an adaptive optics subsystem and a two-dimensional optical coherence tomography subsystem.
NTIS
Adaptive Optics; Patent Applications; Retina; Tomography

20080037324 Edell, Shapiro and Finnan, LLC, Rockville, MD, USA
Method and Apparatus for Measurement of Optical Detector Linearity
Predina, J. P., Inventor; Williams, F. L., Inventor; 21 Sep 04; 20 pp.; In English
Patent Info.: Filed Filed 21 Sep 04; US-Patent-Appl-SN-10-944 807
Report No.(s): PB2008-102085; No Copyright; Avail.: CASI: A03, Hardcopy

A system for measuring optical detector linearity according to the present invention employs a laser source that illuminates an integrating sphere. The sphere randomizes the laser signal phase and produces a uniform intensity over the sphere output. A collimator expands the sphere output for entry into an interferometer, where the incident optical energy is amplitude modulated in a sinusoidal fashion by a linear mechanical mirror movement. Optical band filters eliminate significant harmonic content being present on a pre-detected optical signal. Sampling of the detected signal energy is performed synchronous to the mechanical mirror position to assure sinusoidal response. The sampled signals are processed to separately determine signal harmonic components attributed to detector non-linearity and multiple laser reflections within the system. The system utilizes at least two measurements at two different laser intensities. An optional third measurement of background radiance may be applied to the first two measurements to enhance accuracy.
NTIS
Lasers; Linearity; Optical Measurement; Optical Measuring Instruments; Spheres

20080037389 Fulbright and Jaworski, LLP, Austin, TX, USA

Laser Treatment of Cutaneous Vascular Lesions

Vargas, G., Inventor; Barton, J. K., Inventor; Chan, E. K., Inventor; Milner, T. E., Inventor; Welch, A. J., Inventor; 13 Sep 05; 15 pp.; In English

Contract(s)/Grant(s): NSF-BES9986296

Patent Info.: Filed Filed 13 Sep 05; US-Patent-Appl-SN-11-225 821

Report No.(s): PB2008-102856; No Copyright; Avail.: CASI: A03, Hardcopy

Methods for treating maladies such as cutaneous vascular lesions. A patient in need of vascular lesion treatment is identified. A hyperosmotic agent is administered to a region adjacent the lesion. Blood flow velocity is slowed within the region using the hyperosmotic agent, and the lesion is exposed to laser radiation.

NTIS

Cardiovascular System; Laser Beams; Lasers; Lesions; Patent Applications

20080037518 UT-Battelle, LLC, Oak Ridge, TN, USA

Laser Scanning System for Object Monitoring

McIntyre, T. J., Inventor; Maxey, L. C., Inventor; Chiaro, P. J., Inventor; 23 Sep 04; 24 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-947 951

Report No.(s): PB2008-102082; No Copyright; Avail.: CASI: A03, Hardcopy

A laser scanner is located in a fixed position to have line-of-sight access to key features of monitored objects. The scanner rapidly scans pre-programmed points corresponding to the positions of retroreflecting targets affixed to the key features of the objects. The scanner is capable of making highly detailed scans of any portion of the field of view, permitting the exact location and identity of targets to be confirmed. The security of an object is verified by determining that the cooperative target is still present and that its position has not changed. The retroreflecting targets also modulate the reflected light for purposes of returning additional information back to the location of the scanner.

NTIS

Laser Applications; Optical Scanners; Patent Applications; Scanners; Scanning

20080037562 NASA Marshall Space Flight Center, Huntsville, AL, USA

Extreme Universe Space Observatory (EUSO) Optics Module

Young, Roy; Christl, Mark; June 13, 2008; 10 pp.; In English; Third JEM-EUSO General Assembly: RIKEN, 13-18 Jun. 2008, Wako, Japan; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037562

A demonstration part will be manufactured in Japan on one of the large Toshiba machines with a diameter of 2.5 meters. This will be a flat PMMA disk that is cut between 0.5 and 1.25 meters radius. The cut should demonstrate manufacturing the most difficult parts of the 2.5 meter Fresnel pattern and the blazed grating on the diffractive surface. Optical simulations, validated with the subscale prototype, will be used to determine the limits on manufacturing errors (tolerances) that will result in optics that meet EUSO s requirements. There will be limits on surface roughness (or errors at high spatial frequency); radial and azimuthal slope errors (at lower spatial frequencies) and plunge cut depth errors in the blazed grating. The demonstration part will be measured to determine whether it was made within the allowable tolerances.

Author

Manufacturing; Observatories; Azimuth; High Frequencies

20080037568 NASA Langley Research Center, Hampton, VA, USA

Mach-Number Measurement with Laser and Pressure Probes in Humid Supersonic Flow

Herring, G. C.; [2008]; 9 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080037568

Mach-number measurements using a nonintrusive optical technique, laser-induced thermal acoustics (LITA), are compared to pressure probes in humid supersonic airflow. The two techniques agree well in dry flow (-35 C dew point), but

LITA measurements show about five times larger fractional change in Mach number than that of the pressure-probe when water is purposefully introduced into the flow. Possible reasons for this discrepancy are discussed.
Author
Acoustics; Supersonic Flow; Pressure Sensors; Mach Number; Air Flow; Lasers; Flow Measurement

20080037796 Maryland Univ., College Park, MD, USA
High Contrast Programmable Field Masks for JWST NIRSpec
Kutyrev, Alexander S.; June 23, 2008; 1 pp.; In English; SPIE 2008, 23-28 Jun. 2008, Marseille, France
Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail.: Other Sources; Abstract Only

Microshutter arrays are one of the novel technologies developed for the James Webb Space Telescope (JWST). It will allow Near Infrared Spectrometer (NIRSpec) to acquire spectra of hundreds of objects simultaneously therefore increasing its efficiency tremendously. We have developed these programmable arrays that are based on Micro-Electro Mechanical Structures (MEMS) technology. The arrays are 2D addressable masks that can operate in cryogenic environment of JWST. Since the primary JWST science requires acquisition of spectra of extremely faint objects, it is important to provide very high contrast of the open to closed shutters. This high contrast is necessary to eliminate any possible contamination and confusion in the acquired spectra by unwanted objects. We have developed and built a test system for the microshutter array functional and optical characterization. This system is capable of measuring the contrast of the microshutter array both in visible and infrared light of the NIRSpec wavelength range while the arrays are in their working cryogenic environment. We have measured contrast ratio of several microshutter arrays and demonstrated that they satisfy and in many cases far exceed the NIRSpec contrast requirement value of 2000.
Author
Electromechanical Devices; James Webb Space Telescope; Functional Design Specifications; Field-Programmable Gate Arrays

20080037825 Holland and Knight, Miami, FL, USA
Achromatic Imaging Lens With Extended Depth of Focus
Wang, M. R., Inventor; Yang, J., Inventor; 14 Oct 04; 40 pp.; In English
Contract(s)/Grant(s): DMI-0319169
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-965 519
Report No.(s): PB2008-102789; No Copyright; Avail.: CASI: A03, Hardcopy

A lens includes a diffractive surface having an etched structure and a refractive surface having a curved structure. The lens reduces chromatic aberration of incident light and extends depth of focus. In one alternative, the etched structure is a calculated phase pattern or a pattern that is embossed or diamond tuned. In another alternative, the curved structure is convex shaped or concave shaped. In yet another alternative, the lens is an imaging lens wherein high lateral resolution of incident light is preserved.
NTIS
Depth; Imaging Techniques; Lens Design; Lenses; Patents; Refractivity

20080037826 Honeywell International, Inc., Morristown, NJ, USA
Detecting Radiation Events
Molaskey, C. T., Inventor; Chamberlin, D. A., Inventor; Wiley, P., Inventor; 15 Oct 04; 11 pp.; In English
Contract(s)/Grant(s): DASG60-00-C-0072
Patent Info.: Filed Filed 15 Oct 04; US-Patent-Appl-SN-10-966 634
Report No.(s): PB2008-102788; No Copyright; Avail.: CASI: A03, Hardcopy

A system for detecting radiation events in a ring laser gyro is provided. The system includes one or more photodetectors, that produce photocurrent signals to monitor the ring laser gyro. Further, the system includes one or more comparator circuits actuating at one or more thresholds. The one or more comparator circuits are responsive to the photodetectors to detect when a radiation event occurs based on the photocurrent signal. The system further includes a path length control circuit responsive to the one or more comparator circuits, that restores operating conditions for the ring laser gyro when a radiation event occurs.
NTIS
Detection; Laser Gyroscopes; Patent Applications; Ring Lasers

20080037827 Altera Law Group, LLC, Minneapolis, MN, USA
Scalable Imaging Spectrometer
Kehoe, M. R., Inventor; Smith, C. W., Inventor; Swanson, R. C., Inventor; 22 Jul 05; 21 pp.; In English
Contract(s)/Grant(s): FA8650-04-M-1652
Patent Info.: Filed Filed 22 Jul 05; US-Patent-Appl-SN-11-187 584
Report No.(s): PB2008-102787; No Copyright; Avail.: CASI: A03, Hardcopy

A scalable imaging spectrometer, using anamorphic optical elements to form an intermediate focus in only one dimension. Light reflects off an object to form an incident beam. The beam reflects off an anamorphic objective mirror to form a line focus at a slit. At the slit, the beam is focused along the spectral dimension, but remains substantially collimated along the spatial dimension. The beam is then recollimated in the spectral dimension by a second anamorphic mirror, reflects off a diffraction grating, passes through a lens, and is brought to focus on a two dimensional detector, which produces both spectral and spatial information about the object. Because there is no intermediate focus in the spatial dimension, there are no off-axis aberrations from the anamorphic mirrors, and the field of view may be substantially increased over prior art spectrometers in the spatial dimension.

NTIS
Imaging Spectrometers; Patent Applications

20080037854 Eliseeva (Houston)), Lexington, MA, USA
High Gain Resonant Modulator System and Method
Burns, W. K., Inventor; Prince, J., Inventor; Ackerman, E., Inventor; 20 Oct 04; 22 pp.; In English
Contract(s)/Grant(s): N66001-02-C-8059; DARPA-F30602-00-C-0128
Patent Info.: Filed Filed 20 Oct 04; US-Patent-Appl-SN-10-969 616
Report No.(s): PB2008-102784; No Copyright; Avail.: CASI: A03, Hardcopy

An optical resonant modulator includes an optical ring resonator and an optical loop that is coupled to the optical ring resonator by two couplers. The optical ring resonator can have a hybrid design in which the ring resonator is formed on an electro-optically passive material and the optical loop is formed on an electro-optically active material. An amplification section can be inserted between the electro-optically passive and the electro-optically active sections. In analog applications, an optical resonator includes a Mach Zehnder interferometer section having an input and an output, with a feedback path coupling the output to the input. Applications of the optical modulator of the invention, and a method for modulating an optical signal also are disclosed.

NTIS
High Gain; Modulators; Patent Applications; Resonators

20080037873 Lumen Intellectual Property, Palo Alto, CA, USA
Diffractive Optical Spectral Filter Having Arbitrary Amplitude and Phase Response
Belikov, R., Inventor; Solgaard, O., Inventor; 22 Feb 05; 11 pp.; In English
Contract(s)/Grant(s): AROSR-F49620-00-C-0040
Patent Info.: Filed Filed 22 Feb 05; US-Patent-Appl-SN-11-062 781
Report No.(s): PB2008-102790; No Copyright; Avail.: CASI: A03, Hardcopy

A diffractive optical filter having a fractional level density s(j) and a transfer function C(m) that is an approximation to a desired Hermitian, passive transfer function B(m) is provided. The fractional level density s(j) is obtained by Fourier (or inverse Fourier) transforming B(m) to obtain t(j), calculating u(j)=t(j)-min(t(j)), calculating v(j)=u(j)/D where D is the sum of u(j) over j, and setting s(j) substantially equal to v(j). A 2-D tiltable mirror array can be used to provide a 1024 tap optical filter having 10-bit tap resolution. Applications of the invention include laser tuning elements, spectroscopy and wavelength-division multiplexing, switching, and/or filtering.

NTIS
Diffractive Optics; Frequency Response; Optical Filters; Patent Applications; Phase Shift; Spectra

20080038077 MacPherson Kwok Chen and Heid, LLP, Irvine, CA, USA
Closed Loop RZ-DPSK Alignment for Optical Communications
Cheung, P. Y., Inventor; Dupont, J. R., Inventor; Wah, L. C., Inventor; Yu, G., Inventor; 25 Oct 04; 9 pp.; In English

Patent Info.: Filed Filed 25 Oct 04; US-Patent-Appl-SN-10-973 857
Report No.(s): PB2008-101612; No Copyright; Avail.: CASI: A02, Hardcopy

A method and system are provided for using a power spectral density of an output of a modulator to facilitate closed loop feedback for controlling alignment of a pulse with respect to information formed upon the pulse.

NTIS

Alignment; Feedback Control; Laser Beams; Modulators; Optical Communication; Patent Applications; Phase Shift Keying

20080038078

High-Efficiency Spectral Purity Filter for EUV Lithography

Chapman, H. N., Inventor; 2 Jun 04; 10 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-862 127
Report No.(s): PB2008-101613; No Copyright; Avail.: CASI: A02, Hardcopy

An asymmetric-cut multilayer diffracts EUV light. A multilayer cut at an angle has the same properties as a blazed grating, and has been demonstrated to have near-perfect performance. Instead of having to nano-fabricate a grating structure with imperfections no greater than several tens of nanometers, a thick multilayer is grown on a substrate and then cut at an inclined angle using coarse and inexpensive methods. Effective grating periods can be produced this way that are 10 to 100 times smaller than those produced today, and the diffraction efficiency of these asymmetric multilayers is higher than conventional gratings. Besides their ease of manufacture, the use of an asymmetric multilayer as a spectral purity filter does not require that the design of an EUV optical system be modified in any way, unlike the proposed use of blazed gratings for such systems.

NTIS

Asymmetry; Cutting; Extreme Ultraviolet Radiation; Lithography; Patent Applications; Purity; Spectra

20080038082 Thorp Reed and Armstron, LLP, Pittsburgh, PA, USA

Object Recognizer and Detector for Two-Dimensional Images Using Bayesian Network Based Classifier

Schnelderman, H., Inventor; 22 Oct 04; 58 pp.; In English
Contract(s)/Grant(s): MDA-904-00-C-2109; MDA-904-03-C-1709
Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-971 868
Report No.(s): PB2008-101619; No Copyright; Avail.: CASI: A04, Hardcopy

A system and method for determining a classifier to discriminate between two classes--object or non-object. The classifier may be used by an object detection program to detect presence of a 3D object in a 2D image (e.g., a photograph or an X-ray image). The overall classifier is constructed of a sequence of classifiers (or 'sub-classifiers'), where each such classifier is based on a ratio of two graphical probability models (e.g., Bayesian networks). A discrete-valued variable representation at each node in a Bayesian network by a two-stage process of tree-structured vector quantization is discussed. The overall classifier may be part of an object detector program that is trained to automatically detect many different types of 3D objects (e.g., human faces, airplanes, cars, etc.). Computationally efficient statistical methods to evaluate overall classifiers are disclosed. The Bayesian network-based classifier may also be used to determine if two observations (e.g., two images) belong to the same category. For example, in case of face recognition, the classifier may determine whether two photographs are of the same person. A method to provide lighting correction or adjustment to compensate for differences in various lighting conditions of input images is disclosed as well. As per the rules governing abstracts, the content of this abstract should not be used to construe the claims in this application.

NTIS

Bayes Theorem; Classifiers; Detection; Image Processing; Patent Applications

20080038084 Blank Rome, LLP, Washington, DC, USA; Rochester Univ., NY USA; Houston Univ., TX, USA

Method and Apparatus for Using Adaptive Optics in a Scanning Laser Opthalmoscope

10 May 05; 17 pp.; In English
Contract(s)/Grant(s): NIH-R1EY13299-01; NSF-AST9876783
Patent Info.: Filed Filed 10 May 05; US-Patent-Appl-SN-11-125 331
Report No.(s): PB2008-101622; No Copyright; Avail.: CASI: A03, Hardcopy

A scanning laser ophthalmoscope incorporates adaptive optics to compensate for wavefront aberrations in the eye. Light from a light source is scanned onto the retina. Light reflected from the retina is detected for imaging and is also used for

wavefront sensing. The sensed wavefront aberrations are used to control an adaptive optic device, such as a deformable mirror, disposed in the path of the light from the source in order to compensate for the aberrations.
NTIS
Adaptive Optics; Eye (Anatomy); Lasers; Patent Applications

20080038666 Los Alamos National Lab., NM USA
MITEQ DR-125G-A, 12-GHz Fiber-Optic Detector Evaluations for the Photonic Doppler Velocimetry Diagnostic
Rutkowski, A.; Rutkowski, M.; January 2006; 11 pp.; In English
Report No.(s): DE2007-917717; No Copyright; Avail.: National Technical Information Service (NTIS)

The 12.5-GHz bandwidth MITEQ DR-125G-A detector is used often in the photonic Doppler velocimetry (PDV) diagnostic of Los Alamos National Laboratory (LANL). This paper presents detector characteristics as applied to optical heterodyning. We propose a test setup to simulate the beat frequency generated when incident and reflected light from a moving surface are mixed by optically combining a small-linewidth, tunable laser with a fixed, 1550-nm, thin-linewidth, high-power laser. The detectors transfer function, harmonic content, and signal-to-noise ratio (SNR) were to be measured and plotted for different optical power levels. Based on these results, appropriate light levels can be set to produce the highest dynamic range and signal level for the beat frequency. The goal is to provide insight into setting up the diagnostic for optimal detector performance using a specific optical input power.
NTIS
Fiber Optics; Heterodyning; Quantum Mechanics; Velocity Measurement

20080038696 Victoria Univ., British Columbia Canada
Polarization Vision and the Development of Retinal Network Models. Neuronal Information Transfer Functions from Cones and Horizontal Cells to Bipolar Cells
Hawryshyn, Craig; Kamermans, Maarten; Jan 2008; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0070
Report No.(s): AD-A482268; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482268

The visual system has an extraordinary processing capability. Often the vertebrate visual system surpasses man-made imaging devices in flexibility and performance. Using knowledge of retinal physiology and retinal information transfer schemes will lead to the development of very flexible and high performance imaging devices. The overall objective of the program is to move towards the development of polarization chip technology for use in imaging devices in autonomous vehicles performing under extreme optical conditions. To fulfill this aim, a collaboration was started between Dr. Craig Hawryshyn, an expert in polarization vision and Dr. Maarten Kamermans, an expert in retinal circuitry. This team examined the information transfer function and the retinal processing of polarization information, in order to develop mathematical models of polarization vision. The experiments dealing with polarization vision were conducted in Kingston (Canada), while those regarding the transfer functions from photoreceptors to horizontal cells and bipolar cells were performed in Amsterdam (The Netherlands).
DTIC
Bipolarity; Information Transfer; Mathematical Models; Models; Networks; Neurophysiology; Retina; Transfer Functions; Vision

20080038711 Naval Research Lab., Washington, DC USA
Analog Fiber Optic Link with DC-100 MHz Bandwidth
Sullivan, C A; Girardi, P G; Lohrmann, Dieter R; May 30, 2008; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482305; NRL/MR/5740-08-9066; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482305

An analog fiber optic link covering the frequency range from DC to 100 MHz was designed, constructed, and tested, in order to connect a 10 kA pulse current probe to oscilloscopes for oscillographing laser filament induced arc currents.
DTIC
Analogs; Bandwidth; Direct Current; Fiber Optics

20080038863 Naval Research Lab., Washington, DC USA

Correlating Growth Conditions with Photoluminescence and Lasing Properties of Mid-IR Antimonide Type II 'W' Structures

Canedy, C L; Boishin, G I; Bewley, W W; Kim, C S; Vurgaftman, I; Kim, M; Lindle, J R; Meyer, J R; Whitman, L J; Jun 9, 2004; 6 pp.; In English

Report No.(s): AD-A482468; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We explored the evolution of the photoluminescence (PL) properties versus molecular beam epitaxy growth conditions for a series of type II 'W' quantum well [InAs/GaInSb/InAs/AlAsSb] structures. The highest PL intensities are obtained when the quantum wells are grown in a temperature range between 487 and 507 C. Cross-sectional scanning tunneling microscopy was used to explain the temperature evolution of the PL. AlAs clustering within the AlAsSb barrier was observed at low growth temperature. The PL intensity decrease at high temperature was related to In clustering in the GaInSb layer. Laser structures grown at both 425 and 500 C displayed lower lasing thresholds, lower internal losses, and longer Shockley Read lifetimes than any similar structures grown previously at NRL. A thicker optical cladding layer of 3.5 mm suppressed mode leakage into the substrate and reduced the internal loss to 2.1 /cm at 78 K.

DTIC

Antimonides; Correlation; Infrared Radiation; Lasing; Molecular Beam Epitaxy; Photoluminescence; Quantum Wells

20080038933 Defence Science and Technology Organisation, Victoria, Australia

Operation Manual for Measurement and Discrete Layer Peeling of Fibre Bragg Grating Spectra

Brooks, Chris; Davis, Claire; Feb 2008; 67 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482574; DSTO-TN-0801; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document is a manual detailing the operation of an interrogation system for measuring the complex reflection spectrum of a Bragg grating. The manual also describes custom-designed software for deconvolving this data to determine the pitch profile of the grating by using a discrete layer peeling technique. This information can be used to determine the strain profile experienced by the grating in cases where the grating length spans the localised strain field.

DTIC

Bragg Gratings; Fiber Optics; Fibers; Manuals; Peeling

20080039136 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Introduction to Focus-Diverse Phase Retrieval

Dean, Bruce H.; October 08, 2006; 1 pp.; In English; Frontiers in Optics, 8-10 Oct. 2006, Rochester, NY, USA; Copyright; Avail.: Other Sources

The fundamental physics of the image-based approach is discussed in addition to various applications of the image-based algorithms. Specification of the optimal amount of defocus diversity is solved by identification as a Talbot effect.

Author

Imaging Techniques; Algorithms; Defocusing; Wave Fronts; Optical Properties; Diffraction; Scalars; Segmented Mirrors; Image Analysis

20080039138 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Development of a Cryogenic Thermal Distortion Measurement Facility for Testing the James Webb Space Telescope Instrument Support Integration Module 2-D Test Assemblies

Miller, Franklin; Bagdanove, paul; Blake, Peter; Canavan, Ed; Cofie, Emmanuel; Crane, J. Allen; Dominquez, Kareny; Hagopian, John; Johnston, John; Madison, Tim; Miller, Dave; Oaks, Darrell; Williams, Pat; Young, Dan; Zukowski, Barbara; Zukowski, Tim; July 12, 2007; 1 pp.; In English; Space Cryogenics Workshop, 12-13 Jul. 2007, Huntsville, AL, USA; Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope Instrument Support Integration Module (ISIM) is being designed and developed at the Goddard Space Flight Center. The ISM Thermal Distortion Testing (ITDT) program was started with the primary objective to validate the ISM mechanical design process. The ITDT effort seeks to establish confidence and demonstrate the ability to predict thermal distortion in composite structures at cryogenic temperatures using solid element models. This-program's goal is to better ensure that ISIM meets all the mechanical and structural requirements by using test results to verify or improve structural modeling techniques. The first step to accomplish the ITDT objectives was to design, and then construct solid element models of a series 2-D test assemblies that represent critical building blocks of the ISIM structure. Second, the actual test assemblies consisting of composite tubes and invar end fittings were fabricated and tested for thermal distortion. This

paper presents the development of the GSFC Cryo Distortion Measurement Facility (CDMF) to meet the requirements of the ISIM 2-D test. assemblies, and other future ISIM testing needs. The CDMF provides efficient cooling with both a single, and two-stage cryo-cooler. Temperature uniformity of the test assemblies during thermal transients and at steady state is accomplished by using sapphire windows for all of the optical ports on the radiation shields and by using .thermal straps to cool the test assemblies. Numerical thermal models of the test assemblies were used to predict the temperature uniformity of the parts during cooldown and at steady state. Results of these models are compared to actual temperature data from the tests. Temperature sensors with a 0.25K precision were used to insure that test assembly gradients did not exceed 2K lateral, and 4K axially. The thermal distortions of two assemblies were measured during six thermal cycles from 320K to 35K using laser interferometers. The standard deviation for all of the distortion measurements is less than 0.5 microns, which falls within the ISIM requirement of 3 microns.
Author
James Webb Space Telescope; Cryogenic Temperature; Temperature Distribution; Distortion; Modules; Coolers; Temperature Measurement

20080039147 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Kilopixel Pop-Up Bolometer Arrays for the Atacama Cosmology Telescope
Chervenak, J. A.; Wollack, E.; Henry, R.; Moseley, S. H.; Niemack, M.; Staggs, S.; Page, L.; Doriese, R.; Hilton, G. c.; Irwin, K. D.; December 06, 2007; 1 pp.; In English; SOFIA 2020 Vision Scientific and Technological Opportunities Workshop, 6-8 Dec. 2007, Pasadena, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The recently deployed Atacama Cosmology Telescope (ACT) anticipates first light on its kilopixel array of close-packed transition-edge-sensor bolometers in November of 2007. The instrument will represent a full implementation of the next-generation, large format arrays for millimeter wave astronomy that use superconducting electronics and detectors. Achieving the practical construction of such an array is a significant step toward producing advanced detector arrays for future SOFIA instruments. We review the design considerations for the detector array produced for the ACT instrument. The first light imager consists of 32 separately instrumented 32-channel pop-up bolometer arrays (to create a 32x32 filled array of mm-wave sensors). Each array is instrumented with a 32-channel bias resistor array, Nyquist filter array, and time-division SQUID multiplexer. Each component needed to be produced in relatively large quantities with suitable uniformity to meet tolerances for array operation. An optical design was chosen to maximize absorption at the focal plane while mitigating reflections and stray light. The pop-up geometry (previously implemented with semiconducting detectors and readout on the SHARC II and HAWC instruments) enabled straightforward interface of the superconducting bias and readout circuit with the 2D array of superconducting bolometers. The array construction program balanced fabrication challenges with assembly challenges to deliver the instrument in a timely fashion. We present some of the results of the array build and characterization of its performance.
Author
Cosmology; SOFIA (Airborne Observatory); Superconductivity; Optical Equipment; Design Analysis; Millimeter Waves; Deployment

20080039158 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Importance of High Spatial and Appropriate Spectral Resolution Spectroscopy
Gull, Theodore; November 13, 2007; 1 pp.; In English; Astrophysics 2020: Large Space Missions Beyond the Next Decade, 13-15 Nov. 2007, Baltimore, MD, USA; No Copyright; Avail.: Other Sources; Abstract Only

Many diverse astronomical sources are resolved with diffraction-limited large telescopes. Application of appropriate dispersion spectroscopy unveils much information on the physics of these objects ranging from gamma ray bursters in host galaxies, star-formation regions and central engines in nearby galaxies, structures in galactic nebulae, resolved binaries with mass exchange, extended winds of massive stars, protoplanetary systems, and comets, asteroids and planets within our own solar system. Active optics and interferometers coupled with spectrographs can provide near-diffraction-limited spectroscopy from the ground but only longward of one micron. Below one micron, and certainly below 6000A, we must turn to space-based large telescopes equipped with spectrographs capable of providing spatially diffraction-limited spectroscopy of astronomical sources. Examples will be presented from the HST/STIS, ground-based and other instruments on science that has been accomplished. Suggestions will be made of what might be possible, and limitations thereof, with future large monolithic, multiple mirror or interferometric telescopes equipped with spectrographs that would be matched to the diffraction limit of the telescope.
Author
Spectroscopy; Telescopes; Diffraction

20080039162 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Photogrammetric Metrology for the James Webb Space Telescope Integrated Science Instrument Module

Nowak, Maria; Crane, Allen; Davila, Pam; Eichhorn, William; Gill, James; Herrera, Acey; Hill, Michael; Hylan, Jason; Jetten, Mark; Marsh, James; Ohl, Raymond; Quigley, Rob; Redman, Kevin; Sampler, Henry; Wright, Geraldine; Young, Philip; August 26, 2007; 2 pp.; In English; SPIE Optics and Photonics, 26-30 Aug. 2007, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a 6.6m diameter, segmented, deployable telescope for cryogenic IR space astronomy (approximately 40K). The JWST Observatory architecture includes the Optical Telescope Element and the Integrated Science Instrument Module (ISIM) element that contains four science instruments (SI) including a Guider. The ISM optical metering structure is a roughly 2.2x1.7x2.2m, asymmetric frame that is composed of carbon fiber and resin tubes bonded to invar end fittings and composite gussets and clips. The structure supports the SIs, isolates the SIs from the OTE, and supports thermal and electrical subsystems. The structure is attached to the OTE structure via strut-like kinematic mounts. The ISIM structure must meet its requirements at the approximately 40K cryogenic operating temperature. The SIs are aligned to the structure's coordinate system under ambient, clean room conditions using laser tracker and theodolite metrology. The ISIM structure is thermally cycled for stress relief and in order to measure temperature-induced mechanical, structural changes. These ambient-to-cryogenic changes in the alignment of SI and OTE-related interfaces are an important component in the JWST Observatory alignment plan and must be verified. We report on the planning for and preliminary testing of a cryogenic metrology system for ISIM based on photogrammetry. Photogrammetry is the measurement of the location of custom targets via triangulation using images obtained at a suite of digital camera locations and orientations. We describe metrology system requirements, plans, and ambient photogrammetric measurements of a mock-up of the ISIM structure to design targeting and obtain resolution estimates. We compare these measurements with those taken from a well known ambient metrology system, namely, the Leica laser tracker system. We also describe the data reduction algorithm planned to interpret cryogenic data from the Flight structure. Photogrammetry was selected from an informal trade study of cryogenic metrology systems because its resolution meets sub-allocations to ISIM alignment requirements and it is a non-contact method that can in principle measure six degrees of freedom changes in target location. In addition, photogrammetry targets can be readily related to targets used for ambient surveys of the structure. By thermally isolating the photogrammetry camera during testing, metrology can be performed in situ during thermal cycling. Photogrammetry also has a small but significant cryogenic heritage in astronomical instrumentation metrology. It was used to validate the displacement/deformation predictions of the reflectors and the feed horns during thermal/vacuum testing (90K) for the Microwave Anisotropy Probe (MAP). It also was used during thermal vacuum testing (100K) to verify shape and component alignment at operational temperature of the High Gain Antenna for New Horizons. With tighter alignment requirements and lower operating temperatures than the aforementioned observatories, ISIM presents new challenges in the development of this metrology system.
Author

James Webb Space Telescope; Photogrammetry; Metrology

20080039171 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Optical Modeling of the Alignment and Test of the NASA James Webb Space Telescope

Howard, Joseph M.; Hayden, Bill; Keski-Kuha, Ritva; Feinberg, Lee; March 03, 2007; 6 pp.; In English; IEEE Aerospace Conference, 3-10 Mar. 2007, Big Sky, MT, USA; Original contains black and white illustrations

Report No.(s): IEEEAC Paper 1154, Version 3; Copyright; Avail.: Other Sources

Optical modeling challenges of the ground alignment plan and optical test and verification of the NASA James Webb Space Telescope are discussed. Issues such as back-out of the gravity sag of light-weighted mirrors, as well as the use of a sparse-aperture auto-collimating flat system are discussed. A walk-through of the interferometer based alignment procedure is summarized, and sensitivities from the sparse aperture wavefront test are included as examples.'
Author

James Webb Space Telescope; Collimation; Apertures; Mirrors; Wave Fronts; Alignment

75
PLASMA PHYSICS

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

20080036833 NASA Marshall Space Flight Center, Huntsville, AL, USA
Numerical Investigation of Plasma Detachment in Magnetic Nozzle Experiments
Sankaran, Kamesh; Polzin, Kurt A.; July 20, 2008; 2 pp.; In English; AIAA Joint Propulsion Conference, 20-23 Jul. 2008, Hartford, CT, USA; Original contains black and white illustrations
Contract(s)/Grant(s): SAA805968; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080036833

At present there exists no generally accepted theoretical model that provides a consistent physical explanation of plasma detachment from an externally-imposed magnetic nozzle. To make progress towards that end, simulation of plasma flow in the magnetic nozzle of an arcjet experiment is performed using a multidimensional numerical simulation tool that includes theoretical models of the various dispersive and dissipative processes present in the plasma. This is an extension of the simulation tool employed in previous work by Sankaran et al. The aim is to compare the computational results with various proposed magnetic nozzle detachment theories to develop an understanding of the physical mechanisms that cause detachment. An applied magnetic field topology is obtained using a magnetostatic field solver (see Fig. I), and this field is superimposed on the time-dependent magnetic field induced in the plasma to provide a self-consistent field description. The applied magnetic field and model geometry match those found in experiments by Kuriki and Okada. This geometry is modeled because there is a substantial amount of experimental data that can be compared to the computational results, allowing for validation of the model. In addition, comparison of the simulation results with the experimentally obtained plasma parameters will provide insight into the mechanisms that lead to plasma detachment, revealing how they scale with different input parameters. Further studies will focus on modeling literature experiments both for the purpose of additional code validation and to extract physical insight regarding the mechanisms driving detachment.
Author
Numerical Analysis; Magnetic Nozzles; Magnetohydrodynamic Flow; Detachment

20080037552 NASA Marshall Space Flight Center, Huntsville, AL, USA
Relationship Between Alfvenic Fluctuations and Heavy Ion Heating in the Cusp at 1 Re
Coffey, Victoria; Chandler, Michael; Singh, Nagendra; May 27, 2008; 1 pp.; In English; 2008 American Geophysical Union Joint Assembly, 27-30 May 2008, Fort Lauderdale, Fl, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

We look at the effect of heavy ion heating from their coupling with observed broadband (BB-ELF) emissions. These wave fluctuations are common to many regions of the ionosphere and magnetosphere and have been described as spatial turbulence of dispersive Alfven waves (DAW) with short perpendicular wavelengths. With Polar passing through the cusp at 1 Re in the Spring of 1996, we show the correlation of their wave power with mass-resolved O+ derived heating rates. This relationship lead to the study of the coupling of the thermal O+ ions and these bursty electric fields. We demonstrate the role of these measurements in the suggestion of DAW and stochastic ion heating and the observed density cavity characteristics.
Author
Magnetohydrodynamic Waves; Heavy Ions; Plasma Heating; Broadband

20080038893 Naval Research Lab., Washington, DC USA
Time Dependent Filamentation and Stimulated Brillouin Forward Scattering in Inertial Confinement Fusion Plasmas
Schmitt, Andrew J; Afeyan, Bedros B; Nov 15, 1997; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482511; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerical simulations of the temporal evolution of laser light filamentation and stimulated Brillouin forward scattering (SBFS) in plasmas, under conditions that are relevant to laser fusion, are presented and analyzed. Long term unsteady behavior of filaments is observed to be the norm. Temporal and spatial incoherence due to filamentation and SBFS are impressed upon time-independent incident laser beams. The bandwidth and angular divergence imposed upon the beam increase with the strength of the interaction. In addition, the spectrum of the transmitted light is redshifted by an amount that increases with the interaction strength. Spectral analysis of the transmitted light reveals that SBFS plays a role in the generation of the observed temporal incoherence. Incident beams with some spatial incoherence but no temporal smoothing are compared to those with

ab initio temporal beam smoothing (TBS). Under typical conditions, TBS beams will undergo far less angular and spectral spreading and far less SBFS than unsmoothed beams.
DTIC
Brillouin Effect; Forward Scattering; Inertial Confinement Fusion; Plasmas (Physics); Time Dependence

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*.

20080037342 National Renewable Energy Lab., Golden, CO, USA
Wafer Characteristics Via Reflectometry
Sopori, B. L., Inventor; 14 Mar 03; 31 pp.; In English
Contract(s)/Grant(s): DE-AC36-99GO10337
Patent Info.: Filed Filed 14 Mar 03; US-Patent-Appl-SN-10-535 291
Report No.(s): PB2008-101938; No Copyright; Avail.: CASI: A03, Hardcopy

Various exemplary methods are directed to determining wafer thickness and/or wafer surface characteristics. An exemplary method includes measuring reflectance of a wafer and comparing the measured reflectance to a calculated reflectance or a reflectance stored in a database. Another exemplary method includes positioning a wafer on a reflecting support to extend a reflectance range. An exemplary device has an input , analysis modules and optionally a database. Various exemplary reflectometer chambers include radiation sources positioned at a first altitudinal angle and at a second altitudinal angle. An exemplary method includes selecting radiation sources positioned at various altitudinal angles. An exemplary element includes a first aperture and a second aperture that can transmit reflected radiation to a fiber and an imager, respectfully.
NTIS
Optical Measurement; Patent Applications; Wafers

20080037781 Foley and Lardner, Milwaukee, WI, USA; Michigan Biotechnology Inst., Lansing, MI, USA
Electrochemical Methods for Generation of a Biological Proton Motive Force and Pyridine Nucleotide Cofactor Regeneration
Zeikus, G. J., Inventor; Shin, H. S., Inventor; Jain, M. K., Inventor; 23 Mar 05; 26 pp.; In English
Contract(s)/Grant(s): DE-FG02-93ER20108
Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-088 278
Report No.(s): PB2008-100709; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed are methods using neutral red to mediate the interconversion of chemical and electrical energy. Electrically reduced neutral red has been found to promote cell growth and formation of reduced products by reversibly increasing the ratio of the reduced:oxidized forms of NAD(H) or NADP(H). Electrically reduced neutral red is able to serve as the sole source of reducing power for microbial cell growth. Neutral red is also able to promote conversion of chemical energy to electrical energy by facilitating the transfer of electrons from microbial reducing power to a fuel cell cathode.
NTIS
Cell Division; Patent Applications; Protons; Pyridine Nucleotides

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20080038721
Relativistic Quantum Information Theory
Adami, Christoph; Nov 20, 2007; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0207
Report No.(s): AD-A482323; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482323

We have studied the physics of the relative state of quantum detectors that move with respect to each other and their

sources, that are accelerated with respect to the source, and that are placed within the gravitational field of a black hole. We outline the general theory of how the entanglement of polarized photons changes under relativistic Lorentz transformations, and have studied quantum information transmission in the presence of a black hole. A description of the accretion of photons by black holes within curved-space quantum field theory has revealed that information is not lost as the photons are absorbed by the black hole because the process of stimulated emission of radiation guarantees that information always stays outside of the event horizon, thus solving the black hole information paradox. We also show that stimulated emission turns a black hole into a nearly optimal quantum cloning device, and calculate the cloning fidelity as a function of the black hole absorption coefficient. Finally, we study stimulated emission for accelerated grey bodies in Rindler space, and formulate a framework for consecutive measurements of the same quantum system that allows for a description of the causal dynamics of quantum systems without reference to a time variable.
DTIC
Information Theory; Quantum Theory; Relativistic Theory

20080038722 Washington Univ., Saint Louis, MO USA
Group Theoretical Approach for Controlled Quantum Mechanical Systems
Tarn, Tzyh-Jong; Nov 6, 2007; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0386
Report No.(s): AD-A482325; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482325

The aim of this research is the study of controllability of quantum mechanical systems and feedback control of de-coherence in order to gain an insight on the structure of control of quantum systems. During the reporting period, many important results have been obtained. Particularly, we have obtained results on (1) Controllability of quantum systems possesses infinite-dimensional system Lie-algebra, and (2) Feedback control of de-coherence in open quantum systems. Algebraic conditions for controllability and the control of de-coherences were obtained. To our knowledge no such conditions existed in the literature for quantum mechanical systems. The obtained results are very important. They will guide us on how to control a quantum system with scattering states (possesses continuous spectrum) and help us to design feedback control for quantum systems. Additionally we have published our results in high standard journals and presented our results at prestigious conferences. The PI was invited to give invited and plenary addresses at important control conferences.
DTIC
Control Systems Design; Mechanical Properties; Quantum Theory

20080038873 Iowa State Univ. of Science and Technology, Ames, IA USA
Decoherence and Noise in Spin-based Solid State Quantum Computers. Approximation-Free Numerical Simulations
Harmon, Bruce N; Dobrovitski, Viatcheslav V; Jul 21, 2007; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-03-1-0132
Report No.(s): AD-A482480; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project has developed and used advanced high-precision numerical techniques to accurately assess the details of the decoherence process governing the dynamics of qubits interacting with spin environments. Analytical results and coherent state numerical techniques (similar to those pioneered in quantum optics by R. Glauber) have also been developed and applied. Most recently, specific strategies for quantum control have been investigated for realistic systems in order to extend the coherence times for spin-based quantum computing implementations. Many of the investigations were motivated by recent laboratory results and were studied and driven via interactions with experimental groups supported by the QC program. 14 publications were produced, 18 invited talks given, and 4 postdocs were trained.
DTIC
Quantum Computers; Solid State

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080038054 Government Accountability Office, Washington, DC, USA
NASA Workforce: Briefing on National Aeronautics and Space Administration's Use of Term Appointments
September 10, 2008; 32 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-08-920R; No Copyright; Avail.: CASI: A03, Hardcopy

Congress expanded NASA's ability to use term appointments to fill civil service positions in 2004. NASA sought this

flexibility to ensure that it could hire and retain the workforce it desired. In a joint explanatory statement accompanying the Consolidated Appropriations Act, 2008 (Pub. L. No. 110-161), the Government Accountability Office (GAO) reviewed NASA's use of term appointments for civil servant positions. The GAO briefed the committees on the results of the review. This report summarizes that briefing, which is reprinted in full as an enclosure. As agreed to by the committees, this concludes the work performed under this mandate.
Derived from text
NASA Programs; Human Resources; Personnel; Personnel Management; Management Planning

20080039133 NASA Dryden Flight Research Center, Edwards, CA, USA
We Don't Need Any Stinking AFSRB!
Henwood, Barton; May 08, 2008; 18 pp.; In English; Flight Test Safety Workshop, 6-8 May 2008, Melbourne, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080039133

Flight Test supports four needs: a) Management approval to proceed; b) Establish a record of accountability; c) Inject expert insight into the risk management process; and d) Mitigate the human factors vulnerabilities associated with small group teaming and project ownership.
Derived from text
Human Factors Engineering; Risk Management; Flight Tests

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*.

20080037393 Newcastle-upon-Tyne Univ., Newcastle, UK
Control Blocks: Tangible Tools for Tabletop Groupware
Hook, J.; Olivier, P.; May 2007; 5 pp.; In English
Report No.(s): PB2008-102603; CS-TR-1022; Copyright; Avail.: National Technical Information Service (NTIS)

We propose Control Blocks, a system of graspable interface tools designed to bring the benefits of tangible interaction to the complex tasks required of the tabletop computer groupware environment. Control blocks are physical artefacts, directly associated with virtual content. They are however augmented with large mechanical controls to provide the manipulation of additional functionality without compromising the tools physical nature.
NTIS
Software Development Tools; Interfaces; Computer Programs

20080037411 Bureau of Economic Analysis, Washington, DC, USA
BEA (Bureau of Economic Analysis) Government Statistics Users Conference (2nd). Held in Washington, DC. on September 14, 2006. Conference Report
Hamano, A.; Ludlow, E.; Rider, R.; Oct. 06, 2006; 15 pp.; In English; BEA (Bureau of Economic Analysis) Government Statistics Users Conference (2nd)., September 14, 2006, Washington, DC.
Report No.(s): PB2008-102600; No Copyright; Avail.: CASI: A03, Hardcopy

The 2nd BEA Government Statistics Users Conference was held on September 14, 2006, from 9:00 a.m. to 12:15 p.m. in the conference center at BEA in downtown Washington, D.C. Brooks Robinson, Chief of the Government Division, served as the conference moderator. The conference presenters included representatives from BEA and other Federal agencies. Conference attendees included both data users and data suppliers representing Federal agencies and economic research organizations.
NTIS
Conferences; Economic Analysis

20080037486 Department of Defense, Washington, DC USA
Department of Defense Net-Centric Data Strategy
Stenbit, John P; May 9, 2003; 31 pp.; In English
Report No.(s): AD-A482100; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the December 2001 memorandum Interoperability and Data Management, the DoD CIO requested development of an enterprise level data strategy to advance the Department toward the goal of network centric operations. A Core Data Management Working Group, with representatives from across the Department, was established to develop this strategy consistent with other net-centric initiatives, such as the Global Information Grid (GIG) Enterprise Services. The attached DoD Net-Centric Data Strategy provides a key enabler of the Department's Transformation by establishing the foundation for managing the Department's data in a net-centric environment.
DTIC
Data Management; Defense Program; Interoperability

20080037488 Department of Defense, Washington, DC USA
Strategy for a Net-Centric, Service Oriented DoD Enterprise
Grimes, John G; May 4, 2007; 19 pp.; In English
Report No.(s): AD-A482076; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document describes the Department of Defense's (DoD's) vision for establishing a Net- Centric Environment (NCE) that increasingly leverages shared services and Service Oriented Architecture (SOA). The DoD's NCE is a framework for human and technical connectivity and interoperability that allows DoD users and mission partners to share and protect information and to make informed decisions. The NCE consists of numerous mission and business services and common and shared infrastructure services. This strategy is applicable to DoD's Warfighting, Business, DoD Intelligence, and Enterprise Information Environment (ElE) Mission Areas and Joint Capability Portfolios. The Net-Centric Services Strategy (NCSS) expands upon the DoD Net-Centric Data Strategy (May 2003) by connecting services to the Data Strategy goals. The NCSS is consistent with other DoD net-centric strategies and guidance. Separate DoD issuances will be provided to address NCSS implementation details and specific technical guidance.
DTIC
Information Systems; Interoperability

20080037786 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Presence Personalization and Persistence: A New Approach to Building Archives to Support Collaborative Research
McGlynn, Thomas A.; November 2, 2008; 1 pp.; In English; Astronomical Data Analysis Systems and Software (ADASS meeting), 2-6 Nov. 2008, Quebec, Canada; No Copyright; Avail.: Other Sources; Abstract Only

We discuss approaches to building archives that support the way most science is done. Today research is done in formal teams and informal groups. However our on-line services are designed to work with a single user. We have begun prototyping a new approach to building archives in which support for collaborative research is built in from the start. We organize the discussion along three elements that we believe to be necessary for effective support: We must enable user presence in the archive environment; users must be able to interact. Users must be able to personalize the environment, adding data and capabilities useful to themselves and their team. These changes must be persistent: subsequent sessions must be able to build upon previous sessions. In building the archive we see the large multi-player interactive games as a paradigm of how this approach can work. These three 'P's are essential in gaming as well and we shall use insights from the gaming world and virtual reality systems like Second Life in our prototype.
Author
Research; On-Line Systems; Prototypes; Human-Computer Interface; User Requirements; Information Management; Data Storage; Data Retrieval; Teams

20080037926 Paine Coll., Augusta, GA USA
Organizational Metrics: A Progress Report
Lawless, W F; Wood, Joseph; Tung, Hui-Lien; Jun 2007; 7 pp.; In English
Report No.(s): AD-A481529; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481529

The traditional model of an organization is predicated on the correspondence between reality and the aggregated observations reported by its individual members. But the evidence indicates that observational data alone cannot reconstruct

an organization's actual status (Levine & Moreland, 1998). The well-known result is that traditional organizational theory has failed (Weick & Quinn, 1999), leading Pfeffer & Fong (2005) to propose that illusions are a critical missing ingredient. We agree, and have constructed an alternative to assume that social reality is predicated on a bistable interdependence between observational illusions that may not correspond to reality ('fog of war') and physical actions.
DTIC
Research Management; Organizations; Stability

20080038010 Department of Defense, Washington, DC USA
The Department of Defense Information Assurance Strategic Plan. Volume 1.1
Jan 2004; 21 pp.; In English
Report No.(s): AD-A482003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our first Strategic Plan which was published in October 2003 was a major accomplishment and provided a solid foundation and framework for how we will assure the Department's information. The Vision and Goals in our Strategic Plan are enduring and serve to define a consistent strategic direction to assuring our information. As we stated last year the Strategic Plan is a living document and we are committed to updating the Plan to ensure our efforts remain a vital and accurate reflection of the major issues facing the Department. We have aligned our investments and strategic initiatives to our Goals and are continuing to define and track milestones and performance measures to gauge their success. While the overall framework and basic tenets of the Strategic Plan are still valid we are placing a greater emphasis on a number of areas to reflect the strategic priorities of the Department: * We have refined the mission statement to reflect the critical role of IA in the Net-Centric Warfare (NOW) mission and to address the priorities of the Assistant Secretary of Defense for Networks and Information Integration (NII). We have refined strategic and performance objectives for Goals #1 2 and 3 to provide a strategic focus on Net-centric transformation and the need for an enterprise IA architecture and policy. Additional emphasis has been placed on the implementation and deployment of key capabilities such as Public Key Infrastructure (PKI) biometrics and the transformation of the Security Management Infrastructure (SMI). We have refined strategic and performance objectives for Goal #4 to provide a stronger emphasis on full lifecycle integration for IA throughout the acquisition process and increased accountability through program management and perform performance measurement.
DTIC
Defense Program; Networks; Project Management; Policies; Warfare

20080038039 California Univ., Berkeley, CA USA
Extensible Systems Dynamics Framework
Brooks, Christopher; Lee, Edward A; Apr 2008; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-C-0053; Proj-558S
Report No.(s): AD-A481830; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA481830

Modern defense strategy and execution has become more net-centric and distributed, allowing more information to be made available more rapidly. The warfighter must assemble decision-quality information from potentially inaccurate, or even conflicting, pieces of information collected from multiple sources. The Pedigree Management and Assessment Framework (PMAF) enables the publisher of information to record standard pedigree, such as information about the source, manner of collection, and the chain of modification of that information. In addition, the publisher can define and include other related information relevant to quality assessment, such as domain-specific information about sensor accuracy or organizational structure of agencies. PMAF stores this potentially enormous amount of information in a volume-efficient manner and presents the information to the user in an intuitive graphical format, together with PMAF-generated assessments that allow the user to quickly estimate information quality. PMAF has been created to be compatible with the Air Force Research Laboratory's Operational Information Management framework and a Web Services environment. It can access pedigree information across communities-of-interest and across network boundaries.
DTIC
Information Retrieval; Information Transfer; Information Management; Research Management; Information Systems

20080038717 Naval Postgraduate School, Monterey, CA USA

SecureCore Software Architecture: Trusted Management Layer (TML) Kernel Extension Module Interface Specification

Shifflett, David J; Clark, Paul C; Irvine, Cynthia E; Nguyen, Thuy D; Vidas, Timothy M; Levin, Timothy E; Jan 2008; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): CNS-0430566; CNS-0430598

Report No.(s): AD-A482317; NPS-CS-07-021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482317

A mobile computing device has more inherent risk than desktops or most other stationary computing devices. Such mobile devices are typically carried outside of a controlled physical environment, and they must communicate over an insecure medium. The risk is even greater if the data being stored, processed, and transmitted by the mobile device is classified. The purpose of the SecureCore research project is to investigate fundamental architectural features required for the trusted operation of mobile computing devices such as smart cards, embedded controllers, and hand-held computers. The goal is to provide secure processing and communication features for resource-constrained platforms, without compromise of performance, size, cost, or energy consumption. In this environment, the security must also be built-in, transparent, and flexible. This document describes the interfaces for kernel extension modules that may be incorporated into the Trusted Management Layer (TML), specifically the Least Privilege Separation Kernel (LPSK). The LPSK is composed of modules which are used as the building blocks of the kernel implementation. These modules are referred to as core kernel modules. Kernel extension modules are separate from the core LPSK modules, providing additional functionality. Included in this document are interfaces that the LPSK provides for the kernel extension modules to call, as well as interfaces the kernel extension modules present for the LPSK to call under certain circumstances.

DTIC

Application Programming Interface; Computer Information Security; Computer Programming; Computer Programs; Computers; Kernel Functions; Security; Software Engineering

20080038718 Naval Postgraduate School, Monterey, CA USA

SecureCore Software Architecture: Trusted Management Layer (TML) Kernel Extension Module Integration Guide

Shifflett, David J; Clark, Paul C; Irvine, Cynthia E; Nguyen, Thuy D; Vidas, Timothy M; Levin, Timothy E; Dec 2007; 18 pp.; In English

Contract(s)/Grant(s): CNS-0430566; CNS-0430598

Report No.(s): AD-A482318; NPS-CS-07-022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482318

A mobile computing device has more inherent risk than desktops or most other stationary computing devices. Such mobile devices are typically carried outside of a controlled physical environment, and they must communicate over an insecure medium. The risk is even greater if the data being stored, processed, and transmitted by the mobile device is classified. The purpose of the SecureCore research project is to investigate fundamental architectural features required for the trusted operation of mobile computing devices such as smart cards, embedded controllers, and hand-held computers. The goal is to provide secure processing and communication features for resource-constrained platforms, without compromise of performance, size, cost, or energy consumption. In this environment, the security must also be built-in, transparent, and flexible. This document describes the requirements for building kernel extension modules that may be incorporated into the Trusted Management Layer (TML), specifically the Least Privilege Separation Kernel (LPSK). The LPSK is composed of modules which are used as the building blocks of the kernel implementation. These modules are referred to as core kernel modules. Kernel extension modules are separate from the core LPSK modules, providing additional functionality. Integration of extension modules with the LPSK is described, including coding techniques, and compile and link directions.

DTIC

Computer Information Security; Computer Programming; Computer Programs; Computers; Kernel Functions; Requirements; Security; Software Engineering

20080038744 HRL Labs., LLC, Malibu, CA USA

Scalable Quantum Information Processing and Applications

Ross, Richard S; Gyure, Mark F; Croke, Edward T; Simms, Geoffrey D; Anderson, Chris; Kosut, Robert; Jan 19, 2008; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-C-0077

Report No.(s): AD-A482352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482352

The main goal of this program was to design fabricate and test a semiconductor device capable of demonstrating the fundamental physics required for the realization of a spin-coherent single photon transmitter/receiver system. These requirements included careful tailoring of the g factor for conduction band electrons in the InGaAs/InP materials system and the confinement detection and manipulation of single electrons under lithographically defined gates In this final report we will describe our major accomplishments.

DTIC

Conduction Bands; Data Processing; Electrons; Quantum Theory; Repeaters

20080038760 Humansystems, Inc., Guelph, Ontario Canada

Models of Information Aggregation Pertaining to Combat Identification: A Review of the Literature (Modele du Regroupement de L'information Concernant L'identification au Combat: Une Analyse Documentaire)

Famewo, Julie; Matthews, Michael; Lamoureux, Tab; Apr 2007; 61 pp.; In English

Report No.(s): AD-A482371; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482371

This report reviews research literature pertaining to models of human information aggregation in order to apply them, when possible, to combat identification (CID) decisions made by individuals in a land force context. In particular, the review examined social science, science and military literature to identify principles and theories associated with how human decision makers weigh and integrate information. The review identified a variety of heuristics and cognitive biases associated with these processes, along with formal and informal models of combining qualitative and quantitative information. The report presents current conceptualizations of combat identification and places it within the context of cue based decision making under the intuitive decision framework. By framing this complex decision we were able to evaluate the applicability of the methods of aggregation to the CID task.

DTIC

Combat; Decision Making; Surveys

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20080038670 National Transportation Safety Board, Washington, DC USA

Derailment of Chicago Transit Authority Train Number 220 Between Clark/Lake and Grand/Milwaukee Stations, Chicago, Illinois, July 11, 2006

Sep. 11, 2007; 74 pp.; In English

Report No.(s): PB2007-916302; NTSB/RAR-07/02; No Copyright; Avail.: CASI: A04, Hardcopy

On Tuesday, July 11, 2006, about 5:06 p.m., central daylight time, the last car of northbound Chicago Transit Authority Blue Line train number 220 derailed in the subway between the Clark/Lake and Grand/Milwaukee stations in downtown Chicago, Illinois. About 1,000 passengers were on board the eight-car rapid transit train. Following the derailment, the train came to a stop, and electrical arcing between the last car and the 600-volt direct current third rail generated smoke. The single operator in the lead car received a number of calls on the train intercom. The operator exited the control compartment, stepped onto the catwalk, and walked beside the train to investigate. Electrical power was removed from the third rail and most passengers walked to an emergency exit stairway about 350 feet in front of the train that led to the street level. Some passengers had to be assisted in their evacuation by emergency responders. The Chicago Fire Department reported that 152 persons were treated and transported from the scene. There were no fatalities. Total damage exceeded $1 million. The safety issues discussed in this report are poor track conditions, ineffective management and safety oversight, difficulty locating the

train, and problems with tunnel ventilation and smoke removal. As a result of its investigation of this accident, the National Transportation Safety Board makes recommendations to the Federal Transit Administration, the State of Illinois, the Regional Transportation Authority, the Chicago Transit Board, and the Chicago Transit Authority.
NTIS
Rail Transportation; Safety Management; Emergencies; Accidents; Damage

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SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20080037985 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MODIS On-board Blackbody Performance
Xiong, Xiaoxiong; Chen, N.; Wu, A.; Wenny, B.; Dodd, J.; August 25, 2008; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Currently, there are two MODIS instruments operated on-orbit: one on-board the Terra spacecraft launched in December 1999 and the other on-board the Aqua spacecraft launched in May 2002. MODIS is a scanning radiometer that has 16 thermal emissive bands (TEBs) in the MWIR and LWIR regions. The remaining spectral bands are in the VISINIR and SWIR regions. The TEBs have a total of 160 detectors (10 detectors per band), which are calibrated on-orbit using an on-board blackbody (BB). MODIS TEB calibration is performed via a quadratic algorithm with its linear calibration coefficients updated on a scan-by-scan basis using each detector's response to the BB. The offset and nonlinear terms of the quadratic calibration equation are stored in a look-up table (LUT). The LUT parameters are derived from pre-launch calibration and updated on-orbit from BB observations, as needed. Typically, the BB is set at a fixed temperature. Periodically, a warm-up and cool-down activity is performed, which enables the BB temperature to be varied from instrument ambient up to 315K. The temperature of the BB is measured each scan using 12 thermistors, which were fully characterized pre-launch with reference to the NIST temperature scale. This paper describes MODIS on-board BB operational activities and performance. The TEB detector response (short-term stability and long-term changes) and noise characterization results derived from BB observations and their impact on the TEB calibration uncertainty are also presented.
Author
MODIS (Radiometry); Terra Spacecraft; Aqua Spacecraft; Imaging Spectrometers; Spectral Bands; Thermistors; Coefficients

20080037986 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MODIS Solar Diffuser On-orbit Performance
Xiong, Xiaoxiong; Chen, H.; Choi, T.; Sun, J.; Angal, A.; July 25, 2008; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

MODIS is a key instrument for the NASA Earth Observing System (EOS), currently operated on both the Terra and Aqua missions. Each MODIS instrument has 20 reflective solar bands (RSBs) and 16 thermal emissive bands (TEBs). MODIS RSB on-orbit calibration is reflectance based using an on-board solar diffuser (SD). The SD bi-directional reflectance factors (BRFs) were characterized pre-launch using reference diffuser samples, which are traceable to NIST reflectance standards. The SD BRF on-orbit degradation (or change) is tracked by another onboard device, called the solar diffuser stability monitor (SDSM). The SDSM is operated during each scheduled SD calibration event, making alternate observations of direct sunlight and the diffusely reflected sunlight from the SD. The time series of the ratios of SDSM's SD view to its Sun view provide SD degradation information. This paper presents and compares the Terra and Aqua MODIS SD on-orbit performance. Results show that the SD on-orbit degradation depends on the amount of solar exposure of the SD plate. In addition, it is strongly wavelengthdependent, with a larger degradation rate at shorter wavelengths. For Terra MODIS, an SD door anomaly occurred in May 2003 that led to a decision to fix the door permanently at an 'open' position. Since then, the SD degradation rate has significantly increased due to more frequent solar exposure. As expected, the SD on-orbit performance directly impacts the RSB calibration performance. The lessons learned from MODIS on-orbit calibration will provide useful insights into the development and operation of future SD calibration systems.
Author
MODIS (Radiometry); Terra Spacecraft; Aqua Spacecraft; Imaging Spectrometers; Spectral Bands; Coefficients; Earth Observing System (EOS); Bidirectional Reflectance; Lessons Learned

20080038640 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Neutron Star Interior Composition Explorer (NICE)
Gendreau, Keith C.; Arzoumanian, Zaven; July 13, 2008; 8 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Original contains color illustrations
Contract(s)/Grant(s): NNG06E090A; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080038640

This viewgraph presentation contains an overview of the mission of the Neutron Star Interior Composition Explorer (NICE), a proposed International Space Station (ISS) payload dedicated ot the study of neutron stars. There are also reviews of the Science Objectives of the payload,the science measurements, the design and the expected performance for the instruments for NICE,
CASI
Neutron Stars; Payloads; Spaceborne Experiments; NASA Space Programs

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080036843 Committee on Space Research, Ottawa, Ontario, Canada
GLAST GRB Observations and Capabilities
Meegan, Charles; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Gamma Ray Large Area Space Telescope (GLAST) is schedule to launch on May 16, 2008. GLAST consists of the Large Area Telescope (LAT), which will detect gamma rays above 20 MeV with unprecedented sensitivity, and the GLAST Burst Monitor (GBM), which will provide all-sky monitoring of GRBS in the 10 kev to 30 MeV range. Predicted GRB capabilities of GLAST will be described. The on-orbit performance of the instruments and preliminary GRB observations will be presented.
Author
Fermi Gamma-Ray Space Telescope; Gamma Ray Bursts; Gamma Ray Astronomy

20080037293 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Albedo Dichotomy of Iapetus Measured at UV Wavelengths
Hendrix, Amanda R.; Hansen, Candice J.; Icarus; September 21, 2007; Volume 193, pp. 344-351; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40908; http://dx.doi.org/10.1016/j.icarus.2007.07.025

The dramatic hemispheric dichotomy in albedo displayed by Saturn's moon Iapetus has intrigued astronomers for centuries. Here we report on far-ultraviolet observations of Iapetus' bright and dark terrains from Cassini. We compare the reflectance spectra of Iapetus's dark terrain, Hyperion and Phoebe and find that both Phoebe and Hyperion are richer in water ice than Iapetus' dark terrain. Spectra of the lowest latitudes of the dark terrain display the diagnostic water ice absorption feature; water ice amounts increase within the dark material away from the apex (at 90 deg W longitude, the center of the dark leading hemisphere), consistent with thermal segregation of water ice. The water ice in the darkest, warmest low latitude regions is not expected to be stable and may be a sign of ongoing or recent emplacement of the dark material from an exogenic source.
Author
Dichotomies; Iapetus; Albedo; Hyperion

20080037294 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Ultraviolet Observations of Phoebe from the Cassini UVIS
Hendrix, Amanda R.; Hansen, Candice J.; Icarus; September 21, 2007; Volume 193, Issue 2, pp. 323-333; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40917; http://dx.doi.org/10.1016/j.icarus.2007.06.030

Observations of Saturn's distant moon Phoebe were made at far-ultraviolet (FUV) (1100-1900 A) and extreme-ultraviolet (EUV) (600-1100 A) wavelengths by the Cassini Ultraviolet Imaging Spectrograph (UVIS) during the Cassini spacecraft flyby

on June 11, 2004. These are the first UV spectra of Phoebe and the first detection of water ice on a Solar System surface using FUV wavelengths. The characteristics of water ice in the FUV are presented, and Hapke models are used to interpret the spectra in terms of composition and grain size; the use of both areal and intimate mixing models is explored. Non-ice species used in these models include carbon, ice tholin, Triton tholin, poly-HCN and kerogen. Satisfactory disk-integrated fits are obtained for intimate mixtures of approx.10% H2O plus a non-ice species. Spatially resolved regions of higher (approx.20%) and lower (approx.5%) H2O ice concentrations are also detected. Phoebe does not display any evidence of volatile activity. Upper limits on atomic oxygen and carbon are 5 x 10(exp 11) and 2 x 10(exp 12) atoms/sq. cm, respectively, for solar photon scattering. The UVIS detection of water ice on Phoebe, and the ice amounts detected, are consistent with IR measurements and contribute to the evidence for a Phoebe origin in the outer Solar System rather than in the main asteroid belt.
Author
Ultraviolet Spectrometers; Extreme Ultraviolet Radiation; Cassini Mission; Gas Giant Planets; Asteroid Belts; Space Probes; Imaging Techniques

20080037748 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Diagnosing the Structure of the HD 163296 Protoplanetary Disk Via Coronagraphic Imaging Polarimetry
Kowalski, Adam F.; Wisniewski, John P.; Clampin, M.; Grady, C. A.; Sitko, M. L.; Bjorkman, K. S.; Fukagawa, M.; Hines, D. C.; Katoh, E.; Whitney, B. A.; July 21, 2008; 1 pp.; In English; Cool Stars 15, 21-25 Jul. 2008, Saint Andrews, Scotland, UK
Contract(s)/Grant(s): NNH06CC03B; Copyright; Avail.: Other Sources; Abstract Only

Coronagraphic imaging polarimetry is a high contrast imaging technique which can diagnose both the spatial distribution and size distribution of dust grains which comprise primordial protoplanetary disks. It can therefore be a useful tool to test our understanding of how the structure of young disks evolves through the era of gas giant planet formation. We report our initial analysis of the H-band polarized and total intensity of the nearby Herbig Ae star HD 163296, and characterize the morphology of the scattered light disk in the context of previous optical HST coronagraphic imagery. Our observations were obtained as part of a multi-epoch campaign designed to diagnose and correlate the behavior of the inner and outer regions of select protoplanetary disks. This campaign will help test recent suggestions (Sitko et al. 2008; Wisniewski et al. 2008) that that HD 163296 dis experiences the novel phenomenon of time-variable self-shadowing, whereby occasional changes in the scale height of the inner disk wall induces changes in the illumination of the outer disk.
Author
Protoplanetary Disks; Stellar Structure; Coronagraphs; Imaging Techniques; Polarimetry

20080037785 NASA Goddard Space Flight Center, Greenbelt, MD, USA
SWIFT Observations AGN
Mushotzky, Richard; July 21, 2008; 1 pp.; In English; Putting Gravity to Work, 21-25 Jul. 2008, Cambridge, UK; No Copyright; Avail.: Other Sources; Abstract Only

I will present results from the x-ray and optical follow-up observations of the Swift Burst Alert Telescope (BAT) Active Galactic Nuclei (AGN) survey. I will discuss the nature of obscuration in these objects, the relationship to optical properties and the change of properties with luminosity and galaxy type.
Author
Gamma Ray Astronomy; Gamma Ray Telescopes; Swift Observatory; Onboard Equipment; Optical Properties; Active Galactic Nuclei

20080037791 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Science requirements for LISA
Stebbins, Robin T.; July 16, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly (Committee on Space Research), 16 Jul. 2008, Montreal, Quebec, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Historically, gravitational wave antennas have been characterized by their detection capability. This is measured in terms of signal-to-noise ratio, and implies a rate of false positives and false negatives. But to do useful astrophysics, one would like to measure - or more properly, estimate - astrophysical parameters of the gravitational wave sources. In the interest of strengthening the connection between science objectives and a specific instrument performance, the LISA community has reformulated the Laser Interferometer Space Antenna (LlSA) science requirements around the anticipated uncertainty in astrophysical parameter estimation. The rationale for this characterization of LlSA and a summary of the astrophysics and

fundamental physics that LISA can do will be given. LISA will be able to make precision measurements of sources out to z approximately equal to 10.
Author
LISA (Observatory); Laser Interferometry; Interferometers; Precision; Measurement; Parameter Identification

20080037795 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Hard X-Ray Emission from Scorpius X-1 Seen by INTEGRAL
Sturner, Steve; Shrader, C. R.; September 08, 2008; 1 pp.; In English; 7th INTEGRAL Workshop: An INTEGRAL View of Compact Objects, 8-11 Sep. 2008, Copenhagen, Denmark
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

We present the results of our hard X-ray and gamma-ray study of the LMXB Sco X-1 utilizing INTEGRAL data as well as contemporaneous RXTE PCA data. We have investigated the hard X-ray spectral properties of Sco X-1 including the nature of the high-energy, nonthermal component and its possible correlations with the location of the source on the soft X-ray color-color diagram. We find that Sco X-1 follows two distinct spectral tracks when the 20-40 keV count rate is greater than 130 counts/second. One state is a hard state which exhibits a significant high-energy, powerlaw tail to the lower energy thermal spectrum. The other state shows a much less significant high-energy component. We found suggestive evidence for a correlation of these hard and soft high-energy states with the position of Sco X-1 on the low-energy X-ray color-color diagram. We will also report on searches for similar behavior in other Z sources such as GX 17+2, GX 5-1, and GX 340+0.
Author
X Ray Binaries; Scorpius Constellation; X Rays; Emission

20080037800 NASA Goddard Space Flight Center, Greenbelt, MD, USA
LISA and NASA's Physics of the Cosmos Theme
Stebbins, Robin T.; June 16, 2008; 1 pp.; In English; Seventh International LISA Symposium, 16-20 Jun. 2008, Barcelona, Spain; No Copyright; Avail.: Other Sources; Abstract Only

In the past year, the LISA Project at NASA has completed a major review and has thoroughly reviewed its cost estimates. This talk will summarize the conclusions of the Beyond Einstein Program Assessment, and review the main conclusions of the cost estimation work done at NASA, including reduced mission concepts. Astro2010, the decadal review which sets priorities for astronomy and astrophysics projects in the U.S., is getting organized. Preparing for and participating in Astro2010 will be a crucial activity for the NASA side of the LISA Project in thc next 18 months.
Author
Cost Estimates; Mission Planning; Astrophysics

20080037801 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Gamma-ray Large Area Space Telescope (GLAST)
Ritz, Steve; May 27, 2008; 1 pp.; In English; University of California, Santa Cruz Institute of Particle Physics meeting, 27 May 2008, Santa Cruz, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy range 20 MeV to >300 GeV, with supporting measurements for gamma-ray bursts from 8 keV to 30 MeV. The very large field of view will make it possible to observe 20% of the sky at any instant, and the entire sky on a timescale of a few hours. With its upcoming launch, GLAST will open a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations. In addition to the science opportunities, this talk includes a description of the instruments, the opportunities for guest investigators, and the mission status.
Author
Fermi Gamma-Ray Space Telescope; Gamma Ray Bursts; Gamma Ray Telescopes; Cosmic Rays; Field of View; Active Galactic Nuclei; Black Holes (Astronomy); Ultraviolet Radiation; Background Radiation

20080037802 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Reviewing Epeak Relations with Swift and Suzaku Data
Krimm, H. A.; Yamaoka, K.; Ohno, M.; Sakamoto, T.; Sato, G.; Sugita, S.; Tashiro, M.; [2008]; 1 pp.; In English; 6th Huntsville Symposium on Gamma-Ray Bursts, 20-23 Oct. 2008, Huntsville, AL, USA; Copyright; Avail.: Other Sources; Abstract Only

in recent years several authors have derived correlations between gamma-ray burst (GRB) spectral peak energy (Epeak)

and either isotropic-equivalent radiated energy (Eiso) or peak luminosity (Liso) . Since these relationships are controversial, but could provide redshift estimators, it is important to determine whether bursts detected by Swift exhibit the same correlations. Swift has greatly added to the number of GRBs for which redshifts are known and hence Eiso and Lisc could be calculated. However, for most bursts it is not possible to adequately constrain Epeak with Swift data alone since most GRBs have Epeak above the energy range (15-50 keV) of the Swift Burst Alert Telescope (BAT). Therefore we have analyzed the spectra of 78 bursts (31 with redshift) which were detected by both Swift/BAT and the Suzaku Wide-band All-sky Monitor (WAM), which covers the energy range 50-50C0 keV. For most bursts in this sample we can precisely determine Epeak and for bursts with known redshift we can compare how the Epeak relations for the Swift/Suzaku sample compare to earlier published results.
Author
Broadband; Gamma Ray Bursts; Swift Observatory; Red Shift; Correlation

20080037805 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mini-Survey on SDSS OIII AGN with Swift
Angelini, Lorella; [2008]; 1 pp.; In English; Bologna INFN and ASDC/ASI Collaboration on New Missions Simbol-X Calibration Activity and Data Format, 28 Sep. - 28 Nov. 2008, Bologna, Italy; No Copyright; Avail.: Other Sources;
Abstract Only

The number of AGN and their luminosity distribution are crucial parameters for our understanding of the AGN phenomenon. There is a common wisdom that every massive galaxy has a massive black hole. However, most of these objects either are not radiating or until recently have been very difficult to detect. The Sloan Digital Sky Survey (SDSS) data, based on the [OIII] line indicate that perhaps up to 20% of all galaxies may be classified as AGN a surprising result that must be checked with independent data. X-ray surveys have revealed that hard X-ray selected AGN show a strong luminosity dependent evolution and their luminosity function (LF) shows a dramatic break towards low L_X (at all z). This is seen for all types of AGN, but is stronger for the broad-line objects. In sharp contrast, the local LF of {it optically-selected samples} shows no such break and no differences between narrow and broad-line objects. Assuming both hard X-ray and [O{\sc iii}] emission are fair indicators of AGN activity, it is important to understand this discrepancy. We present here the results of a min-survey done with Swift on a selected sample of SDSS selected AGN. The objects have been sampled at different L([O{\sc iii}]) to check the relation with the L_X observed with Swift.
Author
Sky Surveys (Astronomy); Black Holes (Astronomy); X Rays; Luminosity

20080037806 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Summary on the XRT Data Products and Pipeline Production
Angelini, Lorella; Sep. 21, 2008; 1 pp.; In English; Swift XRT meeting, 21-24 Sep. 2008, Urbino, Italy; No Copyright; Avail.: Other Sources; Abstract Only

The new code to generate light curves for GRB observed with the XRT on Swift has been distributed with the latest software release. The code has been extensively tested compared with similar output from Penn State. Adjustments in both codes were made to best represent the latest calibration information and the latest software algorithms. In this talk will be highlighted the steps taken to produce the GRB light-curves, how it is been tested for non GRB sources and last the future adjustments to be made to include a better correction for the bad columns. In addition it will be presented as a new routine developed to automatically collect spectra at different phases of the GRB decay. This new routine will be included in the next software release. The XRT pipeline at GSFC will implement the production of the data files containing the level 3 products. The talk will discuss the current status and the additional data files planned.
Author
Calibrating; Algorithms; X Ray Telescopes; Gamma Ray Bursts

20080037807 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Atmospheric Dynamics of Alpha Tau (K5 III) -- Clues to Understanding the Magnetic Dynamo
Carpenter Kenneth G.; July 21, 2008; 1 pp.; In English; Cool Stars 15 Conference, 21-25 Jul. 2008, Saint Andrews, Scotland, UK; No Copyright; Avail.: Other Sources; Abstract Only

Using HST/GHRS, HST/STIS and FUSE archival data for (alpha) Tau and the CHIANTI spectroscopic code, we have derived line shifts, volumetric emission measures, and plasma density estimates, and calculated filling factors for a number of UV lines forming between 10,000 K and 300,000 K in the outer atmosphere of this red giant star. The data suggest the

presence of low-temperature extended regions and high-temperature compact regions, associated with magnetically open and closed structures in the stellar atmosphere, respectively. The signatures of UV lines from Alpha Tau can be consistently understood via a model of upward-traveling Alfven waves in a gravitationally stratified atmosphere. These wakes cause non-thermal broadening in UV lines due to unresolved wave motions and downward plasma motions in compact magnetic loops heated by resonant .4lf\en wave heating. We discuss implications of this interpretation for understanding the nature of magnetic dynamos operating in late-type giants.
Author
Stellar Atmospheres; Solar Magnetic Field; Rotating Generators; Atmospheric Physics; Plasma Density; Coronal Loops

20080037808 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Spatial Resolution Mid-IR Imaging of V838 Monocerotis: Evidence of New Circumstellar Dust Creation
Winsiewski, John P.; Clampin, Mark; Bjorkman, Karen S.; Barry, Richard K.; July 21, 2008; 1 pp.; In English; Cool Stars 15, 21-25 Jul. 2008, Saint Andrews, Scotland, UK
Contract(s)/Grant(s): NNH06CC03B; No Copyright; Avail.: Other Sources; Abstract Only

The eruptive variable V838 Monocerotis experienced three dramatic outbursts in early 2002. Its unexpectedly erratic photometric behavior wes matched by strong spectroscopic variability, in which the srar transitioned through the F, K, G spectral type s in 2002 February, reseabled a M5 supergiant by 2002 Aprll, and had a L-type super qiant spectram in 2002 October. The star is also infamous for producisg e spectacu lar light echo whose evolction has beer traced by HST/ACS. We report high sFatial resolution 11.2 and 18.1 micron imagicq of V838 Nonoceroris obrained with Genini Ob servatory's Klchelle in 2007 March. The 2007 flux density of the unresclved stellar core of is rouqhly 2 tixes brighter than zhaz observed in 2C04. We interpret tkese aata as evidecce t-at V838 Mon has experienced a new circums~ellar dust creatioc evezt. We suggest that this newly c reated dust is Likely clumpy, and speculate that one (or ore) of Ekese clumps migh t have passed through the line-cf-sight in late 2036, prodccing the brief rnalti-wav elength pkotonetric event reported by Bond (2006) and Yunari ez a1 (2007). A gap o f spatially exzended therrrzl (18 micron) emission is present over radial distances of 1860 - 93000 AU from che central source. Assuming ejecta material expands at a constant velocity of 300-500 km/s, this gap suggests that no prior significanz circ unstellar dust production events have occurred withiin the past approx. 900-1500 years.
Author
Spatial Resolution; Stellar Envelopes; Imaging Techniques; Supergiant Stars; Infrared Radiation; Variability

20080037810 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Did LMC X-3 Undergo a 'Her X-1-like' Anomalous Low State?
Boyd, Patricia t.; June 02, 2008; 1 pp.; In English; AAS Conference, 2-6 Jun. 2008, Saint Louis, MO, USA; No Copyright; Avail.: Other Sources; Abstract Only

The black hole X-ray binary LMC X-3 has been monitored by the Rossi X-ray Timing Explorer (RXTE) from its launch to the present by the All-Sky Monitor (ASM). This well-sampled light curve is supplemented by frequent pointed observations with the PCA and HEXTE instruments which provide improved sensitivity, time resolution and spectral information. The long-term X-ray luminosity of the system is strongly modulated on timescales of hundreds of days. The mean 2-10 kev X-ray flux varies by a factor of more than 100 during this long-term cycle. This variability has been attributed to the precession of a bright, tilted, and warped accretion disk---the mechanism also invoked to explain the 35-day super-orbital period in the X-ray binary pulsar system Her X-1. The ASM light curve displays a unique episode, starting in December 2003, during which LMC X-3 displayed a very low, nearly constant flux, for about 80 days. This is markedly different from the typical low-flux excursions in LMC X-3, which smoothly evolve toward and then away from a minimum flux on about a 10-day time scale. The character of the long-term variability, as measured by amplitude and characteristic time scale, is not the same after this long low state as it was before. Similar shifts in long-term period and amplitude are seen after the so-called 'anomalous low states' in Her X-1, when the 35-day X-ray modulation ceases for an unpredictable length of time. These similar shifts in the long-term amplitude and timescale in the two systems suggests they share a similar mechanism which gives rise to the anomalous low states
Author
Black Holes (Astronomy); X Ray Timing Explorer; Pulsars; Light Curve; Temporal Resolution; Variability; X Rays

20080037811 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Gamma-ray Large Area Space Telescope (GLAST): Status and Plans
Ritz, Steve; August 25, 2008; 1 pp.; In English; Cosmo 08, 25-29 Aug. 2008, Madison, Wi, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy

range 20 MeV to >300 GeV, with supporting measurements for gamma-ray bursts from 8 keV to 30 MeV. The very large field of view makes it possible to observe 20% of the sky at any instant, and the entire sky on a timescale of a few hours. With its recent launch on 11 June, GLAST now opens a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts: the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations. In addition to the science opportunities, this talk includes a description of the instruments and the mission status and plans.
Author
Active Galactic Nuclei; Gamma Ray Bursts; Gamma Ray Telescopes; Ultraviolet Radiation; Dark Matter; Black Holes (Astronomy); Annihilation Reactions

20080037970 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A KPC-scale X-ray jet in the BL LAC Source S5 2007+777
Sambruna, Rita; Maraschi, Laura; Tavecchio, Fabrizio; July 13, 2008; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The BL Lac S3 2007++777, a classical radio-selected BL Lac from the sample of Stirkel et al. exhibiting an extended (19') radio jet. was observed with Chandra revealing an X-ray jet with simi1ar morphology. The hard X-ray spectrum and broad band SED is consistent with an IC/CMB origin for the X-ray emission, implying a highly relativistic flow at small angle to the line of sight with an unusually large deprojected length, 300 kpc. A structured jet consisting of a fast spine and slow wall is consistent with the observations.
Author
Active Galaxies; X Ray Spectra; X Ray Sources; Active Galactic Nuclei

20080037973 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Supercritical Pile Model: Prompt Emission Across the Electromagnetic Spectrum
Kazanas, Demos; Mastichiadis, A.; [2008]; 1 pp.; In English; Sixth Huntsville Gamma-Ray Burst Symposium 2008, 20-23 Oct. 2008, Huntsville, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The 'Supercritical Pile' GRB model is an economical model that provides the dissipation necessary to convert explosively the energy stored in relativistic protons in the blast wave of a GRB into radiation; at the same time it produces spectra whose luminosity peaks at ~1 MeV in the lab frame, the result of the kinematics of the proton-photon - pair production reaction that effects the conversion of proton energy to radiation. We outline the fundamental notions behind the 'Supercritical Pile' model and discuss the resulting spectra of the prompt emission from optical to gamma-ray energies of order Gamma^2 m_ec^2, (Gamma is the Lorentz factor of the blast wave) present even in the absence of an accelerated particle distribution and compare our results to bursts that cover this entire energy range. Particular emphasis is given on the emission at the GLAST energy range both in the prompt and the afterglow stages of the burst.
Author
Gamma Ray Bursts; Electromagnetic Spectra; Proton Energy; Detonation Waves; Emission Spectra; Shock Waves

20080037974 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Extrasolar Planetary Imaging Coronagraph: Visible Nulling Coronagraph Testbed Results
Lyon, Richard G., et al.; June 23, 2008; 1 pp.; In English; SPIE 2008, 23-28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

The Extrasolar Planetary Imaging Coronagraph (EPIC) is a proposed NASA Discovery mission to image and characterize extrasolar giant planets in orbits with semi-major axes between 2 and 10 AU. EPIC will provide insights into the physical nature of a variety of planets in other solar systems complimenting radial velocity (RV) and astrometric planet searches. It will detect and characterize the atmospheres of planets identified by radial velocity surveys, determine orbital inclinations and masses, characterize the atmospheres around A and F stars, observed the inner spatial structure and colors of inner Spitzer selected debris disks. EPIC would be launched to heliocentric Earth trailing drift-away orbit, with a 3-year mission lifetime (5 year goal) and will revisit planets at least three times at intervals of 9 months. The starlight suppression approach consists of a visible nulling coronagraph (VNC) that enables high order starlight suppression in broadband light. To demonstrate the VNC approach and advance it's technology readiness the NASA Goddard Space Flight Center and Lockheed-Martin have

developed a laboratory VNC and have demonstrated white light nulling. We will discuss our ongoing VNC work and show the latest results from the VNC testbed,
Author
Extrasolar Planets; Coronagraphs; Gas Giant Planets; Solar Velocity; Radial Velocity; Planetary Atmospheres; Astrometry

20080037975 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Cosmic Odyssey of Dust
Dwek, Eli; June 23, 2008; 1 pp.; In English; The Cosmic Odyssey of the Elements, 23-27 Jun. 2008, Aegina, Greece; No Copyright; Avail.: Other Sources; Abstract Only

We will present models for the evolution of dust in high redshift galaxies and in galaxies in the local universe. Galaxies at very high redshift, when the universe was less than one billion years old, contain massive quantities of dust that could only have for~nedin the explosion of core-collapse supernovae. These same objects are also the main source of grain destruction during the later, remnant phase of their evolution. These galaxies offer therefore a unique opportunity for examining the effect of massive stars on the formation and destruction of interstellar dust, and the lecture will present a model for the evolution of dust in these very young galaxies. Spectral and photometric observations of nearby galaxies show a correlation between the strength of their mid-IR aromatic features, attributed to PAH molecules, and their metal abundance, leading to a deficiency of these features in low-metallicity galaxies. We show the observed correlation represents a trend of PAH abundance with galactic age, reflecting the delayed injection of carbon dust into the ISM by AGB stars in the final post-AGB phase of their evolution. We also show that larger dust particles giving rise to the far-IR emission follow a distinct evolutionary trend closely related to the injection of dust by massive stars into the ISM.
Author
Astronomical Models; Cosmic Dust; Polycyclic Aromatic Hydrocarbons; Interstellar Matter; Massive Stars; Red Shift; Asymptotic Giant Branch Stars; Far Infrared Radiation

20080037976 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Maryland Univ., College Park, MD, USA
High Efficiency Near Infrared Spectrometer for Zodiacal Light Spectral Study
Kutyrea, A. S.; June 23, 2008; 1 pp.; In English; SPIE 2008, 23-28 Jun. 2008, Marseille, France
Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail.: Other Sources; Abstract Only

We are developing a near infrared spectrometer for measuring solar absorption lines in the zodiacal light in the near infrared region. R. Reynolds at el. (2004, ApJ 61 2, 1206) demonstrated that observing single Fraunhofer line can be a powerful tool for extracting zodiacal light parameters based on their measurements of the profile of the Mg I l~neat 5 184 A. We are extending this technique to the near infrared with the primary goal of measuring the absolute intensity of the zodiacal light. This measurement will provide the crucial information needed to accurately subtract zodiacal emission from the DIRBE measurements to get a much higher quality measurement of the extragalactic IR background. The instrument design is based on a dual Fabry-Perot interferometer with a narrow band filter. Its double etalon design allows to achieve high spectral contrast to reject the bright out of band telluric OH emission. High spectral contrast is absolutely necessary to achieve detection limits needed to accurately measure the intensity of the absorption line. We present the design, estimated performance of the instrument with the expected results of the observing program.
Author
Near Infrared Radiation; Zodiacal Light; Luminous Intensity; Infrared Spectrometers; Hydroxyl Emission; Fabry-Perot Interferometers; Background Radiation

20080037977 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gravitational Radiation Characteristics of Nonspinning Black-Hole Binaries
Kelly, Barnard; May 16, 2008; 1 pp.; In English; 7th International LISA Symposium, 16-20 Jun. 2008, Barcelona, Spain
Contract(s)/Grant(s): NNH06CC03B; No Copyright; Avail.: Other Sources; Abstract Only

'We present a detailed descriptive analysis of the gravitational radiation from binary mergers of non-spinning black holes, based on numerical relativity simulations of systems varying from equal-mass to a 6:1 mass ratio. Our analysis covers amplitude and phase characteristics of the radiation, suggesting a unified picture of the waveforms' dominant features in terms of an implicit rotating source. applying uniformly to the full wavetrain, from inspiral through ringdown. We construct a model of the late-stage frequency evolution that fits the $\ell = m$ modes, and identify late-time relationships between waveform frequency and amplitude. These relationships allow us to construct a predictive model for the late-time waveforms, an

alternative to the common practice of modelling by a sum of quasinormal mode overtones. We demonstrate an application of this in a new effective-one-body-based analytic waveform model.'
Author
Black Holes (Astronomy); Gravitational Waves; Waveforms; Mass Ratios; Frequencies; Images

20080037978 NASA Goddard Space Flight Center, Greenbelt, MD, USA
5th Annual AGILE Science Workshop
Hunter, Stanley; June 12, 2008; 1 pp.; In English; 5th Annual AGILE Science Workshop, 12-13 Jun. 2008, Rome, Italy; No Copyright; Avail.: Other Sources; Abstract Only

The EGRET model of the galactic diffuse gamma-ray emission (GALDIF) has been extended to provide full-sky coverage and improved to address the discrepancies with the EGRET data. This improved model is compared with the AGILE results from the Galactic center. The comparison is discussed.
Author
Astronomical Models; Gamma Ray Observatory; Gamma Ray Telescopes; Emission Spectra

20080037979 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Thermonuclear Burning as a Probe of Neutron Star
Strohmayer, Tod; July 13, 2008; 1 pp.; In English; COSPAR 2008, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Thermonuclear fusion is a fundamental process taking place in the matter transferred onto neutron stars in accreting binary systems. The heat deposited by nuclear reactions becomes readily visible in the X-ray band when the burning is either unstable or marginally stable, and results in the rich phenomenology of X-ray bursts, superbursts, and mHz quasiperiodic oscillations. Fast X-ray timing observations with NASA's Rossi X-ray Timing Explorer (RXTE) over the past decade have revealed a wealth of new phenomena associated with thermonuclear burning on neutron stars, including the discovery of nuclear powered pulsations during X-ray bursts and superbursts. I will briefly review our current observational and theoretical understanding of these new phenomena, with an emphasis on recent findings, and discuss what they are telling us about the structure of neutron stars.
Author
X Ray Timing Explorer; Neutron Stars; Nuclear Reactions; Combustion; X Rays; Time Measurement

20080037980 NASA Goddard Space Flight Center, Greenbelt, MD, USA
[Results from the X-ray and Optical Follow-up Observations of the Swift BAT AGN Survey]
Mushotzky, R.; September 17, 2008; 1 pp.; In English; Exploring the Hot Universe with IXO, 17-19 Sep. 2008, Munich, Germany; No Copyright; Avail.: Other Sources; Abstract Only

I will present results from the x-ray and optical follow-up observations of the Swift BAT ACN survey. I will discuss the nature of obscuration in these objects, the relationship to optical properties and the change of properties with luminosity and galaxy type and how they will influence the design of XO.
Author
Galaxies; Optical Properties; Visual Observation; X Ray Optics; Swift Observatory; Occultation

20080037989 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Atmospheric Dynamics of alpha Tau (K5 III) - Clues to Understanding the Magnetic Dynamo in Late-Type Giant Stars
Carpenter, Kenneth G.; Airapetian, Vladimir; July 21, 2008; 4 pp.; In English; Cool Stars 15, 21-25 Jul. 2008, Saint Andrews, Scotland, UK; Original contains color illustrations
Contract(s)/Grant(s): HST GO/AR 9967; HST GO/AR 10956; Copyright; Avail.: CASI: A01, Hardcopy

Using HST/GHRS, HST/STIS and FUSE archival data for alpha Tau and the CHIANTI spectroscopic code, we have derived line shifts, volumetric emission measures, and plasma density estimates, and calculated filling factors for a number of UV lines forming between 10,000 K and 300,000 K in the outer atmosphere of this red giant star. The data suggest the presence of low-temperature extended regions and high-temperature compact regions, associated with magnetically open and closed structures in the stellar atmosphere, respectively. The signatures of UV lines from alpha Tau can be consistently understood via a model of upward-traveling Alfven waves in a gravitationally stratified atmosphere. These waves cause

non-thermal broadening in UV lines due to unresolved wave motions and downward plasma motions in compact magnetic loops heated by resonant Alfven wave heating.
Author
Late Stars; Red Giant Stars; Giant Stars; Atmospheric Physics; Coronal Loops; Solar Magnetic Field; Plasma Waves; Magnetohydrodynamic Waves; Stellar Atmospheres

20080037991 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MESSENGER Observations of Mercury's Bow Shock and Magnetopause
Slavin, James A.; Boardsen, S. A.; Sarantos, M.; Acuna, M. H.; Anderson, B. J.; Baker, D. N.; Benna, M.; Gloeckler, G.; Gold, R. E.; Ho, G. C.; Korth, H.; Krimigis, S. M.; Livi, S. A.; McNutt, R. L., Jr.; Raines, J. M.; Schriver, D.; Solomon, S. C.; Travnicek, P.; Zurbuchen, T. H.; April 10, 2008; 1 pp.; In English; European Geophysical Union Conference, 10-19 Apr. 2008, Vienna, Austria; Copyright; Avail.: Other Sources; Abstract Only

MESSENGER'S 14 January 2008 encounter with Mercury will provide the first new observations of the solar wind interaction with this planet since the Mariner 10 flybys that took place over 30 years ago. The closest approach distance for this first MESSENGER flyby is targeted for an altitude of 200 km as compared with the 707 km and 327 km attained by Mariner 10 on 29 March 1974 and 16 March 1975, respectively. The locations of the bow shock and magnetopause boundaries observed by MESSENGER will be examined and compared against those found in the earlier Mariner 10 measurements and the predictions of theoretical models and numerical simulations. The structure of the magnetopause will be investigated for the presence of flux transfer events or other evidence of magnetic reconnection as will the more general implications of these new MESSENGER bow shock and magnetopause observations for the global solar wind interaction with Mercury.
Author
Shock Waves; Bow Waves; Messenger (Spacecraft); Solar Wind; Mariner 10 Space Probe; Magnetopause; Plasma Interactions; Magnetic Field Reconnection

20080037992 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MESSENGER and Venus Express Observations of the Near-tail of Venus: Magnetic Flux Transport, Current Sheet Structure, and Flux Rope Formation
Slavin, James A.; Boardsen, S. A.; Sarantos, M.; Acuna, M. H.; Anderson, B. J.; Barabash, S.; Benna, M.; Fraenz, M.; Gloeckler, G.; Gold, R. E.; Ho, G. C.; Korth, H.; Krimigis, S. M.; McNutt, R. L., Jr.; Raines, J. M.; Solomon, S. C.; Zhang, T.-L.; Zurbuchen, T. H.; April 10, 2008; 1 pp.; In English; European Geophysical Union Conference, 10-19 Apr. 2008, Vienna, Austria; No Copyright; Avail.: Other Sources; Abstract Only

At 23:08 UT on 5 June 2007 the MESSENGER spacecraft reached its closest approach altitude (338 km) during its second flyby of Venus en route to its 2011 orbit insertion at Mercury. Whereas no measurements were collected during MESSENGER'S first Venus flyby in October 2006, the Magnetometer (MAG) and the Energetic Particle and Plasma Spectrometer (EPPS) operated successfully throughout this second encounter. Venus provides the solar system's best example to date of a solar wind - ionosphere planetary interaction. We present MESSENGER observations of the near-tail of Venus with emphasis on determining the time scales for magnetic flux transport, the structure of the cross-tail current sheet at very low altitudes (approx. 300 to 1000 km), and the nature and origin of a magnetic flux rope observed in the current sheet. The availability of the simultaneous Venus Express upstream measurements provides a unique opportunity to examine the influence of solar wind plasma and interplanetary magnetic field conditions on this planet's solar wind interaction at solar minimum.
Author
Messenger (Spacecraft); Magnetic Flux; Current Sheets; Venus (Planet); Solar Activity Effects; Plasma Interactions; Magnetometers; Flyby Missions

20080037993 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MESSENGER Measurements of Mercury's Magnetic Field during the First Flyby
Slavin, James A.; Boardsen, S. A.; Acuna, M. H.; Anderson, B. J.; Johnson, C. L.; Korth, H.; Krimigis, S. M.; McNutt, R. L., Jr.; Purucker, M. E.; Solomon, S. C.; April 10, 2008; 1 pp.; In English; European Geophysical Union Conference, 10-19 Apr. 2008, Vienna, Austria; Copyright; Avail.: Other Sources; Abstract Only

On 14 January 2008 the MESSENGER spacecraft will encounter Mercury for the first time. Depending upon the solar wind conditions, this initial flyby will return Magnetometer measurements of Mercury's magnetic field over a time interval lasting between - 30 md 60 min. Closest approach for MESSENGER is targeted for an altitude of 200 km as compared with

the 707 krn and 327 km attained by Mariner 10 on 29 March 1974 and 16 March 1975, respectively. Furthermore, the differences in the MESSENGER and Mariner 10 encounter trajectories, with respect both to magnetospheric and body-fixed coordinates are highly complementary and expected to lead to significant improvements in our knowledge of Mercury's magnetic field. We present an overview of the MESSENGER magnetic field observations, an initial subtraction of the magnetic fields attributable to magnetospheric current systems from the total measured magnetic field, and an improved model of Mercury's intrinsic magnetic field. We also discuss the expected advances afforded by the two additional MESSENGER flybys, which occur in October 2008 and September 2009, as well as the orbital phase that will begin in March 201 1.
Author
Flyby Missions; Messenger (Spacecraft); Magnetic Fields; Mercury (Planet); Planetary Magnetic Fields; Solar Wind

20080038682 NASA Goddard Space Flight Center, Greenbelt, MD, USA
High Variability in Vela X-1: Giant Flares and Off States
Kreykenbohm, Ingo; Wilms, Joern; Kretschmar, Peter; Torrejon, Jose Miguel; Pottschmidt, Katja; Hanke, Manfred; Santangelo, Andrea; Ferrigno, Carlo; Staubert, Ruediger; [2008]; 15 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNGO6E090A; NNG05GK55G; DLR 50OG9601; DLR 50OG0501; PR2007-0176; Copyright;
Avail.: Other Sources

Aims. We investigate the spectral and temporal behavior of the high mass X-ray binary Vela X-1 during a phase of high activity, with special focus on the observed giant flares and off states. Methods. INTEGRAL observed Vela X-1 in a long almost uninterrupted observation for two weeks in 2003 Nov/Dec. The data were analyzed with OSA 7.0 and FTOOLS 6.2. We derive the pulse period, light curves, spectra, hardness ratios, hardness intensity diagrams, and study the eclipse. Results. In addition to an already high activity level, Vela X-1 exhibited several very intense flares, the brightest ones reaching a maximum intensity of more than 5 Crab in the 20-40 keV band and several off states where the source is no longer detected by INTEGRAL. We determine the pulse period to be 283.5320 +/- 0.0002 s which is stable throughout the whole observation. Analyzing the eclipses resulted in an improvement of the ephemeris. Spectral analysis of the flares shows that there seem to be two types of flares: relatively brief flares which can be extremely intense, and show spectral softening, contrary to high intensity states which are longer and show no softening. Conclusions. Both flares and off states are interpreted as being due to a strongly structured wind of the optical companion. When Vela X-1 encounters a cavity with strongly reduced density, the flux will drop triggering the onset of the propeller effect which inhibits further accretion, thus giving rise to off states. The required drop of the density of the material to trigger the propeller effect in Vela X-1 is of the same order as predicted by theoretical papers on the densities in the OB star winds. The same structured wind can give rise to the giant flares when Vela X-1 encounters a dense blob in the wind.
Author
X Ray Binaries; X Ray Astronomy; Stellar Flares; Stellar Physics; Neutron Stars; Gamma Ray Astronomy

20080038683 NASA Goddard Space Flight Center, Greenbelt, MD, USA
INTEGRAL Long-Term Monitoring of the Supergiant Fast X-Ray Transient XTE J1739-302
Blay, P.; Martinez-Nunez, S.; Negueruela, I.; Pottschmidt, K.; Smith, D. M.; Torrejon, J. M.; Reig, P.; Kretschmar, P.; Kreykenbohm, I.; August 24, 2008; 9 pp.; In English
Contract(s)/Grant(s): NNG06EO90A; AYA2005-00095; CSD-2006-70; PR2007-0176; CT-2006-039965; Copyright; Avail.: Other Sources

Context. In the past few years, a new class of High Mass X-Ray Binaries (HMXRB) has been claimed to exist, the Supergiant Fast X-ray Transients (SFXT). These are X-ray binary systems with a compact companion orbiting a supergiant star which show very short and bright outbursts in a series of activity periods overimposed on longer quiescent periods. Only very recently the first attempts to model the behaviour of these sources have been published, some of them within the framework of accretion from clumpy stellar winds. Aims. Our goal is to analyze the properties of XTE J1739-302/IGR J17391-3021 within the context of the clumpy structure of the supergiant wind. Methods. We have used INTEGRAL and RXTE/PCA observations in order to obtain broad band (1 - 200 keV) spectra and light curves of XTE J1739-302 and investigate its X-ray spectrum and temporal variability. Results. We have found that XTE J1739-302 follows a much more complex behaviour than expected. Far from presenting a regular variability pattern, XTE J1739-302 shows periods of high, intermediate, and low flaring activity.
Author
Companion Stars; Supergiant Stars; X Ray Binaries; X Ray Astronomy; Stellar Winds; Stellar Mass

20080038684 NASA Goddard Space Flight Center, Greenbelt, MD, USA

RXTE and BeppoSAX Observations of the Transient X-ray Pulsar XTE J 18591+083

Corbet, R. H. D.; intZand, J. J. M.; Levine, A. M.; Marshall, F. E.; January 2008; 17 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present observations of the 9.8 s X-ray pulsar XTE J159+083 made with the All-Sky Monitor (ASM) and Proportional Counter Array (PCA) on board the Rossi X-ray Timing Explorer (RXTE), and the Wide Field Cameras (WFC) on board BeppoSAX. The ASM data cover a 12 year time interval and show that an extended outburst occurred between approximately MJD50, 250, and 50, 460 (1996 June 16 to 1997 January 12). The ASM data excluding this outburst interval suggest a possible 61 day modulation. Eighteen sets of PCA observations were obtained over an approx. one month interval in 1999. The flux variability measured with the PCA appears consistent with the possible period found with the ASM. The PCA measurements of the pulse period showed it to decrease non-monotonically and then to increase significantly. Doppler shifts due to orbital motion rather than accretion torques appear to be better able to explain the pulse period changes. Observations with the WFC during the extended outburst give an error box which is consistent with a previously determined PCA error box but is significantly smaller. The transient nature of XTE J1859+083 and the length of its pulse period are consistent with it being a Be/neutral star binary. The possible 61 day orbital period would be of the expected length for a Be star system with a 9.8 s pulse period.

Author

X Ray Timing Explorer; Pulsars; B Stars; Doppler Effect; Errors; X Rays; Modulation

20080038685 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Radio Luminosity Function and Galaxy Evolution in the Coma Cluster

Miller, Neal A.; Hornschemeier, Ann E.; Mabasher, Bahram; Brudgesm Terrry J.; Hudson, Michael J.; Marzke, Ronald O.; Smith, Russell J.; January 2008; 42 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We investigate the radio luminosity function and radio source population for two fields within the Coma cluster of galaxies, with the fields centered on the cluster core and southwest infall region and each covering about half a square degree. Using VLA data with a typical rms sensitivity of 28 (mu)Jy per 4.4' beam, we identify 249 radio sources with optical counterparts brighter than r = 22 (equivalent to M(sub r) = -13 for cluster member galaxies). Comprehensive optical spectroscopy identifies 38 of these as members of the Coma cluster, evenly split between sources powered by an active nucleus and sources powered by active star formation. The radio-detected star-forming galaxies are restricted to radio luminosities between about 10(exp 21) and 10(exp 22) W/Hz, an interesting result given that star formation dominates field radio luminosity functions below about 10(exp 23) W/Hz. The majority of the radio-detected star-forming galaxies have characteristics of starbursts, including high specific star formation rates and optical spectra with strong emission lines. In conjunction with prior studies on post-starburst galaxies within the Coma cluster, this is consistent with a picture in which late-type galaxies entering Coma undergo a starburst prior to a rapid cessation of star formation. Optically bright elliptical galaxies (Mr less than or equals -20.5) make the largest contribution to the radio luminosity function at both the high (> approx. 3x10(exp 22) W/Hz) and low (< approx. 10(exp 21) W/Hz) ends. Through a stacking analysis of these optically-bright ellipticals we find that they continue to harbor radio sources down to luminosities as faint as 3x10(exp 19) W/Hz. However, contrary to published results for the Virgo cluster we find no evidence for the existence of a population of optically faint (M(sub r) approx. equals -14) dwarf ellipticals hosting strong radio AGN.

Author

Elliptical Galaxies; Galactic Clusters; Star Formation; Luminosity; Radio Galaxies; Spectral Counterparts (Astronomy); Emission Spectra; Starburst Galaxies; Radio Stars

20080038686 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Gamma-Ray Emision from the Broad-Line Radio Galaxy 3C 111

Hartman, Robert C.; Kadler, Matthias; Tueller, Jack; January 2008; 19 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The broad-line radio galaxy 3C 111 has been suggested as the counterpart of the Gamma-ray source 3EGJ0416+3650. While 3C 111 meets most of the criteria for a high-probability identification, like a bright flat-spectrum radio core and a blazarlike broadband SED, in the Third EGRET Catalog, the large positional offset of about 1.5 degrees put 3C111 outside the 99% probability region for 3EG J0416+3650, making this association questionable. We present a re-analysis of all available data for 3C111 from the EGRET archives, resulting in probable detection of high-energy Gamma-ray emission above

1000MeV from a position close to the nominal position of 3C 111, in two separate viewing periods (VPs), at a 3sigma level in each. A new source, GROJ0426+3747, appears to be present nearby, seen only in the >1000MeV data. For >100MeV, the data are in agreement with only one source (at the original catalog position) accounting for most of the EGRET-detected emission of 3EGJ0416+3650. A follow-up Swift UVOT/XRT observation reveals one moderately bright X-ray source in the error box of 3EGJ0416+3650, but because of the large EGRET position uncertainty, it is not certain that the X-ray and Gamma-ray sources are associated. A Swift observation of GROJ0426+3747 detected no X.ray source nearby.
Author
Gamma Rays; Radio Galaxies; Spectral Counterparts (Astronomy); X Ray Sources; Gamma Ray Astronomy; Gamma Ray Sources (Astronomy); Active Galactic Nuclei

20080038687 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Testing the Paradigm that Ultra-Luminous X-Ray Sources as a Class Represent Accreting Intermediate
Berghea, C. T.; Weaver, K. A.; Colbert, E. J. M.; Roberts, T. P.; January 2008; 37 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

To test the idea that ultraluminous X-ray sources (ULXs) in external galaxies represent a class of accreting Intermediate-Mass Black Holes (IMBHs), we have undertaken a program to identify ULXs and a lower luminosity X-ray comparison sample with the highest quality data in the Chandra archive. We establish a general property of ULXs that the most X-ray luminous objects possess the fattest X-ray spectra (in the Chandra band pass). No prior sample studies have established the general hardening of ULX spectra with luminosity. This hardening occurs at the highest luminosities (absorbed luminosity > or equals 5x10(exp 39) ergs/s) and is in line with recent models arguing that ULXs are actually stellar-mass black holes. From spectral modeling, we show that the evidence originally taken to mean that ULXs are IMBHs - i.e., the 'simple IMBH model' - is nowhere near as compelling when a large sample of ULXs is looked at properly. During the last couple of years, XMM-Newton spectroscopy of ULXs has to some large extent begun to negate the simple IMBH model based on fewer objects. We confirm and expand these results, which validates the XMM-Newton work in a broader sense with independent X-ray data. We find (1) that cool disk components are present with roughly equal probability and total flux fraction for any given ULX, regardless of luminosity, and (2) that cool disk components extend below the standard ULX luminosity cutoff of 10(exp 39) ergs/s, down to our sample limit of 10(exp 38:3) ergs/s. The fact that cool disk components are not correlated with luminosity damages the argument that cool disks indicate IMBHs in ULXs, for which a strong statistical support was never made.
Author
X Ray Sources; Black Holes (Astronomy); Stellar Mass; X Ray Spectra; Damage; Probability Theory; X Rays

20080038688 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discovery of the Red-Skewed K-alpha Iron Line in Cyg X-2 with Suzaku
Shaposhnikov, Nikolai; Titarchuk, Lev; Laurent, Philippe; January 2008; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: A03, Hardcopy

We report on the Suzaku observation of neutron star low-mass X-ray binary Cygnus X-2 which reveals strong iron K-alpha emission line. The line profile shows a prominent red wing extending down to 4 keV. This discovery increases the number of neutron star sources where red-skewed iron lines were observed and strongly suggests that this phenomenon is common not only in black holes but also in other types of compact objects. We examine the line profile by fitting it with the model which attributes its production to the relativistic effects due to disk reflection of X-ray radiation. We also apply an alternative model where the red wing is a result of down-scattering effect of the first order with respect to electron velocity in the wind outflow. Both models describe adequately the observed line profile. However, the X-ray variability in a state similar to that in the Suzaku observation which we establish by analysing RXTE observation favors the wind origin of the line formation.
Author
Black Holes (Astronomy); Cygnus Constellation; Neutron Stars; Relativistic Effects; Skewness; X Ray Timing Explorer; X Ray Binaries; K Lines

20080038729 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Orbital Observatory GLAST - New Step in the Study of Cosmic Gamma-Radiation

Moiseev, A. A.; [2008]; 7 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080038729

The new Gamma-ray Large Area Space Telescope (GLAST) is scheduled for launch in the middle of 2008. It contains the high energy gamma-ray telescope LAT (Large Area Telescope) which covers the energy range from 20 MeV to >300 GeV and the GMB (GLAST Burst Monitor), covering 8 keV - 30 MeV energy range. The GLAST science objectives include understanding the mechanism of charged particle acceleration in active galactic nuclei, pulsars and supernova remnants, determining the nature of the still-unidentified EGRET sources, detailed study of gamma-ray diffuse emission, high-energy emission from gamma-ray bursts and transient sources, and probing dark matter. A brief overview of the mission is given. Author

Fermi Gamma-Ray Space Telescope; Gamma Ray Bursts; Gamma Ray Telescopes; Supernova Remnants; X Ray Telescopes; Cosmic Rays; Charged Particles; Active Galactic Nuclei

20080038771 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Suzaku Observation of the Dwarf Nova V893 Scorpii: The Discovery of a Partial X-Ray Eclipse

Mukai, Koji; Zietsman, E.; Still, M.; January 2008; 29 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

V893 Sco is an eclipsing dwarf nova that had attracted little attention from X-ray astronomers until it was proposed as the identification of an RXTE all-sky slew survey (XSS) source. Here we report on the pointed X-ray observations of this object using Suzaku. We confirm V893 Sco to be X-ray bright, whose spectrum is highly absorbed for a dwarf nova. We have also discovered a partial X-ray eclipse in V893 Sco. This is the first time that a partial eclipse is seen in Xray light curves of a dwarf nova. We have successfully modeled the gross features of the optical and X-ray eclipse light curves using a boundary layer geometry of the X-ray emission region. Future observations may lead to confirmation of this basic picture, and allow us to place tight constraints on the size of the X-ray emission region. The partial X-ray eclipse therefore should make V893 Sco a key object in understanding the physics of accretion in quiescent dwarf nova.
Author

X Ray Timing Explorer; Boundary Layers; Proving; Emission; Eclipses

20080038777 Naval Observatory, Flaggstaff, AZ USA

Two Stellar Components in the Halo of the Milky Way

Carollo, Daniela; Beers, Timothy C; Lee, Young-Sun; Chiba, Masashi; Norris, John E; Wilhelm, Ronald; Sivarani, Thirupathi; Marsteller, Brian; Munn, Jeffrey A; Bailer-Jones, Coryn A; Dec 13, 2007; 8 pp.; In English

Report No.(s): AD-A482395; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA482395

The halo of the Milky Way provides unique elemental abundance and kinematic information on the first objects to form in the Universe, and this information can be used to tightly constrain models of galaxy formation and evolution. Although the halo was once considered a single component, evidence for its dichotomy has slowly emerged in recent years from inspection of small samples of halo objects. Here we show that the halo is indeed clearly divisible into two broadly overlapping structural components -- an inner and an outer halo that exhibit different spatial density profiles, stellar orbits and stellar metallicities (abundances of elements heavier than helium). The inner halo has a modest net prograde rotation, whereas the outer halo exhibits a net retrograde rotation and a peak metallicity one-third that of the inner halo. These properties indicate that the individual halo components probably formed in fundamentally different ways, through successive dissipational (inner) and dissipationless (outer) mergers and tidal disruption of proto-Galactic clumps.
DTIC

Halos; Milky Way Galaxy; Stars; Stellar Atmospheres

20080039124 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GRB Discoveries with Swift
Gehrels, Neil; September 28, 2008; 16 pp.; In English; 400 Years of Astronomical Telescopes: A Review of History, Science and Technology, 28 Sept - 2 Oct 2008, Noorwijk, Netherlands; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080039124

This brief presentation presents Swift Observatory recordings of gamma ray burst (GRB) activity. Long and short GRBs and afterglows are highlighted. Recordings of GRB emission, afterglow, optical/IR brightness, and flux density are presented. The time structure and current status of short GRB structures is also included.
CASI
Gamma Ray Bursts; Swift Observatory; Gamma Ray Astronomy

20080039127 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Eccentric Binary Millisecond Pulsar in the Galactic Plane
Champion, David J.; Ransom, Scott M.; Lazarus, Patrick; Camilo, Fernando; Bassa, Cess; Kaspi, Victoria M.; Nice, David J.; Freire, Paulo C. C.; Stairs, Ingrid H.; vanLeeuwen, Joeri; Stappers, Ben W.; Cordes, James M.; Hessels, Jason W. T.; Lorimer, Duncan R.; Arzoumanian, Zaven; Backer, Don C.; Bhat, N. D. Ramesh; Chatterjee, Shami; Cognard, Ismael; Deneva, Julia S.; Faucher-Giguere, Claude-Andre; Gaensler, Bryan M.; Han, JinLin; Jenet, Fredrick A.; Kasian, Laura; Science Magazine; June 06, 2008, pp. 1309-1312; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1126/science.1157580

Binary pulsar systems are superb probes of stellar and binary evolution and the physics of extreme environments. In a survey with the Arecibo telescope, we have found PSR J1903+0327, a radio pulsar with a rotational period of 2.15 milliseconds in a highly eccentric (e = 0.44) 95-day orbit around a solar mass (M.) companion. Infrared observations identify a possible main-sequence companion star. Conventional binary stellar evolution models predict neither large orbital eccentricities nor main-sequence companions around millisecond pulsars. Alternative formation scenarios involve recycling a neutron star in a globular cluster, then ejecting it into the Galactic disk, or membership in a hierarchical triple system. A relativistic analysis of timing observations of the pulsar finds its mass to be 1.74 +/- 0.04 Solar Mass, an unusually high value.
Author
Main Sequence Stars; Pulsars; Binary Stars; Companion Stars; Stellar Evolution; Star Clusters; Infrared Astronomy

20080039128 NASA Goddard Space Flight Center, Greenbelt, MD, USA
SWIFT BAT Survey of AGN
Tueller, J.; Mushotzky, R. F.; Barthelmy, S.; Cannizzo, J. K.; Gehrels, N.; Markwardt, C. B.; Skinner, G. K.; Winter, L. M.; January 2008; 15 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present the results1 of the analysis of the first 9 months of data of the Swift BAT survey of AGN in the 14-195 keV band. Using archival X-ray data or follow-up Swift XRT observations, we have identified 129 (103 AGN) of 130 objects detected at [b] > 15deg and with significance > 4.8-delta. One source remains unidentified. These same X-ray data have allowed measurement of the X-ray properties of the objects. We fit a power law to the logN - log S distribution, and find the slope to be 1.42+/-0.14. Characterizing the differential luminosity function data as a broken power law, we find a break luminosity logL*(ergs/s)= 43.85+/-0.26. We obtain a mean photon index 1.98 in the 14-195 keV band, with an rms spread of 0.27. Integration of our luminosity function gives a local volume density of AGN above 10(exp 41) erg/s of 2.4x10(exp -3) Mpc(sup -3), which is about 10% of the total luminous local galaxy density above M* = -19.75. We have obtained X-ray spectra from the literature and from Swift XRT follow-up observations. These show that the distribution of log nH is essentially flat from nH = 10(exp 20)/sq cm to 10(exp 24)/sq cm, with 50% of the objects having column densities of less than 10(exp 22)/sq cm. BAT Seyfert galaxies have a median redshift of 0.03, a maximum log luminosity of 45.1, and approximately half have log nH > 22.
Author
Active Galactic Nuclei; Luminosity; Photons; Red Shift; Seyfert Galaxies; X Ray Spectra

20080039129 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Swift Discovery of X-ray Afterglows Accompanying Short Bursts from SGR 1900+14

Nakagawa, Y. E.; Sakamoto, T.; Sato, G.; Gehrels, N.; Hurley, K.; Palmer, D. M.; [2008]; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNG04GQ84G; Copyright; Avail.: CASI: A03, Hardcopy

The discovery of X-ray afterglows accompanying two short bursts from SGR1900+14 is presented. The afterglow luminosities at the end of each observation are lower by 30-50% than their initial luminosities, and decay with power law indices p approx. 0.2-0.4. Their initial bolometric luminosities are L approx. 10(exp 34)- 10(exp 35) erg/s. We discuss analogies and differences between the X-ray afterglows of SGR short bursts and short gamma-ray bursts.

Author

Gamma Ray Bursts; Afterglows; Swift Observatory; Bolometers

20080039130 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Axisymmetric Hydrodynamical Model for the Torus Wind in AGN, 2, X-ray Excited Funnel Flow

Dorodnitsyn, A.; Kallman, T.; Proga, D.; [2008]; 32 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We have calculated a series of models of outflows from the obscuring torus in active galactic nuclei (AGN). Our modeling assumes that the inner face of a rotationally supported torus is illuminated and heated by the intense X-rays from the inner accretion disk and black hole. As a result of such heating a strong biconical outflow is observed in our simulations. We calculate 3-dimensional hydrodynamical models, assuming axial symmetry, and including the effects of X-ray heating, ionization, and radiation pressure. We discuss the behavior of a large family of these models, their velocity fields, mass fluxes and temperature, as functions of the torus properties and X-ray flux. Synthetic warm absorber spectra are calculated, assuming pure absorption, for sample models at various inclination angles and observing times. We show that these models have mass fluxes and flow speeds which are comparable to those which have been inferred from observations of Seyfert 1 warm absorbers, and that they can produce rich absorption line spectra.

Author

Active Galactic Nuclei; Seyfert Galaxies; Accretion Disks; Black Holes (Astronomy); Velocity Distribution; Radiation Pressure; Mass Flow

20080039132 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Mergers of Non-spinning Black-hole Binaries: Gravitational Radiation Characteristics

Baker, John G.; Boggs, William D.; Centrella, Joan; Kelly, Bernard J.; McWilliams, Sean T.; vanMeter, James R.; [2008]; 25 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present a detailed descriptive analysis of the gravitational radiation from black-hole binary mergers of non-spinning black holes, based on numerical simulations of systems varying from equal-mass to a 6:1 mass ratio. Our primary goal is to present relatively complete information about the waveforms, including all the leading multipolar components, to interested researchers. In our analysis, we pursue the simplest physical description of the dominant features in the radiation, providing an interpretation of the waveforms in terms of an implicit rotating source. This interpretation applies uniformly to the full wavetrain, from inspiral through ringdown. We emphasize strong relationships among the l = m modes that persist through the full wavetrain. Exploring the structure of the waveforms in more detail, we conduct detailed analytic fitting of the late-time frequency evolution, identifying a key quantitative feature shared by the l = m modes among all mass-ratios. We identify relationships, with a simple interpretation in terms of the implicit rotating source, among the evolution of frequency and amplitude, which hold for the late-time radiation. These detailed relationships provide sufficient information about the late-time radiation to yield a predictive model for the late-time waveforms, an alternative to the common practice of modeling by a sum of quasinormal mode overtones. We demonstrate an application of this in a new effective-one-body-based analytic waveform model.

Author

Black Holes (Astronomy); Mass Ratios; Waveforms; Gravitational Waves; Harmonics; Rotation; Frequencies; Mathematical Models

20080039151 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma Ray Burst Discoveries with SWIFT

Gehrels, Neil; September 24, 2007; 1 pp.; In English; High Energy Outflows Conference, 24-28 Sep. 2007, Dublin, Ireland; No Copyright; Avail.: Other Sources; Abstract Only

Gamma-ray bursts are among the most fascinating occurrences in the cosmos. They are thought to be the birth cries of

black holes throughout the universe. There has been tremendous recent progress in our understanding of bursts with the new data from the SWIFT mission. SWIFT was launched in November 2004 and is an international multiwavelength observatory designed to determine the origin of bursts and use them to probe the early Universe. Findings from the mission will be presented with emphasis on the relativistic outflows from GRBs. A huge step forward has been made in our understanding of the mysterious short GRBs. High redshift bursts have been detected from enormous explosions early in the universe. GRBs have been found with giant X-ray flares occurring in their afterglow, challenging predictions of the fireball model. These, and other topics, will be discussed.
Author
Gamma Ray Bursts; Black Holes (Astronomy); Afterglows; Red Shift; Explosions

20080039152 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Characterizing the Superconducting-to-Normal Transition in Mo/Au Transition-Edge Sensor Bilayers
Smith, Stephen J.; Bandler, Simon R.; Brown, Ari. -D.; Chervenak, Jay A.; Finkbeiner, Fred M.; Iyomoto, Naoko; Kelley, Richard L.; Kilbourne, Caroline A.; Porter, Frederick S.; Sadleir, John E.; July 22, 2007; 1 pp.; In English; Low Temperature Detectors-12 (LTD-12), 22-27 Jul. 2007, Paris, France
Contract(s)/Grant(s): NNH06CC03B; No Copyright; Avail.: Other Sources; Abstract Only

We are developing arrays of Mo/Au bilayer transition-edge sensors (TES's) for applications in future X-ray astronomy missions such as NASA's Constellation-X. The physical properties of the superconducting-to-normal transition in our TES bilayers, while often reproducible and characterized, are not well understood. The addition of normal metal features on top of the bilayer are found to change the shape and temperature of the transition, and they typically reduce the unexplained 'excess' noise. In order to understand and potentially optimize the properties of the transition, we have been studying the temperature, widths and current dependence of these transitions. We report on the characterization of devices both deposited on silicon substrates and suspended on thin silicon nitride membranes. This includes key device parameters such as the logarithmic resistance sensitivity with temperature alpha, and the logarithmic resistance sensitivity with current beta, of the phase-transition. We investigate alpha and beta as a function of current, both at fixed and varying bias points in the transition. Using Ginzburg-Landau theory for the current dependence of the superconducting transition temperature, we investigate the relationship between alpha and beta and compare our measured and theoretical estimates.
Author
X Ray Astronomy; Bias; Silicon Nitrides; Phase Transformations; Transition Temperature; Temperature Dependence; Temperature Effects

20080039156 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GLAST, the Gamma-ray Large Area Space Telescope
Ritz, Steven; October 23, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy range 20 MeV to greater than 300 GeV, with supporting measurements for gamma-ray bursts from 10 keV to 25 MeV. With its upcoming launch in 2008, GLAST will open a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations and Lorentz invariance violation. In addition to the science opportunities, this talk includes a description of the instruments, the collaboration between particle physicists and astrophysicists, the opportunities for guest observers, and the mission status.
Author
Fermi Gamma-Ray Space Telescope; Optical Equipment

20080039159 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Solar System Science with JWST
Sonneborn, G.; Lunine, J.; Hammel, H.; Long, K.; Hutchings, J.; Rieke, G.; September 24, 2007; 1 pp.; In English; Astrophysics in the Next Decade: JWST and Concurrent Facilities, 24-27 Sep. 2007, Tucson, AZ, USA; Copyright; Avail.: Other Sources; Abstract Only

JWST will enable breakthroughs in our understanding of the physical characteristics of cold bodies in the outer reaches of the Solar System. These objects include Pluto and other Kuiper Belt Objects (KBOs), the icy moons of the giant planets, and distant cometary nuclei. Recent discoveries of large objects in the Kuiper belt, along with many smaller members, make it clear that this region represents a major constituent of our Solar System, one that was hidden until recently because it is so

remote and challenging to observe. The near-IR and mid-IR performance of JWST will be unique in its power to probe this region. This poster describes the science drivers for JWST observations of Solar System objects and plans for implementing this capability.
Author
James Webb Space Telescope; Solar System; Astronomy

20080039160 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Microshutter-Based Field Selector for JWST's Near Infared Spectrograph
Silvergerg, Rorbert F.; Arendt, Richard; Franz, David; Jhabvala, Murzy; Kletetschka, Gunther; Kutyrev, Alexander; Li, Mary; Moseley, Samuel H.; Rapchun, David; Snodgrass, Stephen; Sohl, David; Spa, Leroy; August 26, 2007; 1 pp.; In English; SPIE 2007, 26-30 Aug. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

One of the James Webb Space Telescope's (JWST) primary science goals is to characterize the epoch of galaxy formation in the universe and observe the first galaxies and clusters of galaxies. This goal requires multi-band imaging and spectroscopic data in the near infrared portion of the spectrum for large numbers of very faint galaxies. Because such objects are sparse on the sky at the JWST resolution, a multi-object spectrograph is necessary to efficiently carry out the required observations. We have developed a fully programmable microshutter array that will be used as the field selector for the Near Infrared Spectrograph (NIRSpec) on JWST. This device allows slits to be opened at the locations of selected galaxies in the field of view while blocking other unwanted light from the sky background and bright sources. In practice, greater than 100 objects within the field of view will be observed simultaneously. In this paper, we describe the microshutter arrays, their development, fabrication, testing, and progress toward delivery of flight qualified devices to the NIRSpec instrument team in 2008.
Author
Microelectromechanical Systems; Arrays; James Webb Space Telescope; Spectrographs; Optical Equipment; Fabrication; Functional Design Specifications

20080039163 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gamma Ray Burst Discoveries with the Swift Mission
Gehrels, Neil; January 07, 2008; 17 pp.; In English; AAS Meeting, 7-11 Jan. 2008, Austin, TX, USA; Original contains black and white illustrations; No Copyright; Avail.: Other Sources; Abstract Only

Gamma-ray bursts (GRBs) are among the most fascinating occurrences in the universe. They are powerful explosions, visible to high redshift, and thought to be the signature of black hole formation. The Swift Observatory has been detecting 100 bursts per year for 3 years and has greatly stimulated the field with new findings. Observations are made of the X-ray and optical afterglow from approximately 1 minute after the burst, continuing for days. Evidence is building that the long and short duration subcategories of GRBs have very different origins: massive star core collapse to a black hole for long bursts and binary neutron star coalescence to a black hole for short bursts. The similarity to Type II and Ia supernovae originating from young and old stellar progenitors is striking. Bursts are providing a new tool to study the high redshift universe. Swift has detected several events at z greater than 5 and one at z=6.3 giving metallicity measurements and other data on galaxies at previously inaccessible distances. The talk will present the latest results from Swift in GRB astronomy.
Author
Gamma Ray Bursts; Swift Observatory; Red Shift; Cosmology

20080039166 NASA Goddard Space Flight Center, Greenbelt, MD, USA
From the Big Bang to the Nobel Prize and on to James Webb Space Telescope
Mather, John C.; January 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The history of the universe in a nutshell, from the Big Bang to now. and on to the future - John Mather will tell the story of how we got here, how the Universe began with a Big Bang, how it could have produced an Earth where sentient beings can live, and how those beings are discovering their history. Mather was Project Scientist for NASA's Cosmic Background Explorer (COBE) satellite, which measured the spectrum (the color) of the heat radiation from the Big Bang, discovered hot and cold spots in that radiation, and hunted for the first objects that formed after the great explosion. He will explain Einstein's biggest mistake, show how Edwin Hubble discovered the expansion of the universe, how the COBE mission was built, and how the COBE data support the Big Bang theory. He will also show NASA's plans for the next great telescope in space, the James Webb Space Telescope. It will look even farther back in time than the Hubble Space Telescope, and will look inside

the dusty cocoons where stars and planets are being born today. Planned for launch in 2013, it may lead to another Nobel Prize for some lucky observer.
Author
Cosmic Background Explorer Satellite; James Webb Space Telescope; Dust; Hubble Space Telescope; Planets; Exploration

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080036846 Committee on Space Research, Ottawa, Ontario, Canada
Balloon-Borne, High-Energy Astrophysics: Experiences from the 1960s to the 1980s
Fishman, Gerald J.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Observational high-energy astrophysics in the hard-x-ray and gamma-ray regions owes its development and initial successes to the balloon-borne development of detector systems, as well as pioneering observations, primarily in the timeframe from the 1960s to the 1990s. I will describe some of the first observations made by the Rice University balloon group in the 1960s, including the impetus for these observations. The appearance of SN 1987a led to several balloon-flight campaigns, sponsored by NASA, from Alice Springs, Australia in 1987 and 1988. During the 1980s, prototypes of instruments for the Compton Gamma Ray Observatory were flown on many balloon flights, which greatly enhanced the success of that mission. Author
Balloon Flight; Gamma Ray Observatory; Supernovae; X Rays; Astrophysics

20080037600 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-Ray Source Motions and Their Implications for Flare Models
Holman, Gordon D.; May 25, 2008; 1 pp.; In English; The Joint meeting of AAS/SPD and American Geophysics Union (AGU), 25-31 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

RHESSI observations have revealed a downward contraction of solar flare loops followed by upward expansion. In some flares a pair of above-the-looptop sources is observed, one just above the top of the cooler flare loops and the other a discrete source well above the looptops characterized by an effective temperature gradient increasing toward lower altitudes. In one flare the higher, temperature-inverted coronal source sped outward at a speed consistent with that of a coronal mass ejection associated with the flare. In some flares with minimal preheating (early impulsive flares), nonthermal X-ray sources have been observed to propagate downward and then upward along the legs of the flare loop. I will discuss the implications of all of these X-ray source motions for flare models, and their use as diagnostics of the evolution of the physical conditions in flares. Author
X Ray Sources; Solar Flares; Coronal Mass Ejection; Temperature Gradients; Loops; Coronas

20080037608 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Plasmaspheric Structures Observed by the CLUSTER and IMAGE Spacecraft
Fung, S. F.; Adrian, M. L.; Benson, R. F.; Garcia, L. N.; Goldstein, M. L.; Sandel, B.; May 26, 2008; 1 pp.; In English; Joint meeting of the American Astronautical Society/Science Program Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

Global EUV imaging observations by the IMAGE satellite have revealed spectacularly complex changes in plasmaspheric structures as the plasmaspheric plasmas respond to geomagnetic activity while remaining under varying degrees of influence by co-rotation, depending on the radial distance. This complex plasmaspheric plasma dynamics, with its numerous scales of variability, is clearly far from being well understood. There is now renewed interest in studying the plasmasphere due to its apparent connections with the development of the ring current and radiation belt and loss of ionospheric plasmas. Earlier in the mission, the Cluster spacecraft only crossed the plasmapause (L - 4) occasionally and made measurements of the cold plasma in the plasmasphere and plasmaspheric drainage plumes. The study by Darrouzet et al. [2006], for example, provided detailed analyses of in situ Cluster observations and IMAGE EUV imaging observations of three plasmaspheric plumes detected in April-June, 2002. Within the next couple of years, Cluster orbit will change, causing perigee to migrate to lower altitudes, and thus providing excellent opportunities to obtain more detailed measurements of the plasmasphere. In this paper, we report our analyses of the earlier Cluster-IMAGE events by incorporating the different perspectives provided by the

IMAGE Radio Plasma Imager (RPI) observations through the plasmasphere. We will describe our new understanding of the Cluster-IMAGE events and their implications on plasmaspheric dynamics.
Author
Plasmasphere; Plasma Dynamics; Satellite Observation; Astrophysics

20080037619 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using PEACE Data from the four CLUSTER Spacecraft to Measure Compressibility, Vorticity, and the Taylor Microscale in the Magnetosheath and Plasma Sheet
Goldstein, Melvyn L.; Parks, George; Gurgiolo, C.; Fazakerley, Andrew N.; September 21, 2008; 1 pp.; In English; CLUSTER, 21-26 Sep. 2008, NH, USA; Copyright; Avail.: Other Sources; Abstract Only

We present determinations of compressibility and vorticity in the magnetosheath and plasma sheet using moments from the four PEACE thermal electron instruments on CLUSTER. The methodology used assumes a linear variation of the moments throughout the volume defined by the four satellites, which allows spatially independent estimates of the divergence, curl, and gradient. Once the vorticity has been computed, it is possible to estimate directly the Taylor microscale. We have shown previously that the technique works well in the solar wind. Because the background flow speed in the magnetosheath and plasma sheet is usually less than the Alfven speed, the Taylor frozen-in-flow approximation cannot be used. Consequently, this four spacecraft approach is the only viable method for obtaining the wave number properties of the ambient fluctuations. Our results using electron velocity moments will be compared with previous work using magnetometer data from the FGM experiment on Cluster.
Author
Current Sheets; Compressibility; Vorticity; Turbulence; Magnetosheath; Astrophysics

20080037626 NASA Goddard Space Flight Center, Greenbelt, MD, USA
PN Initial Data with Waves: Progress in Evolution
Kelly, Bernard; June 11, 2008; 1 pp.; In English; Post Newton 2008 International Workshop, 11 - 14 Jun. 2008, Jena, Germany Contract(s)/Grant(s): NNH06CC03B; No Copyright; Avail.: Other Sources; Abstract Only

In Kelly, Tichy, Campanelli & Whiting Phys. Rev. D vol. 76, 024008 (2007). we presented nonspinning black-hole binary data for numerical relativity, based on solving the constraint equations to 2.5pN order in an ADM-Transverse-Traceless gauge. Here we report on the first steps in evolving this data in full NR. We review the orbital and waveform characteristics, and how these may be improved in future evolutions.
Author
Black Holes (Astronomy); Binary Data; Numerical Analysis

20080037633 Max-Planck-Inst., Heidelberg, Germany
The Cycle of Dust in the Milky Ways: Clues from the High-Redshift and the Local Universe
Dwek, Eli; September 8, 2008; 1 pp.; In English; Cosmic Dust Near and Far, 8-12 Sep. 2008, Heidelberg, Germany; No Copyright; Avail.: Other Sources; Abstract Only

Massive amount of dust has been observed at high-redshifts when the universe was a mere 900 Myr old. The formation and evolution of dust is there dominated by massive stars and interstellar processes. In contrast, in the local universe lower mass stars, predominantly 2-5 Msun AGB stars, play the dominant role in the production of interstellar dust. These two extreme environments offer fascinating clues about the evolution of dust in the Milky Way galaxy
Author
Cosmic Dust; Galactic Evolution; Milky Way Galaxy

20080037747 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gamma Ray Burst Discoveries by the Swift Mission
Barthelmy, Scott; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly 2008 meeting, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

With 3 years of on-orbit operations (launched in Nov 2004), Swift has detected over 300 gammaray bursts (GRBs). The unique combination of quick and accurate position determinations by the BAT instrument, fast autonomous spacecraft slewing, and multi-band instrumentation (XRT and UVOT) has allowed Swift to accumulate a long list of discoveries about GRBs. These positions are also available to the ground follow-up community (via TDRSS and GCN) within 15-30 sec. A summary of these discoveries will be given (e.g. long and short GRB host associations, SN associations, flaring and on-going activity

in the central engine). The Swift spacecraft and instruments are in fine working order with no signs of performance degradation. With an expected orbital lifetime well past 2020, the overlap with GLAST (launch in mid-2008) will yield greater than 30 GRBs/year with observations by both missions. This will provide an unprecedented wavelength coverage from optical to 100 GeV. The coordination of pointing Swift with GLAST will be described.
Author
Gamma Ray Bursts; Autonomy; Spacecraft Instruments; TDR Satellites; Degradation; Coordination

20080037755 Lawrence Livermore National Lab., Livermore, CA USA; Herzberg Inst. of Astrophysics, Pentiction, British Columbia, Canada
Adaptive Wavefront Calibration and Control for the Gemini Planet Imager
Poyneer, L. A.; Veran, J. P.; Feb. 06, 2007; 5 pp.; In English
Report No.(s): DE2007-913550; UCRL-CONF-227801; No Copyright; Avail.: Department of Energy Information Bridge

Quasi-static errors in the science leg and internal adaptive optics (AO) flexure will be corrected. Wavefront control will adapt to current atmospheric conditions through Fourier modal gain optimization, or the prediction of atmospheric layers with Kalman filtering.
NTIS
Adaptive Control; Adaptive Optics; Calibrating; Wave Fronts

20080037784 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Broad Band Properties of the BAT Selected AGN
Mushotzky, Richard; Winter, Lisa; Tueller, jack; September 08, 2008; 1 pp.; In English; 7th INTEGRAL Workshop, 8-11 Sep. 2008, Copenhagen, Denmark; No Copyright; Avail.: Other Sources; Abstract Only

We will present the x-ray spectral properties of approximately 150 Burst Alert Telescope (BAT) selected active galactic nuclei (AGN) focusing on the issues of spectral complexity, x-ray absorption and its distribution and that contribution of sources to the x-ray background. If time permits we will also present the nature of the host galaxies of the AGN and their relationship to merger candidates.
Author
Active Galactic Nuclei; Gamma Ray Astronomy; Astronomical Spectroscopy; Broadband

20080037787 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Supercritical Pile GRB Model: The Prompt to Afterglow Evolution
Kazanas, Demosthenes; September 08, 2008; 1 pp.; In English; 7th INTEGRAL Workshop, 8-11 Sep. 2008, Copenhagen, Denmark; No Copyright; Avail.: Other Sources; Abstract Only

The ‘Supercritical Pile’ is a very economical gamma ray burst (GRB) model that provides for the efficient conversion of the energy stored in the protons of a Relativistic Blast Wave (RBW) into radiation and at the same time produces - in the prompt GRB phase, even in the absence of any particle acceleration - a spectral peak at an energy sim 1 MeV. We extend this model to include also the evolution of the RBW Lorentz factor Gamma and thus follow the spectral and temporal features of this model into the early GRB afterglow stage. One of the novel features of the present treatment is the inclusion of the feedback of the GRB produced radiation on the evolution of Gamma with radius. This feedback and the presence of kinematic and dynamic thresholds in the model can be the sources of rich time evolution which we have begun to explore. In particular, one can this way obtain afterglow light curves with steep decays followed by the more conventional flatter afterglow slopes, while at the same time preserving the desirable features of the model, i.e. the well defined relativistic electron source and radiative processes that produce the proper peak in the nu F spectra. Furthermore, the existence of a kinematic threshold in this model provides for a operational distinction of the prompt and afterglow GRB stages; in fact, the afterglow stage sets in when the RBW Lorentz factor cannot anymore fulfill the kinematic condition for pair formation in the photon - proton pair production reactions that constitute the fundamental process for the dissipation of the blast wave kinetic energy. We present the results of a specific set of parameters of this model with emphasis on the multiwavelength prompt emission and transition to the early afterglow.
Author
Gamma Ray Bursts; Models; Energy Conversion; Afterglows

20080037788 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fast X-Ray Oscillations During Magnetar Flares
Strohmayer, Tod E.; August 17, 2008; 1 pp.; In English; PREX Workshop (Lead Radius Experiment Workshop and Neutron Rich Matter in the Heavesn and on Earth), 17-19 Aug. 2008, Newport News, VA, USA; No Copyright; Avail.: Other Sources; Abstract Only

I will review recent studies of high frequency variability during magnetar giant flares. These oscillations may represent the first observations of global shear oscillations in neutron star crusts. I will also discuss how the observation of crust vibrations can provide a new tool to study neutron star structure.
Author
Magnetars; Stellar Flares; X Rays; Oscillations

20080037789 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-Ray Spectroscopy of Photoionized Plasmas
Kallman, Tim; Oct. 5, 2008; 1 pp.; In English; Exploring the Hot Universe with IXO, 5-11 Oct. 2008, Mons, Belgium; No Copyright; Avail.: Other Sources; Abstract Only

Spectroscopy allows study of sources on small spatial scales, and can provide detailed diagnostic information about elemental abundances, temperature, density and gas dynamics. For compact sources such as accreting black holes in active galactic nuclei (AGN) and X-ray binaries X-ray spectra provide truly unique insight. Observations using Chandra and XMM have revealed components of gas in these systems which were previously unknown or poorly studied. Interpretation of these data presents modeling and analysis challenges, and requires an understanding of atomic physics, ionization and spectrum formation in a radiation-dominated environment. In this talk I will discuss examples, and how they have contributed to our understanding of accreting sources and the nearby gas.
Author
X Ray Spectroscopy; Photoionization; Plasmas (Physics)

20080037790 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Galaxies in the X-Ray Band
Hornschemeier, Ann; July 21, 2008; 1 pp.; In English; Putting Gravity to Work, 21-25 Jul. 2008, Cambridge, UK; Original contains poor quality, truncated or crooked pages; No Copyright; Avail.: Other Sources; Abstract Only

This talk will provide a brief review of progress an X-ray emission from normal (non-AGN) galaxy populations, including important constraints on the evolution of accreting binary populations over important cosmological timescales. We will also look to the future, anticipating constraints from near-term imaging hard X-ray missions such as NuSTAR, Simbol-X and NeXT and then the longer-term prospects for studying galaxies with the Generation-X mission,
Author
X Rays; Emission; Galaxies

20080037792 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Pulsars at the Highest Energies: Questions for the GLAST and ACT's
Thompson, Dave; July 07, 2008; 1 pp.; In English; International Symposium on High Energy Gamma Ray Astronomy, 7-11 Jul. 2008, Heidelberg, Germany; Original contains poor quality, truncated or crooked pages; No Copyright; Avail.: Other Sources; Abstract Only

The recent announcement by the MAGIC team of pulsed gamma rays from the Crab Pulsar above 25 GeV and the launch of AGILE and the Gamma-ray Large Area Space Telescope (GLAST) offer the promise of major progress in understanding the most extreme emission from pulsar magnetospheres. While waiting for detailed results, we can formulate questions to be addressed, based on past measurements and theoretical modeling. This brief review will highlight promising approaches for research into high-energy pulsed radiation.
Author
Pulsars; Pulsed Radiation; Fermi Gamma-Ray Space Telescope

20080037793 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gas in Debris Disks: Clues to the Late Stages of Planet Formation
Roberg, A.; July 21, 2008; 1 pp.; In English; CoolStars 15 Conference, 21-25 Jul. 2008, Saint Andrews, Scotland, UK; No Copyright; Avail.: Other Sources; Abstract Only

The basic character of debris disks was established soon after their discovery in the mid-80's. These disks around nearby

main sequence stars are composed of material produced by collisions and/or evaporation of extrasolar asteroids and comets. Debris disks appear to be largely composed of dust, though little is known about its typical composition. Nonetheless, at least some debris disks have detectable gas, which has very different characteristics from the gas in younger protoplanetary disks. The gas component has resisted observation, but appears to hold important clues to the composition of extrasolar planetesimals during the late-stages of planetary system formation and the formation of terrestrial planet atmospheres. In this talk, I will explain our current understanding of the place of debris disks in the planet formation process and describe what is known about the gas component. Finally, I will outline upcoming opportunities for sensitive new studies of gas in debris disks.
Author
Debris; Planetary Evolution; Cosmic Gases

20080037797 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Gas in Protoplanetary Disks
Roberge, Aki; May 27, 2008; 1 pp.; In English; Far-Infrared Astronomy from Space Workshop, 27-31 May 2008, Pasadena, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Gas makes up the bulk of the mass in a protoplanetary disk, but it is much more difficult to observe than the smaller dust component. The lifetime of gas in a disk has far-reaching consequences, including limiting the time available for giant planet formation and controlling the migration of planetary bodies of all sizes, from Jupiters to meter-sized planetesimals. Here I will discuss what is known about the gas component of protoplanetary disks, highlighting recent results from infrared studies with the Spitzer Space Telescope. Exciting upcoming opportunities for gas studies will also be discussed. In particular, the first large far-IR survey of gas tracers from young disks will be performed using the Herschel Space Observatory, as part of the 'Gas in Protoplanetary Systems' (GASPS) Open Time Key Project.
Author
Cosmic Gases; Protoplanetary Disks; Cosmology

20080037798 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multiwavelength Emission From Pulsar Slot Gaps
Harding, Alice K.; Stern, Julie; Dyks, Jarek; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

We present results of a 3D model of optical to gamma-ray emission from the slot gap accelerator of a rotation-powered pulsar. Primary electrons accelerating to high altitude in the pulsar magnetosphere at the outer edge of the open field volume, as well as electron-positron pairs on field line interior to the slot gap, radiate curvature, inverse Compton and synchrotron radiation. Both primaries and pairs undergo cyclotron resonant absorption of radio photons, allowing them to maintain significant pitch angles and to produce a broad spectrum of emission from infra-red to GeV energies. Synchrotron radiation from pairs with a power-law energy spectrum dominate the spectrum up to 10 MeV. Synchrotron and curvature radiation of primaries dominates from 10 MeV up to a few GeV. The high-energy pulse profiles are dominated by caustics on trailing field lines. In the case of the Crab pulsar, the radio conal emission may also form caustics in phase with the high-energy peaks. If resonant absorption of radio emission produces high-energy synchroti-on radiation, emission below 200 Mev is expected to exhibit correlations in time and phase with the radio emission.
Author
Light Emission; Electron-Positron Pairs; Synchrotron Radiation; Radio Emission; Pulsar Magnetospheres; Energy Spectra; Gamma Rays

20080037799 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simple Waveforms, Simply Described
Baker, John G.; June 11, 2008; 1 pp.; In English; Post Newton 08, 11-14 Jun. 2008, Jena, Germany; No Copyright; Avail.: Other Sources; Abstract Only

Since the first Lazarus Project calculations, it has been frequently noted that binary black hole merger waveforms are 'simple.' In this talk we examine some of the simple features of coalescence and merger waveforms from a variety of binary configurations. We suggest an interpretation of the waveforms in terms of an implicit rotating source. This allows a coherent description, of both the inspiral waveforms, derivable from post-Newtonian(PN) calculations, and the numerically determined merger-ringdown. We focus particularly on similarities in the features of various Multipolar waveform components Generated by various systems. The late-time phase evolution of most L these waveform components are accurately described with a si~nple analytic fit. We also discuss apparent relationships among phase and amplitude evolution. Taken together with PN

information, the features we describe can provide an approximate analytic description full coalescence wavefoRms. complementary to other analytic waveforn~s approaches.
Author
Analogies; Black Holes (Astronomy); Waveforms

20080037995 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The ALI-ARMS Code for Modeling Atmospheric non-LTE Molecular Band Emissions: Current Status and Applications
Kutepov, A. A.; Feofilov, A. G.; Manuilova, R. O.; Yankovsky, V. A.; Rezac, L.; Pesnell, W. D.; Goldberg, R. A.; April 13, 2008; 1 pp.; In English; European Geosciences Union (EGU) General Assembly 2008, 13-18 Apr. 2008, Vienna, Austria; No Copyright; Avail.: Other Sources; Abstract Only

The Accelerated Lambda Iteration (ALI) technique was developed in stellar astrophysics at the beginning of 1990s for solving the non-LTE radiative transfer problem in atomic lines and multiplets in stellar atmospheres. It was later successfully applied to modeling the non-LTE emissions and radiative cooling/heating in the vibrational-rotational bands of molecules in planetary atmospheres. Similar to the standard lambda iterations ALI operates with the matrices of minimal dimension. However, it provides higher convergence rate and stability due to removing from the iterating process the photons trapped in the optically thick line cores. In the current ALI-ARMS (ALI for Atmospheric Radiation and Molecular Spectra) code version additional acceleration of calculations is provided by utilizing the opacity distribution function (ODF) approach and 'decoupling'. The former allows replacing the band branches by single lines of special shape, whereas the latter treats non-linearity caused by strong near-resonant vibration-vibrational level coupling without additional linearizing the statistical equilibrium equations. Latest code application for the non-LTE diagnostics of the molecular band emissions of Earth's and Martian atmospheres as well as for the non-LTE IR cooling/heating calculations are discussed.
Author
Molecular Spectra; Radiation Spectra; Atmospheric Radiation; Atomic Spectra; Distribution Functions; Line Spectra; Stellar Atmospheres; Astrophysics; Energy Levels

20080038052 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Impact of Universal Plasma and Energetic Particle Processes on Icy Bodies of the Kuiper Belt and the Oort Cloud
Cooper, John F.; Richardson, J. D.; Hill, M. E.; Sturner, S. J.; [2008]; 1 pp.; In English; Chapman Conference on Universal Heliophysical Proceses, 10-14 Nov. 2008, Savannah, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

Modeling of space plasma and energetic particle interactions with icy bodies of the outer solar system is simplified when there is commonality of the underlying source, acceleration, and transport processes in spatially distinct regions from the supersonic heliosphere through the heliosheath into the local interstellar medium (LISM). Current trends in the Voyager heliosheath measurements suggest strong commonality to processes in the LISM. The Fisk-Gloeckler 'universal' spectrum at suprathermal energies apparently plays a strong role in coupling the plasma and high energy particle regimes in the spatial and energetic transitions from the outer heliosphere to the LISM. Dominant processes in consecutive energy regimes project to varying effects versus irradiation depth on exposed upper surfaces of airless small icy bodies and to upper atmospheres of larger bodies such as Titan and Pluto. Relative absence of the universal suprathermal spectrum in the mid-heliospheric region of the classical Kuiper Belt may profoundly affect surface color diversity of icy bodies in this region.
Author
Interstellar Matter; Oort Cloud; Energetic Particles; Kuiper Belt; Plasma Interactions; Space Plasmas; Energy Transfer

20080038656 Fermi National Accelerator Lab., Batavia, IL, USA; Universita degli Studi di, Napoli, Federico , Italy; Valencia Univ., Spain; Aarhus Univ., Denmark
High Energy Neutrinos with a Mediterranean Neutrino Telescope
Borriello, E.; Mangano, G.; Miele, G.; Pastor, S.; Pisanti, O.; January 2007; 4 pp.; In English
Report No.(s): DE2007-917434; FERMILAB-CONF-07-139-A; No Copyright; Avail.: Department of Energy Information Bridge

The high energy neutrino detection by a km3 Neutrino Telescope placed in the Mediterranean sea provides a unique tool to both determine the diffuse astrophysical neutrino flux and the neutrinonucleon cross section in the extreme kinematical region, which could unveil the presence of new physics. Here is performed a brief analysis of possible NEMO site performances.
NTIS
Neutrinos; Telescopes

20080038658 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Contribution to the NSAC Long-Range Plan
Dec. 2006; 28 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-917517; LBNL-PUB-966; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a time of great opportunity in nuclear spectros-copy. The development of radioactive beam capabili-ties around the world is opening a new landscape for discovery, and the connections between nuclear structure studies and astrophysics, neutrino physics, and physics beyond the standard model are stronger than ever. New detector technologies are evolving which can meet the challenges of the new generation of experiments. Leading these is the technology of gamma-ray tracking which can revolutionize gamma-ray spectroscopy in a way that large arrays of gamma detectors did a decade ago. During the last few years this technology has been shown feasible and GRETINA a 1 detector is under construction. However, the momentum in developing this technology to its full potential must continue to-wards GRETA, a full pi calorimeter. GRETA will carry gamma-ray spectroscopy into the next generation where it will be needed to fully exploit the science opportunities at radioactive beam facilities and increase the reach of stable beam facilities. In addition, gamma-ray tracking technology will have important applications for science, medicine, and homeland security.
NTIS
Gamma Ray Spectrometers; Gamma Rays

20080038667 Stanford Univ., Palo Alto, CA, USA
Magnetic Bootstrap
Blandford, R.; Funk, S.; January 2006; 3 pp.; In English
Report No.(s): DE2007-917733; SLAC-PUB-12873; No Copyright; Avail.: Department of Energy Information Bridge

Recent observations with TeV telescopes strongly indicate that young supernova remnants are capable of accelerating cosmic ray protons almost to PeV energies. On quite general grounds, this, in turn, suggests that the magnetic field strength must be enhanced above the standard interstellar value by about two orders of magnitude. It is suggested that protons and electrons are accelerated through diffusive shock acceleration, with the highest energy protons streaming furthest ahead of the shock front. It is then shown that the pressure of the approximately 300TeV protons dominates that of the ambient thermal particles and magnetic field and is likely to be sufficiently anisotropic to render the pre-shock fluid unstable to resonant and non-resonant instability. A new theory of the non-resonant instabilities is outlined. The nonlinear evolution of these instabilities requires careful numerical simulation but it is conjectured that the magnetic field is amplified in this location and provides the means for efficient acceleration of progressively lower energy particles as it is convected towards the subshock in the thermal plasma. Further possible implications of these ideas are sketched.
NTIS
Astrophysics; Supernova Remnants

20080038668 Stanford Univ., Stanford, CA USA; Max-Planck-Inst. fuer Kernphysik, Heidelberg, Germany
Automatic Quenching of High Energy gamma-ray Sources by Synchrotron Photons
Stawarz, L.; Kirk, J. G.; January 2007; 2 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-917736; SLAC-PUB-12861; No Copyright; Avail.: Department of Energy Information Bridge

We investigate a magnetized plasma in which injected high energy gamma-rays annihilate on a soft photon field, that is provided by the synchrotron radiation of the created pairs. For a very wide range of magnetic fields, this process involves gamma-rays between 0.3 GeV and 30 TeV.We derive a simple dynamical system for this process, analyze its stability to runaway production of soft photons and paris, and find conditions for it to automatically quench by reaching a steady state with an optical depth to photon-photon annihilation larger than unity.
NTIS
Gamma Rays; Photons; Synchrotrons

20080038689 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Spectrum of 1ES0229 + 200 and the Cosmic Infrared Background
Stecker, F. W.; Scully, S. T.; Astronomy and Astrophysics; 2008; Volume 478, pp. L1 - L3; In English; Original contains black and white illustrations
Contract(s)/Grant(s): J-805; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1051/0004-6361:20078827

Aims. We reexamine the implications of the recent HESS observations of the blazar 1ES0229+200 for constraining the

extragalactic mid-infrared background radiation. Methods. We examine the effect of gamma-ray absorption by the extragalactic infrared radiation on predicted intrinsic spectra for this blazar and compare our results with the observational data. Results. We find agreement with our previous results on the shape of the infrared spectral energy distribution, contrary to the recent assertion of the HESS group. Our analysis indicates that 1ES0229+200 has a very hard intrinsic spectrum with a spectral index between 1.1 +/- 0.3 and 1.5 0.3 in the energy range between 0.5 TeV and 15 TeV. Conclusions. Under the assumptions that (1) the models of Stecker et al. as derived from numerous detailed infrared observations are reasonable, and (2) spectral indexes in the range 1 < Gamma < 1.5 are obtainable from relativistic shock acceleration under the astrophysical conditions extant in blazar flares, the fits to the observations of 1ES0229+200 using our previous infrared spectral energy distributions are consistent with both the infrared and -ray observations. Our analysis presents evidence indicating that the energy spectrum of relativistic particles in 1ES0229+200 is produced by relativistic shock acceleration, producing an intrinsic gamma-ray spectrum with index 1 < Gamma < 1.5 and with no evidence of a peak in the spectral energy distribution up to energies approximately 15 TeV.
Author
Background Radiation; Blazars; Gamma Ray Spectra; Infrared Astronomy; Infrared Radiation; Gamma Ray Astronomy; Extraterrestrial Radiation

20080038697 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Is There Evidence for X-Ray Emitting Plasma Very Close to the Photospheres of O Stars?
Leutenegger, Maurice A.; [2008]; 14 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH06CC03B; SAO AR7-8002X; Copyright; Avail.: CASI: A03, Hardcopy

Aims. We reexamine the implications of the recent HESS observations of the blazar 1ES0229+200 for constraining the extragalactic mid-infrared background radiation. Methods. We examine the effect of gamma-ray absorption by the extragalactic infrared radiation on predicted intrinsic spectra for this blazar and compare our results with the observational data. Results. We find agreement with our previous results on the shape of the infrared spectral energy distribution, contrary to the recent assertion of the HESS group. Our analysis indicates that 1ES0229+200 has a very hard intrinsic spectrum with a spectral index between 1.1 +/- 0.3 and 1.5 +/- 0.3 in the energy range between approx.0.5 TeV and approx.15 TeV. Conclusions. Under the assumptions that (1) the models of Stecker et al. (2006, ApJ, 648, 774) as derived from numerous detailed infrared observations are reasonable, and (2) spectral indexes in the range 1 < gamma < 1.5 are obtainable from relativistic shock acceleration under the astrophysical conditions extant in blazar flares (Stecker et al. 2007, ApJ, 667, L29), the fits to the observations of 1ES0229+200 using our previous infrared spectral energy distributions are consistent with both the infrared and gamma-ray observations. Our analysis presents evidence indicating that the energy spectrum of relativistic particles in 1ES0229+200 is produced by relativistic shock acceleration, producing an intrinsic -ray spectrum with index 1 < gamma < 1.5 and with no evidence of a peak in the spectral energy distribution up to energies approx.15 TeV.
Author
Infrared Astronomy; Blazars; Gamma Rays; Spectral Energy Distribution; Relativistic Particles; Plasmas (Physics); O Stars; Infrared Radiation; Background Radiation

20080038754 Naval Observatory, Washington, DC USA
Further Constraints on the Presence of a Debris Disk in the Multiplanet System Gliese 876
Shankland, P D; Blank, D L; Boboltz, D A; Lazio, T J; White, G; Jun 2008; 6 pp.; In English
Report No.(s): AD-A482365; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA482365

Using both the Very Large Array (VLA) at 7 mm wavelength, and the Australia Telescope Compact Array (ATCA) at 3 mm, we have searched for microwave emission from cool dust in the extrasolar planetary system Gliese 876 (Gl 876). Having detected no emission above our 3 sigma detection threshold of 135 microJy, we rule out any dust disk with either a mass greater than 0.0006 Earth mass or less than < 250 AU across. This result improves on previous detection aperture thresholds by an order of magnitude, and it has some implications for the dynamical modeling of the system. It also is consistent with the Greaves et al. hypothesis that relates the presence of a debris disk to close-in planets. Due to the dust-planetesimal relationship, our null result may also provide a constraint on the population or composition of the dust and small bodies around this nearby M dwarf.
DTIC
Cosmic Dust; Debris; Detection; Dust; Dwarf Stars; Planetary Systems

20080039145 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Milli-Arc-Second Structure Imager, MASSIM: A New Concept for a High Angular Resolution X-ray Telescope

Skinner, Gerry; Arzoumanian, Z.; Cash, W.; Gehrels, N.; Gendreau, K.; Gorenstein, P.; Krizmanic, J.; Leitner, J.; Miller, M.; Reasenberg, R.; Reynolds, C.; Sambruna, R.; Streitmatter, R.; Windt, D.; June 23, 2008; 1 pp.; In English; SPIE Conference, 23-28 Jun. 2008, Marseille, France

Contract(s)/Grant(s): NNG06E090A; Copyright; Avail.: Other Sources; Abstract Only

MASSIM, the Milli-Arc-Second Structure Imager, is a mission that has been proposed for study within the context of NASA's 'Astrophysics Strategic Mission Concept Studies' program. It uses a set of achromatic diffractive-refractive Fresnel lenses on an optics spacecraft to focus 5-11 keV X-rays onto detectors on a second spacecraft flying in formation 1000 km away. It will have a point-source sensitivity comparable with that of the current generation of major X-ray observatories (Chandra, XMM-Newton) but an angular resolution some three orders of magnitude better. MASSIM is optimized for the study of jets and other phenomena that occur in the immediate vicinity of black holes and neutron stars. It can also be used for studying other astrophysical phenomena on the milli-arc-second scale, such as those involving proto-stars, the surfaces and surroundings of nearby active stars and interacting winds. After introducing the principle of diffractive imaging in the x-ray/gamma-ray regime, the MASSIM mission concept and baseline design will be described along with a discussion of the options and trade-offs within the X-ray optics design.

Author

Astrophysics; Black Holes (Astronomy); Gamma Rays; X Ray Optics; High Resolution; Angular Resolution; Neutron Stars

20080039148 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Seeking to Improve Low Energy Neutral Atom Detection in Space

Shappirio, M.; Coplan, M.; Chornay, D.; Collier, M.; Herrero, F.; Ogilvie, K.; Williams, E.; December 10, 2007; 1 pp.; In English; American Geophysical Union Conference, 10-15 Dec. 2007, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The detection of energetic neutral atoms allows for the remote examination of the interactions between plasmas and neutral populations in space. Before these neutral atoms can be measured, they must first be converted to ions. For the low energy end of this spectrum, interaction with a conversion surface is often the most efficient method to convert neutrals into ions. It is generally thought that the most efficient surfaces are low work functions materials. However, by their very nature, these surfaces are highly reactive and unstable, and therefore are not suitable for space missions where conditions cannot be controlled as they are in a laboratory. We therefore are looking to optimize a stable surface for conversion efficiency. Conversion efficiency can be increased either by changing the incident angle of the neutral particles to be grazing incidence and using stable surfaces with high conversion efficiencies. We have examined how to increase the angle of incidence from -80 degrees to -89 degrees, while maintaining or improving the total active conversion surface area without increasing the overall volume of the instrument. We are developing a method to micro-machine silicon, which will reduce the volume to surface area ratio by a factor of 60. We have also examined the material properties that affect the conversion efficiency of the surface for stable surfaces. Some of the parameters we have examined are work function, smoothness, and bond structure. We find that for stable surfaces, the most important property is the smoothness of the surface.

Author

Energy Conversion Efficiency; Neutral Atoms; Detection; Work Functions; Neutral Particles; Reactivity

20080039150 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Probing the Galactic Binary Black Hole Spin with Photon Timing

Kazanas, Demos; September 10, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

It is generally considered that the X-ray emission in AGN and Galactic Black Hole Candidates is produced by flares above the surface of a geometrically thin optically thick accretion disk, which extends down to the Innermost Stable Circular Orbit (ISCO) of the black hole. We consider the influence of the black hole geometry on the light curves of these flares. To this end we follow a large number of photon orbits emitted impulsively in a locally isotropic fashion, at any phase of the disk orbit and examine their arrival times at infinity by an observer near the plane of the disk. We find out that the presence of the black hole spin induces a certain delay in the photon arrivals, as prograde photon orbits reach the observer on shorter (on the average) times than the retrograde ones. We form a histogram of the differences in photon time arrivals and we find that it exhibits several well defined peaks depending on the flare position and the black hole spin separated by $\Delta t\slmeq 30

M$, where M is the black hole mass. The peaks disappear as the spin parameter goes to zero, implying that one could in principle measure the value of the black hole spin with timing measurements of sufficiently high signal to noise ratio.
Author
Black Holes (Astronomy); Circular Orbits; Histograms; Signal to Noise Ratios; Accretion Disks

20080039154 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Baryonic Content in the Warm-Hot IGM at Low Redshift
Sonneborn, George; Shull, M.; Danforth, C.; Moos, W.; August 23, 2007; 1 pp.; In English; A Century of Cosmology: Past, Present, and Future, 23 Aug. - 4 Sep. 2007, Venice, Italy; Copyright; Avail.: Other Sources; Abstract Only

Baryons are 4.5% of the universe's mass/energy density; only 10% of these are in stars, galaxies, and clusters. At low-redshift 90% of baryons are in the IGM, 30% in Ly-alpha forest, but most are in hot gas (10(exp 5-7) K) produced by shocks during structure formation. O VI 1032-38 A are the best tracers of this gas. The distribution of O VI absorbers observed by FUSE rises as N(sup -2+/-0.2, down to 10(exp 13)/sq cm. Integrated to logN=13, 7% of baryons reside in the O VI-bearing IGM at 10% solar metallicity, T approx. 10(exp 5.5) K. At redshift z<0.1 metals have been transported less than 800/h kpc from L* galaxies and 200/h kpc from 0.1 L* galaxies. The steepness of dN/dz means that low-N absorbers contribute an equal mass of hot IGM as higher N gas. The total mass of O VI-bearing gas in the IGM depends on determining the turnover in dN/dz at low N(O VI). Future observations by FUSE are needed to reach lower N and to reduce the uncertainty in the dN/dz power law.
Author
Baryons; High Temperature Gases; Red Shift; Star Clusters; Galactic Clusters; Flux Density

20080039167 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Diagnosis of Magnetic Structures and Intermittency in Space Plasma Turbulence using the Method of Surrogate Data
Sahraoui, Fouad; Goldstein, Melvyn; September 22, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Several observations in space plasmas have reported the presence of coherent structures at different plasma scales. Structure formation is believed to be a direct consequence of nonlinear interactions between the plasma modes, which depend strongly on phase synchronization of those modes. Despite this important role of the phases in turbulence, very limited work has been however devoted to study the phases as a potential tracers of nonlinearities in comparison with the wealth of literature on power spectra of turbulence where phases are totally missed. We present a method based on surrogate data to systematically detect coherent structures in turbulent signals. The new method has been applied successfully to magnetosheath turbulence (Sahraoui, Phys. Rev. E, 2008, in press), where the relationship between the identified phase coherence and intermittency (classically identified as non Gaussian tails of the PDFs) as well as the energy cascade has been studied. Here we review the main results obtained in that study and show further applications to small scale solar wind turbulence. Implications of the results on theoretical modelling of space turbulence (applicability of weak/wave turbulence, its validity limits and its connection to intermittency) will be discussed.
Author
Space Plasmas; Plasma Turbulence; Interstellar Magnetic Fields

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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*.

20080037555 NASA Marshall Space Flight Center, Huntsville, AL, USA
Applications of Mars Global Reference Atmospheric Model (Mars-GRAM 2005) Supporting Mission Site Selection for Mars Science Laboratory
Justh, Hilary L.; Justus, Carl G.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Quebec, Canada; Copyright; Avail.: Other Sources; Abstract Only

The Mars Global Reference Atmospheric Model (Mars-GRAM 2005) is an engineering level atmospheric model widely used for diverse mission applications. An overview is presented of Mars-GRAM 2005 and its new features. One new feature of Mars-GRAM 2005 is the 'auxiliary profile' option. In this option, an input file of temperature and density versus altitude is used to replace mean atmospheric values from Mars-GRAM's conventional (General Circulation Model) climatology. An

auxiliary profile can be generated from any source of data or alternate model output. Auxiliary profiles for this study were produced from mesoscale model output (Southwest Research Institute's Mars Regional Atmospheric Modeling System (MRAMS) model and Oregon State University's Mars mesoscale model (MMM5)model) and a global Thermal Emission Spectrometer(TES) database. The global TES database has been specifically generated for purposes of making Mars-GRAM auxiliary profiles. This data base contains averages and standard deviations of temperature, density, and thermal wind components,averaged over 5-by-5 degree latitude-longitude bins and 15 degree L(s) bins, for each of three Mars years of TES nadir data. Results are presented using auxiliary profiles produced from the mesoscale model output and TES observed data for candidate Mars Science Laboratory (MSL) landing sites. Input parameters rpscale (for density perturbations) and rwscale (for wind perturbations) can be used to 'recalibrate' Mars-GRAM perturbation magnitudes to better replicate observed or mesoscale model variability.

Author

Atmospheric Models; Mars Probes; Space Laboratories; Aerospace Sciences; Mars Atmosphere

20080037557 NASA Marshall Space Flight Center, Huntsville, AL, USA

Marshall Space Flight Center's Impact Testing Facility Capabilities

Finchum, Andy; Hubbs, Whitney; Evans, Steve; June 23, 2008; 1 pp.; In English; 2008 National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; No Copyright; Avail.: Other Sources; Abstract Only

Marshall Space Flight Center s (MSFC) Impact Testing Facility (ITF) serves as an important installation for space and missile related materials science research. The ITF was established and began its research in spacecraft debris shielding in the early 1960s, then played a major role in the International Space Station debris shield development. As NASA became more interested in launch debris and in-flight impact concerns, the ITF grew to include research in a variety of impact genres. Collaborative partnerships with the DoD led to a wider range of impact capabilities being relocated to MSFC as a result of the closure of Particle Impact Facilities in Santa Barbara, California. The Particle Impact Facility had a 30 year history in providing evaluations of aerospace materials and components during flights through rain, ice, and solid particle environments at subsonic through hypersonic velocities. The facility s unique capabilities were deemed a 'National Asset' by the DoD. The ITF now has capabilities including environmental, ballistic, and hypervelocity impact testing utilizing an array of air, powder, and two-stage light gas guns to accommodate a variety of projectile and target types and sizes. Numerous upgrades including new instrumentation, triggering circuitry, high speed photography, and optimized sabot designs have been implemented. Other recent research has included rain drop demise characterization tests to obtain data for inclusion in on-going model development. The current and proposed ITF capabilities range from rain to micrometeoroids allowing the widest test parameter range possible for materials investigations in support of space, atmospheric, and ground environments. These test capabilities including hydrometeor, single/multi-particle, ballistic gas guns, exploding wire gun, and light gas guns combined with Smooth Particle Hydrodynamics Code (SPHC) simulations represent the widest range of impact test capabilities in the country.

Author

Impact Tests; Spacecraft Construction Materials; Micrometeoroids; Hypervelocity Impact; Aircraft Construction Materials; Environmental Surveys; Terminal Ballistics; Test Facilities

20080037559 NASA Marshall Space Flight Center, Huntsville, AL, USA

Utilizing Mars Global Reference Atmospheric Model (Mars-GRAM 2005) to Evaluate Entry Probe Mission Sites

Justh, Hilary L.; Justus, C. G.; June 23, 2008; 16 pp.; In English; Sixth International Planetary Probe Workshop, 23-27 Jun. 2008, Atlanta, GA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Engineering-level atmospheric model widely used for diverse mission applications. Mars-GRAM s perturbation modeling capability is commonly used, in a Monte-Carlo mode, to perform high fidelity engineering end-to-end simulations for entry, descent, and landing (EDL)1. Traditional Mars-GRAM options for representing the mean atmosphere along entry corridors include: a) TES Mapping Years 1 and 2, with Mars-GRAM data coming from MGCM model results driven by observed TES dust optical depth; and b) TES Mapping Year 0, with user-controlled dust optical depth and Mars-GRAM data interpolated from MGCM model results driven by selected values of globally-uniform dust optical depth. From the surface to 80 km altitude, Mars-GRAM is based on NASA Ames Mars General Circulation Model (MGCM). Mars-GRAM and MGCM use surface topography from Mars Global Surveyor Mars Orbiter Laser Altimeter (MOLA), with altitudes referenced to the MOLA areoid, or constant potential surface. Mars-GRAM 2005 has been validated2 against Radio Science data, and both nadir and limb data from the Thermal Emission Spectrometer (TES)

Derived from text

Mars Global Surveyor; Atmospheric General Circulation Models; Thermal Emission; Mars Atmosphere; Atmospheric Circulation; Atmospheric Entry; Dust; Topography

20080037609 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Saturn's Auroral Response to the Solar Wind: Centrifugal Instability Model

Sittler, Edward C.; Blanc, Michel F.; Richardson, J. D.; May 26, 2008; 1 pp.; In English; Joint meeting of the American Astronautical Society/Science Programs Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

We describe a model initially presented by Sittler et al. [2006] which attempts to explain the global response of Saturn's magnetosphere and its corresponding auroral behavior to variations in the solar wind. The model was derived from published simultaneous Hubble Space Telescope (HST) auroral images and Cassini upstream measurements taken during the month of January 2004. These observations show a direct correlation between solar wind dynamic pressure and (1) auroral brightening toward dawn local time, (2) an increase of rotational movement of auroral features to as much as 75% of the corotation speed, (3) the movement of the auroral oval to higher latitudes and (4) an increase in the intensity of Saturn Kilometric Radiation (SKR). This model is an alternative to the reconnection model of Cowley et al. [2004a,b; 2005] which is more Earth-like while ours stresses rotation. If angular momentum is conserved in a global sense, then when compressed the magnetosphere will tend to spin up and when it expands will tend to spin down. With the plasma sheet outer boundary at L - 15 we argue this region to be the dominant source region for the precipitating particles. If radial transport is dominated by centrifugal driven flux tube interchange motions, then when the magnetosphere spins up, outward transport will increase, the precipitating particles will move radially outward and cause the auroral oval to move to higher latitudes as observed. The Kelvin-Helmholtz instability may contribute to the enhanced emission along the dawn meridian as observed by HST. We present this model in the context of presently published observations by Cassini.

Author

Saturn; Planetary Magnetospheres; Auroras; Solar Wind

20080037613 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Composition of Upstream Flow for Titan's Interaction with Saturn's Magnetosphere during T9 Flyby

Sittler, Edward C.; Hartle, Richard E.; Lipatov, A; Bertucci, C.; Coates, A.; Szego, K.; Shappirio, Mark D.; Simpson, David G.; May 26, 2008; 2 pp.; In English; Joint meeting of the American Astronautical Society/Science Programs Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, Fl, USA; Copyright; Avail.: Other Sources; Abstract Only

As described in Bertucci et al. [2007] Saturn's magnetic field is stretched out into a magnetodisk configuration where the field is confined near the equatorial plane with Titan below the current sheet. As discussed in Maurice et al. [1996] for Jupiter's outer magnetosphere where magnetodisk configuration applies the heavy ions are confined within 2 deg of the current sheet and at higher latitudes protons dominate. We show compositional evidence from the Cassini Plasma Spectrometer (CAPS) Ion Mass Spectrometer (IMS) that protons dominate the ion composition for the upstream flow, while in pickup region H2+ and protons dominate. If true, then we expect a far different interaction between Saturn's magnetosphere and Titan's upper atmosphere and exosphere, where heavy ions are essentially absent.

Author

Magnetohydrodynamic Flow; Titan; Satellite Atmospheres; Saturn; Planetary Magnetospheres

20080037803 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Does NASA's Constellation Architecture Offer Opportunities to Achieve Multiple Additional Goals in Space?

Thronson, Harley; Lester, Daniel F.; Sep. 26, 2008; 1 pp.; In English; Royal Observatory meeting, 26 Sep. 2008, Edinburgh, Scotland, UK; Copyright; Avail.: Other Sources; Abstract Only

Every major NASA human spaceflight program in the last four decades has been modified to achieve goals in space not incorporated within the original design goals: the Apollo Applications Program, Skylab, Space Shuttle, and International Space Station. Several groups in the US have been identifying major future science goals, the science facilities necessary to investigate them, as well as possible roles for augmented versions of elements of NASA's Constellation program. Specifically, teams in the astronomy community have been developing concepts for very capable missions to follow the James Webb Space Telescope that could take advantage of - or require - free-space operations by astronauts and/or robots. Taking as one example, the Single-Aperture Far-InfraRed (SAFIR) telescope with a approx. 10+ m aperture proposed for operation in the 2020 timeframe. According to current NASA plans, the Ares V launch vehicle (or a variant) will be available about the same time, as will the capability to transport astronauts to the vicinity of the Moon via the Orion Crew Exploration Vehicle and associated systems. [As the lunar surface offers no advantages - and major disadvantages - for most major optical systems, the expensive system for landing and operating on the lunar surface is not required.] Although as currently conceived, SAFIR and other astronomical missions will operate at the Sun-Earth L2 location, it appears trivial to travel for servicing to the more accessible

Earth-Moon L1,2 locations. Moreover. as the recent Orbital Express and Automated Transfer Vehicle missions have demonstrated, future robotic capabilities should offer capabilities that would (remotely) extend human presence far beyond the vicinity of the Earth. In addition to multiplying the value of NASA's architecture for future human spaceflight to achieve the goals multiple major stakeholders. if humans one day travel beyond the Earth-Moon system - say, to Mars - technologies and capabilities for operating for long periods in free space must be developed. The engineering, management. and operational successes of the Space Station have demonstrated that international collaboratio~i is possible. However, there is a danger that the hard-won lessons of cLul+sent programs will be lost without continuing development of in-space operations. A program to achieve. for example. major astronomical goals in space using astronauts and robots will sustain international capabilities. produce highly visible achievements. and appeal to a11 additional broad community of stakeholders not currently involved with missions to the lunar surface.
Author
Constellation Program; Earth-Moon System; Crew Exploration Vehicle; International Space Station; James Webb Space Telescope; Space Shuttles; Robotics; Ares 5 Cargo Launch Vehicle; Astronomy

20080037971 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Does NASA's Constellation Architecture Offer Opportunities to Achieve Multiple Additional Goals in Space?
Thronson, Harley A.; Lester, Daniel F.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Every major NASA human spaceflight program in the last four decades has been modified to achieve goals in space not incorporated within the original design goals: the Apollo Applications Program, Skylab, Space Shuttle, and International Space Station. Several groups in the US have been identifying major future science goals, the science facilities necessary to investigate them, as well as possible roles for augmented versions of elements of NASA's Constellation program. Specifically, teams in the astronomy community have been developing concepts for very capable missions to follow the James Webb Space Telescope that could take advantage of - or require - free-space operations by astronauts and/or robots. Taking as one example, the Single-Aperture Far-InfraRed (SAFIR) telescope with a approx.10+ m aperture proposed for operation in the 2020 timeframe. According to current NASA plans, the Ares V launch vehicle (or a variant) will be available about the same time, as will the capability to transport astronauts to the vicinity of the Moon via the Orion Crew Exploration Vehicle and associated systems. [As the lunar surface offers no advantages - and major disadvantages - for most major optical systems, the expensive system for landing and operating on the lunar surface is not required.] Although as currently conceived, SAFIR and other astronomical missions will operate at the Sun-Earth L2 location, it appears trivial to travel for servicing to the more accessible Earth-Moon L1,2 locations. Moreover, as the recent Orbital Express and Automated Transfer Vehicle missions have demonstrated, future robotic capabilities should offer capabilities that would (remotely) extend human presence far beyond the vicinity of the Earth. In addition to multiplying the value of NASA's architecture for future human spaceflight to achieve the goals multiple major stakeholders, if humans one day travel beyond the Earth-Moon system - say, to Mars - technologies and capabilities for operating for long periods in free space must be developed. The engineering. management, and operational successes of the Space Station have demonstrated that international collaboration is possible. However, there is a danger that the hard-won lessons of current programs will be lost without continuing development of in-space operations. A program to achieve. for example, major astronomical goals in space using astronauts and robots will sustain international capabilities, produce highly visible achievements, and appeal to an additional broad community of stakeholders not currently involved with missions to the lunar surface.
Author
Constellation Program; Ares 5 Cargo Launch Vehicle; Crew Exploration Vehicle; Earth-Moon System; International Space Station; Robots; Orbit Transfer Vehicles

20080037972 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Does the NASA Constellation Architecture Offer Opportunities to Achieve Multiple Additional Goals in Space?
Thronson, Harley; Lester, Daniel; [2008]; 1 pp.; In English; 59th International Astronautical Congress 2008, 29 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK; Copyright; Avail.: Other Sources; Abstract Only

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Ares 5 Cargo Launch Vehicle; Constellation Program; Crew Exploration Vehicle; James Webb Space Telescope; Launch Vehicles; Lunar Surface; Space Shuttles; Robots

20080038048 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Polar Gateways Arctic Circle Sunrise Conference 2008, Barrow, Alaska: IHY-IPY Outreach on Exploration of Polar and Icy Worlds in the Solar System

Cooper, John F.; Kauristie, Kirsti; Weatherwax, Allan T.; Sheehan, Glenn W.; Smith, Roger W.; Sandahl, Ingrid; Ostgaard, Nikolai; Chernouss, Sergey; Thompson, Barbara J.; Peticolas, Laura; Moore, Marla H.; Senske, David A.; Tamppari, Leslie K.; Lewis, Elaine M.; [2008]; 4 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Polar, heliophysical, and planetary science topics related to the International Heliophysical and Polar Years 2007-2009 were addressed during this circumpolar video conference hosted January 23-29, 2808 at the new Barrow Arctic Research Center of the Barrow Arctic Science Consortium in Barrow, Alaska. This conference was planned as an IHY-IPY event science outreach event bringing together scientists and educational specialists for the first week of sunrise at subzero Arctic temperatures in Barrow. Science presentations spanned the solar system from the polar Sun to Earth, Moon, Mars, Jupiter, Saturn, and the Kuiper Belt. On-site participants experienced look and feel of icy worlds like Europa and Titan by being in the Barrow tundra and sea ice environment and by going 'on the ice' during snowmobile expeditions to the near-shore sea ice environment and to Point Barrow, closest geographic point in the U.S. to the North Pole. Many science presentations were made remotely via video conference or teleconference from Sweden, Norway, Russia, Canada, Antarctica, and the USA, spanning up to thirteen time zones (Alaska to Russia) at various times. Extensive educational outreach activities were conducted with the local Barrow and Alaska North Slope communities and through the NASA Digital Learning Network live from the 'top of the world' at Barrow. The Sun- Earth Day team from Goddard, and a videographer from the Passport to Knowledge project, carried out extensive educational interviews with many participants and native Inupiaq Eskimo residents of Barrow. Video and podcast recordings of selected interviews are available at http://sunearthday.nasa.gov/2008/multimedidpodcasts.php. Excerpts from these and other interviews will be included in a new high definition video documentary called 'From the Sun to the Stars: The New Science of Heliophysics' from Passport to Knowledge that will later broadcast on NASA TV and other educational networks. Full conference proceedings are accessible at http://polargateways2008.org/.

Author

Kuiper Belt; Solar System; Titan; Planets; Planetary Environments; Polar Regions; Icy Satellites

20080038058 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Lunar Reconnaissance Orbiter (LRO) Navigation Overview

Lamb, Rivers; May 21, 2008; 20 pp.; In English; Lunar Reconnaissance Orbiter (LRO) Navigation Overview, 21 May 2008, Greenbelt, MD, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080038058

This viewgraph presentation is an overview of the Lunar Reconnaissance Orbiter (LRO), with emphasis on the navigation and plans for the mission. The objective of the LRO mission is to conduct investigations that will be specifically target to prepare for and support future human exploration of the Moon. There is a review of the scientific instruments on board the LRO and an overview of the phases of the planned trajectory.

CASI

Navigation; Lunar Programs; Lunar Probes; Lunar Trajectories; Lunar Orbits

20080038669 Stanford Univ., Stanford, CA USA; Tokyo Inst. of Tech., Japan; Adelaide Univ., Australia
Direct and Reprocessed Gamma-ray Emission of Kpc-Scale Jets in FR I Radio Galaxies
Stawarz, L.; Kneisk, T. M.; Kataoka, J.; January 2007; 2 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-917737; SLAC-PUB-12860; No Copyright; Avail.: Department of Energy Information Bridge

We discuss the contribution of kiloparsec-scale jets in FR I radio galaxies to the diffuse gamma-ray background radiation. The analyzed gamma-ray emission comes from inverse-Compton scattering of starlight photon fields by the ultrarelativistic electrons whose synchrotron radiation is detected from such sources at radio, optical and X-ray energies. We find that these objects, under the minimum-power hypothesis (corresponding to a magnetic field of 300 micro G in the brightest knots of these jets), can contribute about one percent to the extragalactic gamma-ray background measured by EGRET. We point out that this result already indicates that the magnetic fields in kpc-scale jets of low-power radio galaxies are not likely to be smaller than 10 iG on average, as otherwise the extragalactic gamma-ray background would be overproduced.
NTIS
Active Galaxies; Gamma Rays; Radio Galaxies

20080038679 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Ares V and Future Very Large Launch Vehicles to Enable Major Astronomical Missions
Thronson, Harley A.; Lester, Daniel F.; Langhoff, Stephanie R.; Corell, Randy; Stahl, H. Philip; [2008]; 17 pp.; In English; 59th International Astronautical Congress, 29 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK
Report No.(s): IAC-08-A5.3.6; Copyright; Avail.: CASI: A03, Hardcopy

The current NASA architecture intended to return humans to the lunar surface includes the Ares V cargo launch vehicle, which is planned to be available within a decade. The capabilities designed for Ares V would permit an 8.8-m diameter, 55 mT payload to be carried to Sun-Earth L1,2 locations. That is, this vehicle could launch very large optical systems to achieve major scientific goals that would otherwise be very difficult. For example, an 8-m monolith UV/visual/IR telescope appears able to be launched to a Sun-Earth L2 location. Even larger apertures that are deployed or assembled seem possible. Alternatively, multiple elements of a spatial array or two or three astronomical observatories might be launched simultaneously. Over the years, scientists and engineers have been evaluating concepts for astronomical observatories that use future large launch vehicles. In this presentation, we report on results of a recent workshop held at NASA Ames Research Center that have improved understanding of the science goals that can be achieved using Ares V. While such a vehicle uniquely enables few of the observatory concepts considered at the workshop, most have a baseline mission that can be flown on existing or near-future vehicles. However, the performance of the Ares V permits design concepts (e.g., large monolithic mirrors) that reduce complexity and risk.
Author
Ares 5 Cargo Launch Vehicle; Astronomical Observatories; Lunar Surface; Infrared Telescopes; Astronomy

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20080037602 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Inferring the Energy Distribution of Accelerated Electrons in Solar Flares from X-ray Observations
Holman, Gordon D.; Sui, Linhui; Su, Yang; May 25, 2008; 1 pp.; In English; The Joint meeting of AAS/SPD and America Geophysics Union (AGU), 25-31 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

Knowledge of the energy distribution of electrons accelerated in solar flares is important for constraining possible acceleration mechanisms and for understanding the relationships between flare X-ray sources, radio sources, and particles observed in space. Solar flare hard X-rays are primarily emitted from dense, thick-target regions in the lower atmosphere, but the electrons are understood to be accelerated higher in the corona. Various processes can distort the X-ray spectrum or the energy distribution of electrons before they reach the thick-target region. After briefly reviewing the processes that affect the X-ray spectrum and the electron distribution, I will describe recent results from a study of flare spectra from RHESSI to determine the importance of these processes in inferring the energy distribution of accelerated electrons.
Author
Electrons; Energy Distribution; Electron Acceleration; Solar Flares

20080037603 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Heliophysics Data Environment Today

Fung, Shing F.; McGuire, R.; Roberts, D. A.; May 26, 2008; 1 pp.; In English; Joint meeting of the American Astronautical Society/Science Programs Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, Fl, USA; No Copyright; Avail.: Other Sources; Abstract Only

Driven by the nature of the research questions now most critical to further progress in heliophysics science, data-driven research has evolved from a model once centered on individual instrument Principal investigator groups and a circle of immediate collaborators into a more inclusive and open environment where data gathered ay great public cost must then be findable and useable throughout the broad national and international research community. In this paper and as an introduction to this special session, we will draw a picture of existing and evolving resources throughout the heliophyscs community, the capabilities and data now available to end users, and the relationships and complementarity of different elements in the environment today. We will cite the relative roles of mission and instrument data centers and resident archives, multi-mission data centers, and the growing importance of virtual discipline observatories and cross-cutting services including the evolution of a common data dictionary. We will briefly summarize our view of the most important challenges still faced by users and providers, and our vision in ow the efforts today can evolve into a more and more enabling data framework for the global research community to tap the widest range of existing missions and their data to address a full range of critical science questions from the scale of microphysics to the heliospheric system as a whole.

Author

Heliosphere; Solar Physics; Data Acquisition; Data Processing

20080037606 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The User Community and a Multi-Mission Data Project: Services, Experiences and Directions of the Space Physics Data Facility

Fung, Shing F.; Bilitza, D.; Candey, R.; Chimiak, R.; Cooper, John; Fung, Shing; Harris, B.; Johnson R.; King, J.; Kovalick, T.; Leckner, H.; Papitashvili, N.; Roberts, Aaron; May 26, 2008; 1 pp.; In English; Joint meeting of the American Astronautical Society/Science Programs Division, American Geophysical Union, 26-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

From a user's perspective, the multi-mission data and orbit services of NASA's Space Physics Data Facility (SPDF) project offer a unique range of important data and services highly complementary to other services presently available or now evolving in the international heliophysics data environment. The VSP (Virtual Space Physics Observatory) service is an active portal to a wide range of distributed data sources. CDAWeb (Coordinate Data Analysis Web) enables plots, listings and file downloads for current data cross the boundaries of missions and instrument types (and now including data from THEMIS and STEREO). SSCWeb, Helioweb and our 3D Animated Orbit Viewer (TIPSOD) provide position data and query logic for most missions currently important to heliophysics science. OMNIWeb with its new extension to 1- and 5-minute resolution provides interplanetary parameters at the Earth's bow shock as a unique value-added data product. SPDF also maintains NASA's CDF (common Data Format) standard and a range of associated tools including translation services. These capabilities are all now available through webservices-based APIs as well as through our direct user interfaces. In this paper, we will demonstrate the latest data and capabilities now supported in these multi-mission services, review the lessons we continue to learn in what science users need and value in this class of services, and discuss out current thinking to the future role and appropriate focus of the SPDF effort in the evolving and increasingly distributed heliophysics data environment.

Author

Astrophysics; Solar Physics; Data Acquisition; Data Processing

20080037612 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Meridional Circulation in the Sun

Duvall, T. L., Jr.; Hanasoge, S. M.; August 08, 2008; 1 pp.; In English; SOHO 21 2008 Conference, 8-14 Aug. 2008, Boulder, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

Measuring the depth variation of the meridional flows is important for understanding the solar cycle, at least according to a number of dynamo models. While attempting to extend the early observations of Giles (1999; Ph. D. thesis, Stanford Univ.) of time-distance measurements of flow, we have stumbled upon some systematic errors that can affect these measurements: 1) the additional distance traveled by radiation coming from points away from disk center causes an apparent 'shrinking' Sun, that is an apparent flow towards the disk center, 2) in measurements away from the central longitude, the rotation signal can leak into meridional flow signals, and 3) in measurements of the north-south mean travel times along the equator, a spurious error of 6 sec travel time is seen. That the signal is spurious is confirmed by observing half the time with

the image rotated 180 degrees. Although this is an effect with mean travel times and not differences, it still seems useful to understand it. Attempts to understand and overcome these systematic problems will be presented. Forward modeling has been done using ray theory to test the sensitivity of travel times to various models.
Author
Meridional Flow; Solar Cycles

20080037623 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Overview of STEREO/EUVI and SOHO/EIT Data during the WHI Campaign
Kucera, Therese A.; Landi, E.; May 25, 2008; 1 pp.; In English; Joint meeting of the AAS/SPD and AGU, 25-31 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The poster will present an overview of the data from the March-April,2008 Whole Heliospheric Interval Campaign. These instruments will show the targets during the campaign from three points of view at a range of temperatures. Targets are expected to include coronal cavities, coronal holes, active regions and prominences.
Author
Heliosphere; Data Acquisition; Ultraviolet Spectrometers; Spectrographs

20080037746 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Models of Coronal Loops and Those Annoying Observations
Klimchuk, James A.; September 29, 2008; 1 pp.; In English; Second Hinode Science Meeting, 29 Sep. - 3 Oct. 2008, Denver, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

It is often said that coronal loops are the fundamental building blocks of the magnetically-closed corona. This is certainly true, especially when one realizes that the diffuse component of the corona can be thought of as a collection of indistinguishable loops. During the Skylab era, it was believed that loops are in states of quasi static equilibrium. However, more recent observations combined with numerical models have revealed that this interpretation is not correct, at least for many loops. The concept of loops as bundles of impulsively-heated strands is very appealing and solves many of the problems faced by static models, but it too faces observational challenges. Yet another idea involves the fascinating phenomenon of thermal nonequilibrium. I will review the various attempts to model coronal loops and discuss how they agree and disagree with observations, paying particular attention to the latest results from Hinode.
Author
Coronal Loops; Solar Physics

20080037987 NASA Goddard Space Flight Center, Greenbelt, MD, USA
SDO Onboard Ephemeris Generation
Berry, Kevin E.; Liu, Kuo-Chia; August 18, 2008; 8 pp.; In English; AIAA Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080037987

The Solar Dynamics Observatory (SDO) spacecraft is a sun-pointing, semi-autonomous satellite that will allow nearly continuous observations of the Sun with a continuous science data downlink. The science requirements for this mission necessitate very strict sun-pointing requirements, as well as continuous ground station connectivity through high gain antennas (HGAs). For SDO s onboard attitude control system to successfully point the satellite at the Sun and the HGAs at the ground stations with the desired accuracy, in addition to the need for accurate sensors it must have good onboard knowledge of the ephemerides of the Sun, the spacecraft, and the ground station. This paper describes the minimum force models necessary for onboard ephemeris generation in support of an attitude control system. The forces that were considered include the Sun s point mass, Moon s point mass, solar radiation pressure (SRP), and the Earth s gravity with varying degree and order of terms of the geopotential.
Author
Ephemerides; Solar Observatories; Autonomy; Helioseismology; Ground Stations; Solar Radiation; Sun; High Gain

20080038051 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Role of Magnetic Reconnection in Solar Activity
Antiochos, Spiro; DeVore, C. R.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly Conference, 13-18 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

The central challenge in solar/heliospheric physics is to understand how the emergence and transport of magnetic flux at

the photosphere drives the structure and dynamics that we observe in the corona and heliosphere. This presentation focuses on the role of magnetic reconnection in determining solar/heliospheric activity. We demonstrate that two generic properties of the photospheric magnetic and velocity fields are responsible for the ubiquitous reconnection in the corona. First, the photospheric velocities are complex, which leads to the injection of energy and helicity into the coronal magnetic fields and to the efficient, formation of small-scale structure. Second, the flux distribution at the photosphere is multi-polar, which implies that topological discontinuities and, consequently, current sheets, must be present in the coronal magnetic field. We: present numerical simulations showing that photospherically-driven reconnection is responsible for the heating and dynamics of coronal plasma, and for the topology of the coronal/heliospheric magnetic field.
Author
Magnetic Field Reconnection; Solar Magnetic Field; Heliosphere; Solar Corona; Solar Physics

20080038680 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Shock Acceleration of Solar Energetic Protons: The First 10 Minutes
Ng, Chee K.; Reames, Donald V.; [2008]; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): LWS-04-0000-0076; SHP04-0016-0024; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080038680

Proton acceleration at a parallel coronal shock is modeled with self-consistent Alfven wave excitation and shock transmission. 18 - 50 keV seed protons at 0.1% of plasma proton density are accelerated in 10 minutes to a power-law intensity spectrum rolling over at 300 MeV by a 2500km s-1 shock traveling outward from 3.5 solar radius, for typical coronal conditions and low ambient wave intensities. Interaction of high-energy protons of large pitch-angles with Alfven waves amplified by low-energy protons of small pitch angles is key to rapid acceleration. Shock acceleration is not significantly retarded by sunward streaming protons interacting with downstream waves. There is no significant second-order Fermi acceleration.
Author
Magnetohydrodynamic Waves; Plasma Density; Plasma Waves; Coronas; Solar Diameter; Protons; Pitch (Inclination)

20080038681 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Observation of Solar Wind Charge Exchange Emission from Exospheric Material in and Outside Earth's Magnetosheath
Snowden, S. L.; Collier, M. R.; Cravens, T.; Kuntz, K. D.; Lepri, S. T.; Robertson, I.; Tomas, L.; [2008]; 16 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNX06AG73G; Copyright; Avail.: CASI: A03, Hardcopy

A long XMM-Newton exposure is used to observe solar wind charge exchange (SWCX) emission from exospheric material in and outside Earth s magnetosheath. The light curve of the O VII (0.5-0.62 keV) band is compared with a model for the expected emission, and while the emission is faint and the light curve has considerable scatter, the correlation is significant to better than 99.9%. This result demonstrates the validity of the geocoronal SWCX emission model for predicting a contribution to astrophysical observations to a scale factor of order unity (1.36). The results also demonstrate the potential utility of using X-ray observations to study global phenomena of the magnetosheath which currently are only investigated using in situ measurements.
Author
XMM-Newton Telescope; Charge Exchange; Solar Wind; Geocoronal Emissions; Light Curve; Magnetosheath; Astrophysics; Exposure

20080039155 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Questions Concerning the Disconnection and Eruption of Filaments and CMEs
Kucera, Theresa; October 29, 2007; 1 pp.; In English; PROM (Prominence Research Observations and Models) Workshop 2007, 27 - 31 Oct. 2007, Berkeley, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Reviews examples of eruptions and failed eruptions of filaments and CMEs and review questions concerning the processes and mechanisms involved. Where and how does disconnection occur? What can we learn (if anything!) about CME eruptions by observing related filament eruptions?
Author
Coronal Mass Ejection; Filaments

20080039168 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Static and Impulsive Models of Solar Active Regions
Patsourakos, S.; Klimchuk, James A.; [2008]; 10 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080039168

The physical modeling of active regions (ARs) and of the global coronal is receiving increasing interest lately. Recent attempts to model ARs using static equilibrium models were quite successful in reproducing AR images of hot soft X-ray (SXR) loops. They however failed to predict the bright EUV warm loops permeating ARs: the synthetic images were dominated by intense footpoint emission. We demonstrate that this failure is due to the very weak dependence of loop temperature on loop length which cannot simultaneously account for both hot and warm loops in the same AR. We then consider time-dependent AR models based on nanoflare heating. We demonstrate that such models can simultaneously reproduce EUV and SXR loops in ARs. Moreover, they predict radial intensity variations consistent with the localized core and extended emissions in SXR and EUV AR observations respectively. We finally show how the AR morphology can be used as a gauge of the properties (duration, energy, spatial dependence, repetition time) of the impulsive heating.
Author
Solar Magnetic Field; Coronal Loops; Hydrodynamics; Sun

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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*.

20080037597 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Analysis of EUV, UV, and H-alpha Emission from Two Very Different Prominences
Kucera, T.; Landi, E.; May 25, 2008; 1 pp.; In English; Joint meeting of the AAS/SPD and AGU, 25-31 May 2008, Fort Lauderdale, Fl, USA
Contract(s)/Grant(s): NNH04AA12I; No Copyright; Avail.: Other Sources; Abstract Only

We analyze the properties of a pair of prominences observed the UV and EUV in April 2004. One was a generally quiet prominence which exhibited a period of activation. Another was a large ‘coronal cloud’ type prominence. Both were observed by SOHO/SUMER, TRACE, and in Hα by BBSO and MLSO. The quiet prominence was also observed by the SOHO/CDS instrument. TRACE and Hα data provide 2D images on with time cadences on the order of 1 minute. 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. This observing program was designed to allow us to study prominence dynamics . CDS raster data was taken with a slower cadence, in lines formed at temperatures from 20,000 - 1 million K. We combine these different data sets to analyze the thermal properties, including differential emission measures (DEMs), of these very different prominences, and compare the results to those of prominences previously analyzed by ourselves and others.
Author
Extreme Ultraviolet Radiation; H Alpha Line; Thermodynamic Properties; Solar Prominences; Ultraviolet Radiation

20080037749 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Disk-Jet Connection in Radio-Loud AGN: The X-Ray Perspective
Sambruna, Rita; July 07, 2008; 1 pp.; In English; Chandra Radiogalaxy Workshop, 7-11 Jul. 2008, Cambridge, MA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Unification schemes assume that radio-loud active galactic nuclei (AGN) contain an accretion disk and a relativistic jet perpendicular to the disk, and an obscuring molecular torus. The jet dominance decreases with larger viewing angles from blazars to Broad-Line and Narrow-Line Radio Galaxies. A fundamental question is how accretion and ejecta are related. The X-rays provide a convenient window to study these issues, as they originate in the innermost nuclear regions and penetrate large obscuring columns. I review the data, using observations by Chandra but also from other currently operating high-energy experiments. Synergy with the upcoming GLAST mission will also be highlighted.
Author
Active Galactic Nuclei; Accretion Disks; Relativistic Plasmas; Plasma Jets; Radio Emission; X Rays

20080038050 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Innermost Van Allen Radiation Belt for High Energy Protons at Saturn

Cooper, John F.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The high energy proton radiation belts of Saturn are energetically dominated by the source from cosmic ray albedo neutron decay (CRAND), trapping of protons from beta decay of neutrons emitted from galactic cosmic ray nuclear interactions with the main rings. These belts were originally discovered in wide gaps between the A-ring, Janus/Epimetheus, Mimas, and Enceladus. The narrow F and G rings significant affected the CRAND protons but did not produce total depletion. Voyager 2 measurements subsequently revealed an outermost CRAND proton belt beyond Enceladus. Although the source rate is small, the trapping times limited by radial magnetospheric diffusion are very long, about ten years at peak measured flux inwards of the G ring, so large fluxes can accumulate unless otherwise limited in the trapping region by neutral gas, dust, and ring body interactions. One proposed final extension of the Cassini Orbiter mission would place perikrone in a 3000-km gap between the inner D ring and the upper atmosphere of Saturn. Experience with CRAND in the Earth's inner Van Allen proton belt suggests that a similar innermost belt might be found in this comparably wide region at Saturn. Radial dependence of magnetospheric diffusion, proximity to the ring neutron source, and northward magnetic offset of Saturn's magnetic equator from the ring plane could potentially produce peak fluxes several orders of magnitude higher than previously measured outside the main rings. Even brief passes through such an intense environment of highly penetrating protons would be a significant concern for spacecraft operations and science observations. Actual fluxes are limited by losses in Saturn's exospheric gas and in a dust environment likely comparable to that of the known CRAND proton belts. The first numerical model of this unexplored radiation belt is presented to determine limits on peak magnitude and radial profile of the proton flux distribution. Author

Radiation Belts; Proton Energy; Saturn Rings; Cosmic Ray Albedo; Neutron Decay; Nuclear Interactions; Galactic Cosmic Rays

20080038055 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Near-Earth Space Radiation Environment

Xapsos, Michael; August 11, 2008; 25 pp.; In English; Conference on the Application of Accelerators in Research and Industry (CAARI), 11-15 Aug. 2008, Fort Worth, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080038055

This viewgraph presentation reviews the effects of the Near-Earth space radiation environment on NASA missions. Included in this presentation is a review of The Earth s Trapped Radiation Environment, Solar Particle Events, Galactic Cosmic Rays and Comparison to Accelerator Facilities.

CASI

Aerospace Environments; Extraterrestrial Radiation; Galactic Cosmic Rays; Terrestrial Radiation; Electromagnetic Radiation; Extraterrestrial Environments; Earth Orbital Environments

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20080038060 Naval Observatory, Washington, DC USA

A Report on GPS and Galileo Time Offset Coordination Efforts

Hahn, Jorg H; Powers, Edward D; Jan 2007; 7 pp.; In English

Report No.(s): AD-A481716; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA481716

Precise timing is an inherent part of Radio Navigation Systems like GPS and Galileo. This paper will update progress on cooperative efforts between the GPS system and the Galileo system to harmonize the underlying Navigation time scales of both systems to better facilitate a combined GPS/Galileo Navigation solution. This paper will also outline cooperative experimentation and demonstration that will be conducted during the Galileo development phase.

DTIC

Coordination; Galileo Spacecraft; Global Positioning System

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